

THE ASSOCIATION OF IMPULSE BUYING BEHAVIOUR WITH ENVIRONMENT AND SOCIAL FACTORS: A GENDER PERSPECTIVE

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ABSTRACT.

Background: Males and females have different shopping preferences and behaviours that lead them to make impulsive purchases. Several factors have been discussed in the prior literature that would prompt them to make impulsive purchases. However, a lack of attention has been given by researchers to how social and environmental factors would differ between males and females. **Aim:** The primary purpose of this study was to examine whether environmental and social factors are associated with impulse buying in both males and females. **Methods and Sample:** The study was conducted in five premium outlets in Malaysia with a total of 390 respondents. Using t-test and Pearson correlation, this study explored the different patterns of impulse buying behaviour between males and females. **Results:** This study revealed that environmental factors were associated with impulse buying among female tourists. At the same time, word of mouth (WOM) emerged as having a significant relationship with impulse buying among male tourists. **Conclusion, Implication:** Given these findings, this study may have several implications. The retailers could design an encouraging environment to encourage both genders to purchase impulsively. Additionally, having a good reputation plays an important role in encouraging consumers or tourists to spread positive word of mouth. **Limitation:** This study has limitations in certain aspects where it only covers the aspect of gender but not age. Thus, this study suggests future research can measure the age aspect to obtain an interesting result.

Keywords: Environmental factors, social factors, impulse buying, gender

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Introduction

Shopping may not be the main reason why tourists travel. However, it is not surprising to see tourists make an unplanned purchase during vacation or what is termed impulse buying behaviour. Impulse buying behaviour is one of the means to increase retail profit and shopping tourism revenue (Li et al., 2014; Foroughi et al., 2011). The retail sector in Malaysia contributed 44.8% to the tourism industry in 2018 (Statistic Malaysia, 2018). Thus, understanding the role of impulse buying behaviour would provide valuable information and strategies to retailers on how to increase revenue as well as tourist spending. Retailers can gain 60% of their profit from impulse buying behaviour (Clover, 1950). Moreover, impulse buying has been found to contribute 62% of the sales in supermarkets and 80% of the sales of luxury goods (Ruvio & Belk, 2013). The existence of credit cards, cash machines and online shopping networks make it easier for consumers to purchase products anytime and anywhere on impulse (Cheng et al., 2013).

Most previous studies have shown the importance of impulse buying behaviour. However, there is still little research on the role of gender in impulsive purchases, though it is one of the key variables for retailers in managing market segmentation (Tiffernt & Herstein, 2012). The past literature has reported that men and women have different shopping behaviour and preferences (Coley & Burgeess, 2003). Particularly, the factors that have been found to contribute to such differences in impulse buying behaviour include males' and females' emotions (Coley & Bugees, 2003; Prakash et al., 2017), thinking processes (Meyers-Levey & Sternthal, 1991; Laroche et al., 2000), product preferences (Coley & Burgess, 2003; Dittmar et al., 1995), and gender companions (Cheng et al., 2013). Additionally, studies on impulse buying have highlighted the contributing roles of environmental and social factors. However, the past literature has neglected to examine whether the relationships between the main research variables would differ between males and females. Therefore, this study aimed to identify if impulse buying is significantly associated with environmental and social factors and if such associations would differ between males and females.

Theoretical background

Impulse buying behaviour

Impulse buying behaviour is defined as an unplanned purchase (Kollat & Willet, 1969). It is a situation wherein a purchase is made without planning in advance (Stern, 1962). Impulse buying behaviour happens when consumers do not have any intention to purchase a specific product or brand (Hadjali et al., 2012). It reflects consumer feelings, where according to Handayani (2018), impulse buying could give a sense of happiness. A person would feel happy after they made a purchase impulsively. Consumers may feel that they already own a particular product, thereby compelling them to grab and purchase it impulsively (Saad & Metawie, 2015; Virvilaite & Saladiene, 2012; Zhaou et al., 2019). Nonetheless, Stern (1962) stated that impulse buying does not always connote that the consumer did not plan to purchase ahead of time. There may be times when a consumer has planned to buy in advance; however, the actual purchase is different once inside the store. Therefore, impulse buying also occurs even when consumers already have a specific product to purchase in mind.

In contrast, impulse buying behaviour in the context of tourism is strictly considered a planned purchase, that is, tourists have made a plan to go on vacation before booking a trip (Leasser & Dolnicar, 2012). As travelling decisions are sometimes made last minute, Karl et al. (2021) define impulse buying in tourism as a situation in which an individual may approach the travel decision-making process without a list of specific products to buy but with an impulse to act impulsively. According to Stern (1962), pure impulse buying does not occur in tourism except in the context of shopping tourism. Tourists do not have any shopping intention before they travel, but they would eventually purchase specific products to experience the culture of the place they are visiting (Babin et al., 2004; Karl, 2021).

Basically, the process of deciding to make a purchase consists of five stages, namely, problem/need recognition (stage 1), information search (stage 2), evaluation of alternatives (stage 3), purchase decision (stage 4), and post-purchase behaviour (stage 5). However, the intermediate process is skipped in impulse buying (Prakash et al., 2017). The first stage is swiftly followed by the penultimate stage, which is making a purchase decision. Most commonly, the environment in a shopping mall or store is the primary element that encourages consumers to purchase impulsively. In terms of social factors, suggestions from friends, family members, salespersons as well as the crowd may influence customers to make a purchase spontaneously. To summarize, impulse buying behaviour usually occurs due to certain factors that allure them to make a purchase.

Environmental factors

In the shopping setting, the environment is one of the important elements influencing consumers' shopping behaviour. The store environment encompasses the physical characteristics of the store or shopping mall, such as the layout design, sound, color, light, and temperature, that create a certain impression from the consumer's view (Berman & Evans, 2014). Most previous studies have indicated that the attributes of the environment can make consumers stay longer in the mall or store, thus encouraging them to make a purchase (Porral & Mangin, 2019; Mohan et al., 2013; Muruganantham & Bhakat, 2013). Specifically, a comfortable ambience, layout, and music may persuade consumers to make a purchase impulsively (Meents et al., 2020; Bustamante & Rubio, 2017; Anwar et al., 2022). The conducive environment in malls or stores may arouse positive emotions, thereby facilitating impulse buying behaviour.

Sales promotion is another environmental factor that can induce consumers to make a purchase. The symbols, labels, and displays used to attract consumers are among the components of the retail environment (Ashraf et al., 2014). Even though sales promotion might not always induce additional purchases, it leads to customers staying longer in the mall (Li et al., 2021s). Sales promotion manifests marketing communication activities (Alvarez & Casielles, 2005; Mkhize & Ellies, 2020) that are used by retailers to prompt consumers to make a purchase (Shimp, 2003). Additionally, prior studies stated that promotional activities help retailers to gain more sales (Altukar & Kensari, 2018; Chandukala et al., 2017) as well as consumer engagement (Kaveh et al., 2020) which in return garners impulsive purchases (Hashmi et al., 2019; Ali et al., 2019). Consumers or tourists are easily persuaded by sales promotion offered by retailers. Previous studies have found that sales promotion can encourage consumers to make a purchase (Bandyopadhyay et al., 2021; Metilda & Karthika, 2015; Andreti et al., 2013). Moreover, exposure to a great deal of sales promotion affects the mood of the consumers or tourists, thus triggering them to make a purchase. Studies have found explicitly that an attractive promotion, lower price and fewer taxes can influence tourists to purchase impulsively (Ali et al., 2019; Sohn & Lee, 2016; Timothy & Butler, 1995).

The wide variety of selections in shopping malls can spur an exciting feeling among consumers, thereby turning them into variety seekers (Donthu & Garcia, 1999; Moe, 2003; Lim & Dubinsky, 2004). In other words, consumers are offered a wide array of choices before they make a purchase. Khorrami et al. (2015) indicated that a variety of selections allows consumers to adapt to current trends or different situations. This can also arouse the consumers' emotions, thereby leading them to make a purchase on impulse (Sharma et al., 2010; Lin, 2014; Park et al., 2012). Additionally, Idoko et al. (2019) stated that the variety of stores in shopping malls creates positive arousal, such as excitement in shoppers' minds. On the other hand, prior studies (Brusch et al., 2019; Mofokeng, 2021) found that broad product variety leads to customer satisfaction. While in the context of online shopping, product variety is an important element that encourages consumers to make a purchase (Kim & Ammeter, 2018). It allows variety seekers to enjoy their shopping experience, which, in turn, causes impulsive purchases.

Social factors

When it comes to shopping, consumers or tourists tend to be influenced by their families, friends, relatives or even the salesperson as they seek some information or opinions before they make a purchase. Such a form of communication wherein consumers gain information from other consumers who have purchased a product or service is called word of mouth (WOM) (Westbrook, 1987). WOM is the most powerful means of communication and a source of influencing consumer purchase behaviour (Scuderi et al., 2019). It is essential for retailers to sustain their image and good reputation through the spread of a positive WOM among consumers. In predicting consumer purchase intention, Gutierrez-Rodríguez et al. (2020) found that store image lead to positive WOM. When the retailers are able to retain their image, it will lead to store loyalty which in return encourages consumers to spread positive WOM (Guesta-Valino et al., 2022). Interaction with a salesperson can thus influence consumers to make a purchase on impulse (Chang et al., 2011). Chang (2014) also found that the opinions o tourist guide may encourage tourists to purchase impulsively. The process of sharing information or opinions among consumers can therefore influence them to purchase a product (Hawkins et al., 2004; Scuderi et al., 2019). Similarly, the interaction between the consumer and an accommodating employee facilitates impulse buying behaviour (Matilla & Wirtz, 2008).

The crowd in a shopping mall may also influence impulse buying in consumers entering the establishment. Perceived crowding is the density of the crowd in a particular place that affects an individual's feelings (Bandyopadhyay, 2020; Eroglu & Machlet, 1990; Jin et al., 2016). It can stimulate both positive and negative emotions among consumers. Some consumers may feel pleasure and dominance while being a part of the crowd in malls, but some may avoid it (Gogoi, 2017;

Bandyopadhyay, 2020, Nguyen & Ha, 2021). Ladhari et al. (2017) found that human crowd will lead to shopping confusion which will lessen the store loyalty and it lead to stress (Tran, 2020). Somehow, the crowd in shopping malls are able to persuade consumers to make a purchase impulsively (Sriwardiningsih, 2011, Miyuri, 2017). This feeling of excitement that consumers or tourists experience with a crowd may encourage them to make an impulsive purchase (Gogoi 2017; Katakam, 2021; Parsad et al., 2018).

Gender and impulse buying

The differences between men and women are of interest to the industry that seeks to develop strategies that would be responsive to their needs and wants. Males and females have different preferences before they make a purchase (Pradhana & Sastiono, 2018; Paramitha et al., 2022). Men are more likely than women to purchase a product that has practical use and function and allows them to demonstrate their strong personality identity. In contrast, women are more likely to be attracted to products that are related to their social identity, fashion sense and style (Coley & Burgees, 2003; Dittmar et al., 1995). Generally, women engage in more impulse buying compared to men due to their innate tendency to shop (Dittmar et al., 1995; Rook & Hoch, 1985; Tifferet & Herstein, 2012; Djafarova & Bowes, 2021). Women have higher levels of impulsiveness to spend more money than men do (Tinnie, 2011; Atulkar & Kesari, 2017; Imad et al., 2022). Their impulse buying tendency is high and they are known as highly materialistic consumers compared to men (Utama et al., 2021). Moreover, previous researchers (Stern, 1962; Chun et al. 2020) indicated that women tend to carry out planned impulse buying, changing their purchases depending on sales, price specials, and coupon offers, among others. Kollet & Willet (1969) stated that if the number of sales remains constant, both men and women would have the same degree of vulnerability to impulse purchase. On the other hand, Cheng et al. (2013) reported that consumers have a high tendency to purchase on impulse when they are shopping with the opposite gender.

Methodology

Study sample and data collection

This study is to identify whether impulse buying is significantly associated with environmental and social factors in both females and males. Thus, the sample for this study consisted of international and local tourists who shopped in premium outlets in Malaysia. A non-probability sample was employed due to the unavailability of the list of international and local tourists who visited the said establishment in the country. The questionnaires were distributed to 390 respondents who were shopping at the Johor Premium Outlet (JPO), Mitsui Outlet Park (MOP), Freeport A' Famosa Outlet, Design Village Outlet (DVO) and Genting Premium Outlet (GPO). The questionnaires were written in four languages, namely, Malay, English, Chinese, and Arabic. A pre-test of the questionnaires was done by service experts of premium outlets as well as by academic experts at the Universiti Putra Malaysia. A pilot test was also done with 60 respondents. Their comments and suggestions were taken into consideration to improve the questionnaire. Then, the questionnaire was revised and modified accordingly. The respondents were approached after they were done with shopping and were asked if they were willing to participate in the survey. Once they agreed, they were asked to complete the survey, which took just a few minutes for them to do.

Measure

The development of the questionnaire for this study was based on the extant literature. The instruments were measured using a 7-point Likert scale with response options ranging from strongly disagree (1) to strongly agree (7). The store environment was measured using six items of the instrument adapted from Lo & Qu (2015) and Mohan et al. (2013). The seven items for sales promotion were adapted from Lo and Qu (2015), Wakefield & Barnes (1996) and Park et al. (2012). While the six items for variety of selection were obtained from Park et al. (2012). Moreover, the question used to measure WOM was adapted from Jalilvand & Samiei (2012). Lastly, the items for perceived crowding were taken from Gogoi (2017) and Li et al. (2009).

Results

Profile of the sample

Table 1 indicates the demographic profile of the respondents for this study. Most respondents were females (52.1%) aged 25 to 35 years. Approximately 40.5% of the respondents were single, whereas 57.2% were married. Among local tourists, 3.8% had an income below RM 1000, while 17.9% earned about RM 2000 to RM 3000. In contrast, among the international tourists, 12.8% reported having an income below USD 1000, while 14.6% earned about USD1000 to USD2000. Additionally, 31% of the respondents were employed in the government sector and with a bachelor's degree. Also, around 54.9% of the respondents were local tourists, whereas 45.1% were foreigners.

Table 1: Demographic profile

Demographic characteristic	Percentage (%)	Demographic characteristic	Percentage (%)
Gender		Occupation	
Male	47.9	Government Sector	31.0
Female	52.1	Private Sector	45.9
Age		Self-Employment	14.9
18-24	17.7	Others	8.2
25-35	43.6	Country of Origin	
36-44	25.4	Malaysia	54.9
45-55	11.3	Non-Malaysia	45.1
55-60	1.3	Education Level	
Above 60	0.8	Secondary/High school	10.5
Marital Status		Diploma	24.1
Single	40.5	Bachelor's degree	43.1
Married	57.2	Master's degree	17.7
Divorced	2.1	Doctorate degree	4.1
Others	0.3	Others	0.5
Income (RM)		Income (USD)	
Below RM1000	3.8	Below USD 1000	12.8
RM1000-RM2000	5.1	USD1000 – USD2000	14.6
RM2000-RM3000	17.9	USD2000 – USD3000	10.5
RM3000-RM4000	11.0	USD3000 – USD4000	5.1
RM4000-RM5000	9.2	USD4000 – USD5000	0.8
More than RM5000	7.7	More than USD5000	1.0

Results on the significant difference between males and females in terms of the environmental and social factors that affect impulse buying behaviour

Further analysis was performed using a t-test to identify the differences between females and males with regard to the main research variables. As shown in Table 2, the variable with the highest scores was store environment with a mean of above 5 on a 7-point scale. The highest rated items for females were, “the outlet has attractive displays,” and “the environment of the outlet is clean.” Meanwhile, the highest rated item for males was, “it was easy to move about in the outlet.” Generally, there were no statistically significant differences between males and females in all items for store environment.

As to sales promotion, different mean scores emerged between females and males. The item “promotion plays a big part in my choice to make a purchase” had the highest mean score in both gender groups. While, the items with the second highest mean scores were “promotion influences how much I spend when I visit the outlet” and “special price for the product are available in this outlet” for females

and males, respectively. Overall, the results indicated statistically significant differences between males and females in the t-test analysis of five items for sales promotion.

Table 2: Comparisons between males and females on environmental factors

Environmental factors	Males	Females	t	df	t-test sig (2-tailed)	Effect size
Store environment	Mean	Mean				
The decoration of the outlet is modern	5.09	5.30	-1.655	388	.099	0.007
The environment of the outlet is comfortable	5.32	5.30	.204	388	.838	0.000
The environment of the outlet is safe	5.30	5.38	-.673	362.762	.501	0.001
The environment of the outlet is clean	5.35	5.42	-.598	368.372	.550	0.000
It was easy to move about in the outlet	5.34	5.36	-.137	367.008	.891	0.000
It was easy to locate products/merchandise in the outlet	5.25	5.33	-.667	388	.505	0.001
The outlet has attractive displays	5.31	5.43	-1.094	388	.548	0.003
Sales Promotion	Mean	Mean				
The outlet has attractive discounts.	4.81	5.07	-2.124	388	.034**	0.011
The outlet gives out gifts and samples.	4.41	4.33	.546	388	.585	0.000
Special prices of the product are available in this outlet.	5.01	5.14	-1.020	388	.308	0.002
Promotion information influences me when I visit the outlet.	4.82	5.31	-3.625	388	.000**	0.035
Promotion information influences how much I spend when I visit the outlet.	4.89	5.34	-3.339	388	.001**	0.029
If there's a promotion, I like to go to that particular outlet instead of another one.	4.72	4.89	-1.204	388	.229	0.003
Promotion plays a big part in my choice to make a purchase.	5.14	5.42	-2.164	388	.031**	0.012
The price of products in the outlet is economical.	4.77	5.08	-2.399	388	.017**	0.015
Variety of selection	Mean	Mean				
The outlet deals with a variety of fashion items.	4.93	5.26	-2.833	388	.005**	0.021
The outlet has wide assortment of products with different prices.	5.16	5.37	-1.818	388	.070	0.008
The outlet deals with a variety of brands.	5.21	5.47	-2.138	388	.033**	0.011
The outlet sells interesting fashion items.	5.28	5.39	-.848	388	.397	0.001
The selection of shops in this outlet is sufficiently wide and varied.	5.04	5.17	-1.132	388	.258	0.003
There is an attractive range of shops in this outlet.	5.09	5.43	-2.885	388	.004**	0.021

The items for variety of selection with the highest mean scores in females were “the outlet deals with variety of brand,” and “the outlet sells interesting fashion items.” On the other hand, the items “there is an attractive range of shop in this outlet,” and “the outlet deals with a variety of brand” had the highest mean scores among males. The results also demonstrated statistically significant differences between males and females in three items for variety selection.

Table 3: Comparisons between males and females on social factors

Social Factors	Males	Females	t	df	t-test sig (2-tailed)	Effect size
WOM	Mean	Mean				
Ask tourist/friend/salesperson to make good impression on others	4.13	4.42	-1.839	388	.067	0.008
to make good impression. Ask tourist's/friend's/salesperson's reviews.	4.28	4.64	-2.264	388	.024**	0.005
Consult other tourists choose attractive fashion.	4.33	4.51	-1.165	388	.245	0.003
Gain information from tourist/friend/salesperson before purchase.	4.10	4.37	-1.786	388	.075	0.008
When I shop, other tourists/friends/salesperson opinions make me confident.	4.28	4.55	-1.734	388	.084	0.007
Perceived Crowding	Mean	Mean				
I found the outlet too busy during my shopping trip.	4.44	4.66	-1.492	388	.137	0.005
The outlet traffic was high.	4.42	4.67	-1.694	388	.091	0.007
I found a lot of shoppers in the outlet.	4.76	5.02	-1.864	388	.063	0.009
The outlet looks more congested due to the design and layout.	4.36	4.28	.540	388	.589	0.000
The outlet feels very spacious when I shop in the store.	4.98	5.04	-.467	388	.640	0.000
I felt confined when shopping in the outlet.	3.64	3.34	1.795	388	.073	0.008

Furthermore, for WOM, the mean scores were all above four based on a 7-point scale, which are quite lower than those of the environmental factors (see Table 3). The item with the highest rating in females was “to make sure I choose the right product/brand/fashion, I often ask other tourists'/friends'/salespersons' reviews.” In contrast, the statement “when I shop, other tourists'/friends'/salespersons' opinions make me confident to make a purchase” had the highest mean score among males. Overall, there was a statistically significant difference between males and females on one item for WOM.

Further, males and females did not significantly differ in perceived crowding. Nonetheless, both groups had the highest rating for the item “the outlet feels very spacious when I shop in the store.” Similarly, the item “I found many shoppers in the outlet” had the second highest mean score in both females and males.

Results on the correlation analysis of the relationship between impulse buying behaviour and environmental and social factors across gender

Pearson's correlation was used to analyse the relationship of environmental and social factors with impulse buying behaviour in both females and males (see Table 4). For environmental factors, store environment ($r=0.175$, $p<0.05$), sales promotion ($r=0.227$, $p<0.05$), and variety of selection ($r=0.177$, $p<0.05$) were found to have statistically significant associations with impulse buying

behaviour in females, but not in males. On the other hand, for social factors, WOM was significantly correlated with impulse buying behaviour among males ($r=.190$, $p<0.05$) and females ($r=0.52$, $p<0.05$). Lastly, perceived crowding was significantly associated with impulse buying behaviour in both groups.

Table 4: Correlation matrix

Group	Measure	Environmental Factors			
		Store environment	Sales promotion	Variety of selection	IBB
Male	Store environment	1			
	Sales Promotion	.598**	1		
	Variety of selection	.668**	.729**	1	
	IBB	-.013	.099	.010	1
Female	Store environment	1			
	Sales Promotion	.522**	1		
	Variety of selection	.578**	.699**	1	
	IBB	.175**	.227**	.177**	1
Social factors					
Groups	Measure	WOM	Perceived Crowding	IBB	
Male	WOM	1			
	Perceived Crowding	.252**	1		
	IBB	.190**	.222**	1	
Female	WOM	1			
	Perceived Crowding	.317**	1		
	IBB	0.52	.198**	1	

Note: **Correlation is significant at level 0.05 (2-tailed).

Discussion

Notably, there is a need to understand gender differences in the factors that influence buying on impulse. This study revealed that female tourists felt comfortable with a store environment when the retailer could offer them an attractive display as well as a clean establishment. In contrast, male tourists were more comfortable with an environment that allowed them to move around easily. Altukar & Kensari (2018) also found that the eye-catching store design, lightning, music and decoration attract and encourage female consumers to purchase impulsively compared to male consumers. While Borges et al. (2013) found that a hedonic atmosphere leads to higher quality perception and thus leads to purchase intention among female consumers. In contrast with Herter et al. (2014) study, where retail environment perception is stronger for men than for women. The contradiction of the studies might be due to differences in the context of the study as well as the sample size of the study. Somehow, the correlation result of this study indicates that females' impulse buying behaviour was highly correlated with the store atmosphere. Therefore, this study demonstrates that women are more attracted to the store environment which lead them to make impulse buying.

While sales promotion was the main criterion that women looked into before making purchases. The correlation results also indicated that among females, sales promotion is significantly related to impulse buying behaviour. This is consistent with the Saleh et al. (2013) study, which found that females

are more receptive to sales promotions (free samples) than males. However, in Sinha & Verma (2018) study, both males and females are attracted to sales promotion. This study focused on the hedonic and utilitarian benefits of sales promotion which led to the contradiction between both studies. Nevertheless, from both studies, it is found that sales promotion can influence male and female purchasing behaviour in different situations. Women considered the variety of brands that were offered by the retailers, whereas males were more attracted to interesting fashion items. This shows that both genders are attracted to retail shops that offer them a variety of selections. As stated in previous literature (Yeo et al., 2019; Damian, 2011; Idoko, 2019), variety of selections such as product and tenants would encourage consumer's excitement which leads them to make a purchase. Even though generally, it influenced both genders, interestingly, this study has found that variety of selection is significantly associated with impulse buying behaviour. Most of the previous literature (Leung, 2022; Mihic & Milakovic, 2017; Sun & Qu, 2011) studied the intention of both genders in spreading the word and very little research to study on how WOM affects their purchase behaviour. Somehow, this study found that both genders preferred asking their friends or relatives about certain products or services before they make any purchases. Remarkably, the correlation result of this study indicated that among males, WOM was significantly associated with impulse buying behaviour. Therefore, this study demonstrated that males are influenced by WOM before they make a purchase.

Finally, spacious crowding also emerged as an important factor to consider before they make a purchase. However, Bandyopadhyay (2020) demonstrated that spatial crowding showed a negative impact on impulse buying, which contradicts this study. This might be due to the study being taken over at different places with different populations. The correlation result shows that perceived crowding was significantly related to impulse buying behaviour in both gender groups. Similarly, previous literature (Katakam et al., 2021; Parsat et al., 2018) demonstrated that perceived crowding has a significant effect to impulse buying behaviour. Therefore, both genders are attracted to the crowd which leads them to make a purchase.

Limitation and future research

Though this study demonstrated the interesting result of gender differences associated with environmental and social factors, there is still a limitation in some aspects. Firstly, this study only concentrated on the gender aspect but neglected the study on the age aspect. Secondly, this study measured the result by using a t-test and Pearson correlation. Therefore, it is suggested that future research can concentrate on the age aspect, with the collaboration of genders. Different gender within certain age groups might yield results differently as each group might have different styles and behaviour. In fact, it can be tested with other demographic categories. Thus, future research may use two-way approaches between- groups ANOVA to obtain a better result. Additionally, future research can increase the sample size as the result would be different and more interesting.

Implication and conclusion

This study primarily aimed to identify the association of environmental and social factors with impulse buying and to determine whether there would be gender differences in such associations. Overall, the results show that environmental factors (i.e., store environment, sales promotion, and variety of selection) are more associated with impulse buying in females than in males. On the contrary, WOM is more related to impulse buying among males than their counterparts. Nonetheless, perceived crowding is significantly associated with impulse buying by both male and female tourists.

Based on the results of this study, several managerial implications can be identified. Inasmuch as the store environment was found to have a significant relationship with impulse buying in males, then retailers need to focus more on environmental factors to persuade them to purchase impulsively. For instance, retailers should consider designing a layout that would attract males to enter their stores. Since males always want to get a job done, then product arrangement is important to make it easier for them to locate the products they want. This would motivate them to purchase more items. Moreover, retailers should provide a wide range of products and brands to allow consumers to have an assortment of choices. The availability of multiple brands can encourage consumers to make a purchase (Kurtulus & Ertekin, 2015). Additionally, retailers should develop an efficient strategy for sales promotion to attract not just male consumers but females as well.

It is important for retailers to have a good reputation for the spread of a positive WOM. Instead of the preparations made for a product and/or brand, the service provided by a salesperson is more vital in establishing rapport with the consumers, thus creating a positive WOM. Moreover, a good

arrangement of space may avoid or control the density of the crowd, making it easier for consumers to move around the establishment. Overall, this study may provide better ideas and guidelines for retailers and marketers to help them manage the store's environment to eventually encourage male and female tourists to shop.

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THE TAX COMPETITION AMONG EUROPEAN COUNTRIES

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ABSTRACT. Background: Taxes are and form the necessary basis for any form of organization in human society. **Aims:** The aim of the paper is to quantify the outputs of the tax competition among European countries. Specifically, we focus on studying the International Tax Competitiveness Index (ITCI) in the European area and on assessing how this aspect is time dependent. First, we try to find out whether there is a statistically significant relationship in the overall ranking within the ITCI of the surveyed European countries in time. Besides that, we try to confirm whether if the country is at the forefront within the GDP per capita, this country will also be at the forefront of the ITCI. **Sample:** The research sample consists of 27 European countries, for which the overall ranking of the ITCI and GDP per capita (by purchasing power parity (PPP)) were available from 2014 to 2020. **Methods:** We use the Spearman correlation coefficient, Sign test, and Wilcoxon Matched Pairs Test to verify the hypotheses. Results: The results show that variations in the country's level of ITCI change only slowly over time, and it is hard to modify them significantly. Moreover, we present the ranking of European countries within ITCI in 2014-2020 and the ranking within the level of GDP per capita (by PPP). **Conclusions:** We can confirm the assumption that if the country is at the forefront of the ITCI, this country will be located at the forefront of the GDP per capita (by PPP) indicator. **Implications:** The country's tax system is an important determinant of the country's economic performance.

Keywords: taxes, competitiveness, tax competition, International Tax Competitiveness Index

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Introduction

In today's globalized world, where all countries are interconnected, factors of production such as labor and capital are highly mobile. Even in the case of the current coronavirus pandemic, where many companies are struggling with many unexpected problems, it is a priority for companies to invest in countries where they achieve the highest possible rate of return (or the lowest possible loss). Of course, the area of investment or business is significantly affected by the country's tax system. Enterprises will look for countries with the lowest possible tax rates to maximize their after-tax returns. If the tax burden in a country is too high, it will lead to a shift of investment to another country, which will lead to a slowdown in economic growth. The importance of the best possible organization of tax systems is also essential in the context of supporting economic recovery and increasing costs after a coronavirus pandemic.

Taxes are and form the necessary basis for any form of organization in human society. As long as there is a state, it will need a certain amount of financial resources to function. The existence of taxes is, therefore, justified (Sivák, 2015). Competitiveness is a "set of institutions, policies, and factors, which determine a country's level of productivity". In other words, competitive economies tend to produce a higher level of income for their citizens. Moreover, the productivity level determines the profitability rates obtained by investments (physical, human, and technological) in an economy. The profitability rates are fundamental factors of the economic increase rates; therefore, a competitive economy increases faster in the long run (Stefan, 2012).

This paper combines the concept of tax and competitiveness and deals with tax competition. In Europe, the phenomenon of tax competition was already manifested in the early sixties of the 20th century, along with the increase in cross-border mutual (Mihóková, Andrejovská, & Martinková, 2018). This paper aims to analyze the tax competition among European countries.

Theoretical background

Taxes

At present, the term tax is a general term belonging to modern microeconomics or macroeconomics. Taxes belong to the group of indirect economic management tools. According to Schultzová (2011), taxes are a tool for the redistribution of the created product and significantly influence the size of disposable income (pensions) of individual entities. In general, we can characterize the tax as a mandatory, statutory, non-equivalent, usually recurring payment. In what period, in what amount and what taxes are to be paid by tax subjects is determined by the so-called secondary, respectively, additional tax requirements. These requirements precisely specify the designation of the tax administrator, the due date of the tax, the rounding of the tax, the minimum amounts of tax or the non-taxable parts of the tax.

The tax represents a transfer of funds from the private to the public sector. The tax is defined as a mandatory, non-refundable, statutory payment to the public budget. It is a non-purpose and non-equivalent payment (Kubátová, 2010). According to Chorvátová et al. (2006), taxes mean obligatory and non-repayable monetary benefits collected by the state on behalf of financial institutions. Taxes can be characterized as obligatory, statutory amounts that irrevocably deduct part of the nominal income from the tax subject (Široký, 2006). More studies on taxes issues (mainly in Slovakia) are in, e.g., Jenčová & Vašaničová (2019, 2022), Jusková (2019), Jusková & Korečko (2016), Hečková et al. (2019).

Competitiveness

There are several approaches to competitiveness. Organization for Economic Cooperation and Development (OECD, 2016) defines competitiveness by considering its two fundamental reference levels (the firm and the nation). According to OECD, national competitiveness is "the ability of companies, industries, regions, nations or supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis". The objective of national competitiveness is to maintain and improve citizens' living standards (Hatzichronoglou, 1996). The Institute for Management Development (IMD) has a similar approach. It refers to competitiveness both as a tool and an objective of economic policy. The IMD World Competitiveness Centre (2018) understands competitiveness as "the ability of countries, regions, and companies to manage their competencies to achieve long-term growth, generate jobs and increase welfare".

According to the World Economic Forum (2014), "competitive economies are those that can provide high and rising living standards, allowing all members of a society to contribute to and benefit from these levels of prosperity. In addition, competitive economies are those that are sustainable (meeting the needs of the present generation while maintaining the ability to meet those of future generations)". According to the Hungarian Central Bank (2019) "a national economy is competitive if it utilizes its available resources optimally to attain the highest possible but at the same time sustainable level of welfare".

Krugman (1994) criticizes international competitiveness. He thinks that international competitiveness is an irrelevant and dangerous concept because nations do not compete with each other the way corporations do. An increase in productivity causes increasing the standard of living of a nation. The country's future prosperity depends on its productivity growth and certainly on government policies. Nations compete in the way that they choose policies that promote productivity. As pointed out by Dunning (1995), Porter (1990), and Salvatore (1993), international competitiveness does matter.

Several studies have investigated the impact of entrepreneurship on countries' competitiveness. Regarding European Union countries, Bosma, Sanders, & Stan (2018), Ciocanel & Pavelescu (2015), Szabo & Herman (2012) are the authors who have analyzed the relationship between entrepreneurship and national competitiveness.

The World Economic Forum has found the analysis of competitiveness based on the Global Competitiveness Index since 2005. It is a very comprehensive index measuring national competitiveness from the microeconomic and macroeconomic perspectives (Stefan, 2012).

Tax Competition

The concept of "tax competition" was introduced by Charles Tiebout (1956), while Oates (1972) was one of the early contributors to the tax competition literature. He noted that local governments are likely to "keep taxes low to attract business investment" in competing for mobile capital and that the result of such tax competition "may well be a tendency toward less than efficient levels of output of local services". Zodrow & Mieszkowski (1986) and Wilson (1986) formalized this notion in models.

"Tax competition is any way of fixing tax rates in the absence of cooperation between independent governments under which the choice of each party has an impact on the distribution of the mobile tax base among the regions represented by these governments" (Wilson & Wildasin, 2004). According to Winner (2005) "tax competition is a situation when fiscal activity in one jurisdiction causes fiscal externalities in another."

Historically, the theoretical tax competition (Wildasin, 1988) has focused on inter-jurisdictional capital mobility. In these models, individuals do not cross-border to decide where to live and to work. Wilson (1991) and Bucovetsky (1991) extend the model to include "asymmetric tax competition" between large and small jurisdictions. Although most of the tax competition literature has been concerned with capital mobility (Boadway & Tremblay, 2012), standard models have been extended to labor mobility (Braid, 1996). Another seminal paper by Wilson (1995) is about tax competition with perfectly mobile capital and workers. Wildasin (2011) considers tax competition in a dynamic framework, where labor and capital are complementary, imperfectly mobile production factors. Gabszewicz, Tarola, & Zanaj (2016) analyze tax competition in a model of labor migration when individuals are heterogeneous with respect to their home attachment.

Many politicians and experts support the idea of tax competition, which forces governments to be more efficient. International tax competition among countries is studied in several publications (e.g., Cassette & Paty, 2008; Devereux, Lockwood, & Redoano, 2008; Heinemann, Overesch, & Rincke, 2010; Cassette et al, 2013; Redoano, 2014; Altshuler & Goodspeed, 2015).

Increases in the competition between countries in terms of the attractiveness of their tax environment depend on the current degree of globalization. For potential investors, the competition between countries results in changes in the size of the tax bases of competing countries (Remeur, 2015).

De Mooij & Ederveen (2003) comprised more than 25 empirical studies and discovered that the average corporate tax rate elasticity is high: after the rate of corporate tax had decreased by 1%, foreign investment increased by 3.3%, in general. Podvieszko, Parfenova, & Pugachev (2019) proposed to choose the ultimate criterion of competitiveness of a country's tax system to be the integral magnitude of its tax revenues over a long-term period. They have formed a hierarchy structure with the following categories and criteria: tax burden (income tax in %, profit tax in %), convenience of settlement (number of payments required for settlement with tax authorities), quality of tax system governance (time required to prepare a tax report in hours, ease of doing business in rank), the growth rate (average annual growth of the GDP 2009-2015 in %), the remuneration of labor (labor costs per hour in euros), the level of corruption (corruption index). In their paper, they used the MCDA (multiple criteria decision-aid)

approach to evaluate several countries in terms of tax competitiveness. They used SAW - simple additive weighting and PROMETHEE II – preference ranking organization method for enrichment evaluation.

Banociova & Tahlova (2019) aimed to characterize the tax competition among the 28-EU member states in the period 2007-2017 and assess whether states are competitive in the field of corporate taxation. Tax competitiveness among states was perceived by the level of CITRs (corporate income tax revenues) in relation to GDP (gross domestic product). The level of CITRs was influenced by tax variables (statutory tax rate, marginal effective tax rate, statutory tax rate to the power of 2, marginal effective tax rate to the power of 2, anti-evasion rules, control rules of foreign companies, loss of carry-forward, loss of carry-back, tax incentives for research and development, transfer pricing rules), international factors that have a link to tax competitiveness among states (inflow of foreign direct investment in relation to GDP, the land area above sample average, openness, globalization index), other factors affecting the corporate environment in the state (share of GDP of the state in relation to total GDP, GDP growth, unemployment rate, inflation, natural logarithm GDP per capita) and time effect. They have been specified an econometric model of panel regression (fixed model with individual effects).

Some authors created criteria for describing the attractiveness and competitiveness of national tax systems, which comprise the following topics: the favorable tax environment; the business tax burden; the quantity of different taxes and convenience of settlements with tax authorities; economic and demographic factors; the quality of tax administration; and the level of remuneration or corruption (see Goodspeed, 1998; Devereux & Loretz, 2013; Garrett & Mitchell, 2001; Baskaran & da Fonseca, 2014; Swank, 2016). Budget deficit/surplus-to-GDP, government debt-to-GDP, and government expenditure-to-GDP ratios are the macroeconomic variables that affect the tax environment of the countries.

Measuring national competitiveness is a complex task. It is usually not measured with a single ratio but based on a specific set of criteria. In most cases, the factors influencing national competitiveness are tax burden and the tax regime (Vargha, Németh, & Pályi, 2019).

Many indicators or ratios are substantial from the point of tax competitiveness. They evaluate the labor-related burdens carried by employers and employees and the extent of the employee's net disposable revenues (Mádi & Árva, 2016).

The Washington-based Tax Foundation (2018) calculated a separate tax competitiveness index considering more than forty factors for calculating the index. They pay attention to the rate of tax burdens as well as the structure of taxation and tax regulation.

The structure of a country's tax code is a substantial determinant of its economic performance. The variety of approaches to taxation among OECD countries creates a need for a way to evaluate these systems relative to each other. For that purpose, the International Tax Competitiveness Index (ITCI) has been developed to compare how countries structure their tax systems. The ITCI seeks to measure whether a country's tax system is neutral and competitive. The ITCI looks at more than 40 tax policy variables. It utilizes 41 variables across five categories: corporate income tax, individual taxes, consumption taxes, property taxes, and international tax rules. Each category has multiple subcategories. These variables measure not only the level of tax rates but also how taxes are structured. The ITCI looks at a country's corporate taxes, individual income taxes, consumption taxes, property taxes and the treatment of profits earned overseas. The ITCI is a relative ranking of the competitiveness and neutrality of the tax code in each of the 36 OECD countries. The ITCI is designed to measure a country's tax code on a relative basis rather than on an absolute measurement. This means that a score of 100 does not signify the absolute best possible tax code but the best tax code among the 36 OECD countries. Each country's score on the ITCI represents its relative difference from the best country's score (Bunn & Assen, 2020). In this paper, we do not consider all OECD countries, but we select only those from Europe.

Methodology

Research Aim, Hypotheses, and Methods

The paper aims to quantify the outputs of the tax competition among European countries. Specifically, we analyze the ITCI, which was developed to compare the ways that countries structure their tax systems, and thus we assess how this aspect is time dependent. Therefore, the paper's main objective is to determine whether there is a relationship in the overall ranking of the ITCI among the surveyed European countries in time, specifically between the years 2014, 2015, 2016, 2017, 2018, 2019, and 2020. The partial aim is to find out whether we can confirm the assumption that if the country is at the forefront of the GDP per capita by purchasing power parity (PPP) indicator, this country will be at the forefront of the ITCI. Because of the above objective, we formulated the following research hypothesis:

H1: We assume that there is a statistically significant relationship in the overall values of the ITCI of the surveyed European countries between monitored years.

H2: We assume that there are statistically significant differences in the position of European countries within the ITCI and within the position of the GDP per capita.

To verify the H1, we use Spearman's rank correlation coefficient as the proper representative measure for ranks correlation. It is a non-parametric rank statistic proposed as a measure of the strength of the association between two variables (Hauke & Kossowski, 2011). The higher the absolute value of Spearman's rank correlation coefficient, the stronger the association between the two variables (Puth et al., 2015). The procedure tests the specific null hypothesis (H_0) that two variables are not associated in the population and that the observed value of the correlation statistics differs from zero only by chance (Frapporti et al., 1991). The coefficient is calculated according to the formula (1),

$$r_s = 1 - \frac{6 \sum_{i=1}^n d^2}{n(n^2 - 1)} \quad (1)$$

where d is the difference between ranks for the paired observations and n is the number of paired observations test (Vašaničová & Košíková, 2019; Vašaničová, 2022).

To verify the H2, we use the Sign test and Wilcoxon Matched Pairs. "The Sign test is a non-parametric test that is used to test whether two groups are equally sized. The sign test is used when dependent samples are ordered in pairs, where the bivariate random variables are mutually independent. It is based on the direction of the plus and minus sign of the observation, and not on their numerical magnitude." (Majumdar et al, 2019, p. 115). The nonparametric statistical hypotheses relate to the median are: H_0 : No difference in median of the signed differences; H_1 : Median of the signed differences is less than zero (Carter & Lubinsky, 2015, p. 294). "The Wilcoxon Matched Pairs signed-ranks test is non-parametric analogue of the t-test for matched samples. However, this test is based on richer information than the sign test." The null hypothesis (H_0) is that two sets of paired observations come from populations having the same distribution. The alternative hypothesis (H_1) states that the two sets of paired observations come from populations having different distributions (Russo, 2004, p. 169).

Research Background and Research Sample

The research sample consists of 27 European countries, for which the overall ranking of the ITCI and GDP per capita (PPP) were available in the years 2014, 2015, 2016, 2017, 2018, 2019, and 2020. Because ITCI is a ranking of the competitiveness and neutrality of tax codes in OECD countries, we included only European countries that are also part of the OECD in the analysis. In our research sample, we include Turkey, too, even though the larger part of its area is in Asia. On the other hand, ITCI values for all monitored years were not known for Latvia and Lithuania because Latvia became part of the OECD in 2016 and Lithuania only in 2018. Because of more frequent cross-border cooperation, more similar functioning of tax systems and territory, we focused mainly on European countries. Specifically, we do not consider the following OECD countries: Australia, Canada, Chile, Israel, Japan, Korea, Mexico, New Zealand, United States.

According to the section theoretical background, the ITCI measures the degree to which the OECD countries' tax systems promote competitiveness through low tax burdens on business investment and neutrality through a well-structured tax code (Pomerleau & Lundeen, 2014). According to Bunn & Asen (2020), a well-structured tax code can promote economic development while raising sufficient revenue for a government's priorities.

The ITCI considers more than forty variables across five categories: Corporate Taxes, Consumption Taxes, Property Taxes, Individual Taxes, and International Tax Rules. These variables measure not only the level of tax rates but also how taxes are structured. To calculate the variable, subcategory, category, and final score, first, the average and the standard deviation from each variable is calculated. Then each variable is standardized to compare variables with each other. Next is to calculate subcategory scores from variables, with each individual variable score is equally weighted and added together. The subcategories and categories are then modified in the same method (to eliminate any negative values, the inverse of the lowest z-score plus one in each subcategory is added to each country's z-score and the adjusted (sub)category scores for each country are scaled to 100, relative to the country with the best score in each (sub)category). The overall normalized score for each country is calculated by multiplying each category's normalized score by 20 percent (equal weight for the five categories) and adding them together (Pomerleau & Cole, 2015).

Table 1 shows the structure of the ITCI from 2020, but since the creation of the ITCI in 2014, every year, slight changes have been made in ways that could improve measurement competitiveness and neutrality.

Table 1. Components of the International Tax Competitiveness Index (Final Score)

Category	Subcategory	Tax Policy Variables
Corporate Taxes	Corporate Rate	Top Marginal Corporate Rate
	Cost Recovery	Loss Carryback Loss Carryforward Machinery Industrial Buildings Intangibles Inventory Allowance for Corporate Equity
	Tax Incentives and Complexity	Patent Box Implied Tax subsidy Rates on R&D Expenditures Corporate Complexity (CC) (Time) CC (Yearly Profit Payments) CC (Other Yearly Payments)
Consumption Taxes	Consumption Tax Rate	VAT/Sales Tax Rate
	Consumption Tax Base	VAT/Sales Tax Threshold VAT/Sales Tax Base as a Percent of Total Consumption
	Consumption Tax Complexity	Hours to Comply
Property Taxes	Real Property Taxes	Real Property or Land Tax Real Property Taxes Deductible
	Wealth/Estates Taxes	Net Wealth Tax Estate/Inheritance Tax
	Capital/Transaction Taxes	Transfer Taxes Asset Taxes Capital Duties Financial Transaction Tax
International Tax Rules	Territoriality (Participation Exemption)	Dividend Exemption Capital Gains Exemption Country Limitations
	Withholding Taxes	Dividend Withholding Tax Interest Withholding Tax Royalties Withholding Tax
	Tax Treaties	Number of Tax Treaties
	International Tax Regulations	Controlled Foreign Corporation Rules (Income and Exemptions) Interest Deduction Limitations
Individual (Income) Taxes	Ordinary Income Taxes and Payroll Taxes	Top Marginal Income Tax Rate Top Income Tax Rate Threshold Ratio of Marginal to Average Tax Wedge
	Income Tax Complexity	Payments Time
	Capital Gains/Dividends	Top Marginal Capital Gains Tax Rate Top Marginal Dividends Tax Rate

Source: own processing according to Bunn & Asen (2020)

In 2015 and 2016, only slight changes were made to how scores are scaled or how it has scored interest deduction limitations in the international tax regulations category. In 2017 the scoring method of controlled foreign corporation rules changed. In 2018, there were a few following changes. For example, the variable that captured variation in VAT exemptions has been removed because all countries allow some exemptions from the VAT tax base. Moreover, some new measures have been included to better reflect the income tax structure. In 2019, Lithuania was included in the research sample of the ITCI. A variable that identified whether a country allows for taxpayers to adjust the basis of their capital

gains for inflation has been removed. In 2020, several changes to the way the ITCI treats corporate taxes, consumption taxes, and international taxes were incorporated. These changes have been applied in all years' scores to allow consistent comparison across years (Pomerleau & Cole, 2015; Pomerleau, 2016; Pomerleau, Hodge, & Walczak, 2017; Bunn, Pomerleau, & Hodge, 2018; Bunn & Asen, 2019, Bunn & Asen, 2020).

The data used for the composition of the ITCI was obtained from numerous sources, e.g., Bloomberg Tax Country Guides, Deloitte International Tax Source, Ernst & Young International Tax Guides, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, Oxford University Centre for Business Taxation Database, PricewaterhouseCoopers Worldwide Tax Summaries (Bunn & Asen, 2020).

Results

We use Spearman's rank correlation coefficient to verify the existence of a statistically significant relationship in the ranking of the ITCI among the 27 surveyed European countries (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom) in 2014, 2015, 2016, 2017, 2018, 2019, and 2020. The resulting correlation coefficients presented in the correlation matrix (Table 2) show how the ITCI is time dependent. High correlation coefficient values may indicate that ITCI values change very slowly in the time frame. It would mean that when the country has a high ITCI, it is likely to retain this high value more easily. At the same time, if the index for a given country has a low value, no significant change in pillar value is expected in the next period. From the resulting correlation coefficients, we can see that there is a high correlation between the observed periods. The highest relationships are between the values of pillars in consecutive years. The highest relationships are between the values of categories in consecutive years, specifically between 2015 and 2016, 2016 and 2017, 2018 and 2019.

Table 2. Correlation matrix of European countries

	2014	2015	2016	2017	2018	2019	2020
2014	---	0.9254	0.9485	0.9346	0.9038	0.8992	0.8538
2015		---	0.9792	0.9615	0.8731	0.8877	0.8462
2016			---	0.9747	0.8947	0.9138	0.8721
2017				---	0.9350	0.9371	0.9104
2018					---	0.9665	0.9439
2019						---	0.9383
2020							---

Source: own processing

Nevertheless, small deviations are apparent, indicating a possible significant shifting of a country within the overall ranking. In Table 3, we present the specific ranking of the individual European countries (according to the value of ITCI and according to the value of GDP per capita (PPP)).

We can note that even though the ranking values are not always the same, the first and last places remain relatively stable, occupied by the same countries. Since 2016, significant changes should occur because Latvia (which is at the forefront in ITCI) became part of the OECD and appeared for the first time in the ITCI ranking. It was similar in 2018 when Lithuania was added.

Significant deviations in the order of ITCI (jump by more than four places) were in 2015 in Slovenia and the United Kingdom. Slovenia dropped seven places, due to VAT changes that restricted the deductibility of some inputs and the United Kingdom improved eight places due to a cut in its corporate income tax rate from 21 percent to 20 percent (Pomerleau & Cole, 2015). Other significant changes occurred between 2017 and 2018 when Belgium improved five places after tax reform that progressively reduced its statutory income tax rate. Hungary's ranking has also improved by five places. Its advantage is that Hungary has the lowest ratio in cost for each additional dollar raised from labor taxes as well as the lowest top marginal corporate income tax rate in the OECD at 9 percent. In contrast, the United Kingdom dropped by eight places. The United Kingdom receives the worst threshold score for VATs/sales taxes in OECD countries, which means favoring smaller businesses over larger ones, and the UK is characterized by a high collection of property taxes (Bunn, Pomerleau, & Hodge, 2018). In 2019, the most significant change compared to the previous year was Belgium, which dropped by seven

places due to adopting international tax rules following an EU directive (Bunn & Asen, 2019). By contrast, in 2020, Belgium improved its ranking by six places because the corporate tax rate fell and the wealth tax was abolished. Norway improved by five places, thanks to the adopted provision on loss carry-back during a coronavirus pandemic. Iceland dropped five places and Netherlands eight places. In the case of the Netherlands, this was mainly due to the progressive tax system with a combined high rate of personal income.

Table 3. Ranking of countries within the ITCI and GDP per capita (PPP) from 2014 to 2020

Country	2014		2015		2016		2017		2018		2019		2020	
	ITCI	GDP	ITCI	GDP	ITCI	GDP	ITCI	GDP	ITCI	GDP	ITCI	GDP	ITCI	GDP
Austria	10	6	13	6	14	6	10	8	8	8	10	8	10	8
Belgium	18	11	19	11	21	11	20	11	15	11	22	11	16	11
Czech Republic	13	17	11	17	10	17	7	17	7	16	8	16	7	15
Denmark	14	7	17	8	17	8	17	5	17	6	20	5	21	5
Estonia	1	19	1	21	1	20	1	19	1	19	1	19	1	19
Finland	9	12	12	12	15	12	15	12	12	12	15	12	14	12
France	25	14	25	14	26	14	26	14	26	14	27	13	24	13
Germany	16	8	14	10	16	9	18	9	14	9	13	9	13	10
Greece	21	23	20	23	23	25	22	25	22	26	23	26	22	26
Hungary	15	24	18	24	19	23	16	24	11	24	12	23	12	23
Iceland	19	10	16	9	18	5	19	6	20	7	18	7	23	7
Ireland	12	4	8	2	11	2	13	2	16	2	14	2	17	2
Italy	23	15	24	15	25	15	25	15	25	15	25	15	27	16
Latvia	n.a.	27	n.a.	27	2	27	3	26	2	25	2	25	2	24
Lithuania	n.a.	22	n.a.	22	n.a.	21	n.a.	20	n.a.	20	3	20	5	18
Luxembourg	4	1	5	1	6	1	4	1	3	1	5	1	4	1
Netherlands	5	5	4	5	5	7	6	7	4	5	7	6	15	6
Norway	11	2	10	4	9	4	12	4	13	4	16	4	11	4
Poland	20	25	22	25	22	24	23	23	24	23	26	22	26	22
Portugal	24	20	23	19	24	19	24	21	23	21	24	21	25	21
Slovak Republic	6	21	6	20	7	22	8	22	9	22	9	24	8	25
Slovenia	8	18	15	18	12	18	14	18	18	18	17	18	19	17
Spain	22	16	21	16	20	16	21	16	21	17	19	17	20	20
Sweden	3	9	3	7	4	10	5	10	6	10	6	10	6	9
Switzerland	2	3	2	3	3	3	2	3	5	3	4	3	3	3
Turkey	7	26	7	26	8	26	9	27	10	27	11	27	9	27
United Kingdom	17	13	9	13	13	13	11	13	19	13	21	14	18	14

Source: *own processing*

Note: *n.a. denotes not available*

The best-rated countries in the ITCI are (see the light gray cellars in Table 3) Estonia (1st place during the whole monitored period), Switzerland, Luxembourg, Latvia, and Lithuania, which, after joining the OECD countries, replaced Sweden and the Netherlands in the first places. Among the worst-rated countries (see dark gray cellars in Table 3) are France, Italy, Portugal, Poland, and Greece. Weaknesses in these countries are, e.g., in the case of France, the high tax burden on labor or the high corporate income tax rate. The disadvantages of Italy and Poland are multiple distortionary property taxes with separate levies on real estate, net wealth, estates, and financial transactions. Portugal and Greece have high corporate tax rates.

Although we have confirmed that the country's position is changing very slowly over time, space for change is still available. It is especially evident in countries that have significantly changed their position in one year, e.g., due to a cut in its corporate income tax rate, various tax reforms, adopted provision on loss carry-back during a coronavirus pandemic, etc.

Slovakia belongs to the top ten evaluated countries of ITCI, and its values were comparable to the scores of Turkey, the Netherlands (except for 2020), and Austria. According to Bunn & Asen (2020), the strengths of the Slovakian tax system are low personal income rate on dividends, the better-than-average tax treatment of business investment in machinery, buildings, and intangibles, corporations can deduct property taxes when calculating taxable income. Compared with countries in the first places, Slovakia lags behind them mainly in restricting the amount of net operating losses companies can use to offset future profits or in VAT amount. Slovakia's ranking according to GDP per capita is considerably worse compared to OECD countries.

The results in Table 2 confirm hypothesis H1 on the existence of statistically significant relationships in the overall ranking of the ITCI of the surveyed European countries between monitored years. Results show that variations in the level of ITCI (that means structure tax systems, its competitiveness, and neutrality) in a country change only slowly over time, and it is difficult to modify them. Nevertheless, we see that changes are possible. Therefore, we consider it appropriate to focus on the benefits of the tax systems of the best-ranking countries and take an example from them. For example, Estonia's corporate income tax system allows reinvesting companies' profits tax-free, or Estonia apply property taxes only to the value of the land.

Next, we tested the second hypothesis, H2, using the Sign test and Wilcoxon Matched Pairs test. GDP data for 2020 were not available, so we omitted this year from the analysis. Even though some differences are evident (e.g., Estonia has the best tax code in European and the OECD countries, but it is ranked from 19 to 21 among 27 monitored countries according to GDP per capita). According to our results (Table 4), we cannot confirm the existence of statistically significant differences in the position of European countries within the ITCI and the GDP per capita.

Table 4. Sign test a Wilcoxon Matched Pairs test for assessing differences between rankings

Pair of Variables ITCI & GDP in year	Sign test			Wilcoxon Matched Pairs test		
	Percent v < V	Z	p-value	T	Z	p-value
2014	45.8333	0.2041	0.8383	139.5000	0.3000	0.7642
2015	50.0000	-0.2041	0.8383	127.0000	0.6571	0.5111
2016	45.8333	0.2041	0.8383	135.0000	0.4286	0.6682
2017	48.0000	0.0000	1.0000	155.5000	0.1883	0.8506
2018	39.1304	0.8341	0.4042	131.0000	0.2129	0.8314
2019	37.0370	1.1547	0.2482	175.0000	0.3363	0.7366
2020	36.0000	1.2000	0.2301	154.5000	0.2153	0.8296

Source: own processing

We reject the H2 hypothesis. It follows that we can confirm the assumption that if the country is at the forefront of the ITCI this country will be at the forefront of the GDP per capita by PPP indicator.

Conclusion

The 'International Tax Competitiveness Index report compiled by Tax Foundation states that the tax-base structure should be simple for taxpayers to support economic development and increase tax revenues for the development of the state. The global trend in the context of changes in the corporate tax structure is a reduction of statutory tax rates and adoption of measures that extend the tax base. However, the tax systems of individual countries are quite diverse. The ITCI was, therefore, developed to make it easier to compare and evaluate countries in terms of the structure of the tax system.

The rate of tax attractiveness of the environment is monitored through the 'Tax Attractiveness Index'. The Tax Attractiveness Index captures a range of tax aspects relevant to decision-making in the area of the company's location, reflecting not only the tax rate but also other aspects, e.g., the anti-evasion rules, the straight-line depreciation methods, the declining balance method, or the accelerated depreciation method, the loss of carry-forward or carry-back options, the number of years of their transfer, alternatively their abolition, the application of tax concessions and incentives, for example for science and research, or the transfer pricing rules. The growth of the Tax Attractiveness Index assumes more appropriate legislative and tax conditions and tax environment in the state.

We aimed to find out how the structure of the tax system and, thus its competitiveness and neutrality within European countries can be influenced over time. The analysis results show that this aspect's development has only slowly changed over time. Countries with a high level of ITCI will likely keep this level in the years to come. However, it is a significant visible shift in the location of the countries under the measures adopted. As mentioned in the results, Norway improved by five places, thanks to the adopted provision on loss carry-back during a coronavirus pandemic. This difficult situation thus makes it more difficult for business, on the one hand, but opens room for improvement, on the other.

In the context of analyzed International Tax Competitiveness, Estonia, Switzerland, Luxembourg, Latvia, and Lithuania are the best tax structure in the European area. On the contrary, France, Italy, Portugal, Poland, and Greece are the worst. Slovakia belongs to the top ten evaluated

countries of the ITCI, and its values were comparable to those of Turkey, the Netherlands and Austria. Low personal income rate on dividends, better-than-average tax treatment of business investment in machinery, buildings, and intangibles, and the fact that corporations can deduct property taxes when calculating taxable income are strengths of the Slovakian tax system. In Slovakia, an amendment to the Income Tax Act is being prepared, including a tax loss that has not yet been applied (for the years 2015-2018). Based on Eurostat's recommendations, a methodological adjustment is being prepared - the impact of "COVID-19".

However, the structure of the country's tax system is also an important determinant of the country's economic performance, which significantly supports economic development and increases government revenue. We were, therefore, interested in whether there are differences in the country's order according to the assessment of the structure of the tax system (ITCI) and according to GDP per capita. The results did not confirm statistically significant differences. It follows that we can confirm the assumption that if the country is at the forefront of the ITCI this country will be located on the forefront of the GDP per capita by PPP indicator.

We can compare our results with several existing studies about tax competition or tax competitiveness. Banociova & Tahlava (2019) characterized tax competition between EU member states over ten years and assessed whether they are competitive in corporate taxation. They confirmed that there is tax competition in the field of corporate income tax between EU states. Helcmanovska & Andrejovska (2021) determined the impact of selected indicators on corporate tax revenues in EU states from 2004 to 2019. The result of this work was that there are differences between the new and old member states at different levels. The analysis of the tax competitiveness of the EU member countries showed that the new member countries, characterized by a lower level of the tax burden, can be considered more tax "competitive" (Mihokova, Andrejovska, & Martinkova, 2018).

This study had several limitations. First, we analysed data from 2014 to 2020 and focused only on European countries. Repeating the analysis for an extended period can reveal the interesting outcome. Researchers can also extend the analysis to other OECD countries. Second, we did not consider the other qualitative or quantitative data. Moreover, in addition to our methods, we suggest using multidimensional scaling or panel regressions.

We are not aware that there is a similar study that would deal with tax competition between EU countries in a similar way; therefore, the issue investigated in this paper is original, and we consider it a great contribution.

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Digitalization through Pandemic Crisis: Effects on Technology, Processes & Human Capital

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ABSTRACT.

Background: Managers worldwide are dealing with an organisational paradigm never seen before due to the coronavirus pandemic, which motivated them to seek more solutions for their business operations continuity. Considering this scenario, one of the solutions was to transform analogue processes into digital to reduce the pressure organisations are going through and surpass a pandemic stage with a beginning that does not have an end in sight. These constraints have led stakeholders to rethink operations continuity processes, the physical distance and emotional distress in their workers, and the look for technology that meets the organisation's needs. **Aims:** Throughout this article, we aim to investigate how the pandemic crisis-affected digital transformation in organisations on three main pillars: Technology, processes, and human capital. **Methods:** As a methodology, we proceeded with systemic literature review principles with an approach to bibliometric analysis to study how the pandemic crisis has affected digital transformation in organisations. **Implications:** Our study contributes to the body of knowledge about the pandemic effects of digital transformation in organisations and practices by giving companies insights on how to surpass digitalisation obstacles and keep prospering both during and after the crisis.

Results: Abandoning old strategies and rebuilding the organisation, the remote work inclusion, and managers leaving old strategies.

Keywords: Digital Transformation, Digitalization, Technology; Processes, Human Capital, COVID-19.

JEL Classification: M1, M2, M10, M15

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Introduction

Coronavirus disease (COVID-19), which has emerged and created a public health crisis (Wen et al., 2020), is considered the most significant disturbance pandemic in the last three industrial revaluations (Kumar et al., 2020). This new virus has put the economy at risk by shutting down businesses and putting people's lives on hold (Soto-Acosta, 2020). The emergence and spread of this disease have challenged infrastructures and economies worldwide (Wen et al., 2020).

To the point that the global production system and supply chain is being disrupted by this pandemic (Kumar et al., 2020), and there is an undeniable influence on the environment. Nevertheless, digital transformation can overcome these challenges (Bai et al., 2021). The pandemic impacts are transversal to different areas, such as businesses, the economy, education (schools), and health (hospital systems) (He et al., 2021).

Because of that, a quick transition to the online world was necessary through telework, online education, and telehealth (Richter, 2020). This change can be explained by the need for solid coordination of various resources to cope with the pandemic (He et al., 2021) as digital transformation and innovation enable the prevention of long-term stock-outs and knowledge sharing between teams (Soto-Acosta, 2020). The coronavirus, consequently, acted as an accelerator of this digital transformation (Agostino et al., 2020) and brought, simultaneously but depending on sectors, many challenges for individuals as consumers, for companies as market value creators, and societies as global (He et al., 2021).

According to Faraj et al. (2021, p.1), "This extreme event has effectively subjected organisations to a real-life stress test that has exposed the patchwork construction upholding digitalisation". The pandemic forced society to create innovative practices to overcome the damage to our daily life (O'Leary, 2020) and generated a massive-scale upheaval in organisations (Faraj et al., 2021). Although the impact of digital technologies has been a reality in companies for the last decades and has significantly changed the business model (Liu et al., 2011), the emergence of a pandemic has intensified this reality and made it compulsory.

Overall, organisations have been implementing changes based on innovation to improve their performance in the short term and enhance their operational capabilities and profitability in the long term (Ghobakhloo & Fathi, 2020). Considering these extensive transformations and challenges due to the pandemic, the outlined question was made: How has the pandemic crisis affected digital transformation in organisations?

This document is divided into four chapters. In the first section, a literature review is presented in order to have an overview of digital organisational transformation, especially technology, processes, and human capital. The methods employed are presented in the second and third sections, and the empirical results are discussed. This article's methodology is supported by a bibliometric analysis and a systematic literature review. The last part presents the conclusions, implications, limitations, and suggestions for future studies.

Theoretical background

Organisational digital transformation

Technology

It is well known that the COVID-19 pandemic has disturbed organisations in all parts of the globe (Qadir, 2022; Sohrabi, 2020), reducing interactions to a minimum to prevent the spread of the virus (Mahmood, 2020; Doshi, 2020), especially for groups, for whom discontinuing reinforcement was not an option (Kateb, 2022).

The crisis began to impose external pressures to innovate and find alternatives for organisational continuity because the unprecedented disruptions made the traditional format

impossible to work (Faraj, 2021). In this unsustainable environment, technology plays an important role in controlling, responding to, or handling COVID-19 pandemic outbreaks (Rudrapati, 2022).

This has become an opportunity for managers to test and use new tools in the organisation to find solutions to maintain and continue operations; in that sense, the employed technologies, according to Rudrapati (2022), were (1) Artificial intelligence, (2) Big data, (3) Cloud computing, (4) Virtual reality and Augmented Reality, (5) Internet of things and (6) Cyber-physical systems.

Artificial intelligence which will help to predict the outbreak of COVID-19, help to reduce the risk of spreading (Cardoso, 2021), and acquire the know-how to improve productivity and create new knowledge for the business process (Olan, 2022). By using big data applications, it becomes possible to analyse a large amount of data, can enable business intelligence to provide insights that would allow companies to understand customer needs, improve marketing technology, identify opportunities and problems in real life, and make personalisation possible (Gamaroodi, 2020).

Cloud computing contributes by facilitating people to continue their lives digitally through Google, Teams, Zoom, and other digital platforms during the lockdowns (Wang, 2017). Also, virtual reality provides simulated experiences and training sessions through internet services working based on digital platforms (Thoben, 2017). The Internet of Things (IoT) is an interrelated computing device and digital machine that provide several technological applications with the usage of sensors, Bluetooth, Global Position Systems (GPS), and Radio-Frequency Identification (RFID) through smart devices like phones, watches, and robots, also Augmented Reality (AR), has converged with proximity Business to Consumer (B2C), for a better consumer experience, especially in the industrial society (Bag et al., 2020; Oztemel & Gursev, 2020).

Table 1: Types of technology and their contributions

Author(s)	Technology	Contribution
(Rudrapati, 2022; Cardoso, 2021; Olan, 2022)	Artificial Intelligence	Reduce the risk of spreading, predict the outbreak, improve productivity, and create knowledge for businesses.
(Gamaroodi, 2020)	Big Data	Analyse a large proportion of data, enable business intelligence, customer needs, improve marketing technology, identify opportunities and problems in real life.
(Thoben, 2017; Wang 2017)	Cloud Computing	Google, Teams, and other digital platforms.
(Alguliyev, 2018; Mosterman, 2016)	Cyber Physical systems	Monitoring, controlling, coordinating, and integrating the activity of systems.
(Bag et al., 2020; Gursev, 2020)	Internet of Things	Use of sensors, Bluetooth, global position systems (GPS), radio-frequency identification (RFID).
(Thoben, 2017), (Bag et al., 2020; Gursev, 2020)	Virtual Reality and Augmented Reality	Simulated experiences and training sessions through internet services working based on digital platforms, Proximity to business to business (B2B) and consumer experience.

For last, cyber-physical systems help the organisation monitor, control, coordinate, and integrate systems activity (Alguliyev, 2018). This technology can be helpful in the treatment process, effectively defending and protecting the systems from hackers and ensuring the protection of confidential information (Mosterman, 2016). The introduction of technologies leads to new opportunities in the emergence of new digital businesses or restructuring traditional strategies, but it alters the relationship between customers and companies (Scuotto, 2017). With digitalisation, customers can communicate faster with the organisation, facilitate data exchange (Papa, 2018), and at the same time, force businesses to have attention to their digital reputation.

Some scholars argue that despite the trial opportunities, the digital economy raises some questions about the adaptability of how people and organisations will grow and adjust to this new Era

(Martínez-Caro, 2020). Before the pandemic, it was considered that these changes could be a source of stress between digital champions and the remaining workforce, creating an obstacle to the implementation of new technologies (Del Giudice, 2019). However, today it is known that the pandemic context led to surpassing such constraints as both people and organisations need to adopt new technologies in order to keep operating in such an unforeseen context.

The existing practices become challenged by technology, which can (re)define the profession of the workforce. With this into consideration, organisations need to adapt their digital innovations together with their members and keep in mind that the adoption of digital technology during the present crisis, with the importance of consciously applied transformation, will shape professional identities (Kateb, 2022).

Processes

In an era of flexible schedules, the idea of a digital workplace or remote work is emerging and cementing its way into organisations. As referred to by its predecessor (White, 2012), this paperless office enabled employees to safely continue to work for the economy (Pianese, 2016; Wrycza, 2020 & Gandrita, 2022). However, the conversion to this new reality should be considered by managers because several challenges and risks follow the digitalisation of every process (Adriole, 2017; Horváth, 2019; Vial, 2019).

The nature of these constraints is multifaceted and it is possible to divide them into three categories: (1) market challenges can affect the producer-costumer relationship (Fremont, 2018), an impact on supply chains, the transformation of a business model (Matzler, 2018), and the relocation of the corporation operations in high labour cross countries (Wiesmann, 2017); (2) organisation challenges regarding the inclusion of working from home difficulties (poor internet connections and home environment distractions) (Zhang, 2020), the employer's concern about the flexibility of the organisation (Saks, 2021), the knowledge challenge, and the information-based platforms (Brunetti, 2020); (3) economic and societal changes refer to the impact of environmental sustainability, energy consumption, and energy resource (Brunetti, 2020).

Considering these substantial categories, Cukusic (2021), Kar (2019), Manfreda (2021), Tangi (2021), and Zekic (2021) stated that there is significant importance in becoming digital, which creates an endless possibility for citizens, companies, and governments to interact and create value benefitting all the stakeholders, also learning from the assessments made from smart cities.

Digitalisation calls for new forms of workplace collaboration and communication, it can be understood as the use of data and digital technologies to improve business, create revenue, and transform business processes (Kraus, 2022).

Human Capital

According to Hsu and Wang (2012), human capital should be positioned inside a major variable assigned as intellectual capital, incorporating human capital itself and structural capital. The authors go further and under structural capital, it is placed organisation's capital which is stated to be "knowledge created by and stored in an organisation's information technology systems and processes" (Hsu & Wang, 2012, p.3), and customer capital meaning "the relationships that an organisation has with its customers" (Hsu & Wang, 2012, p.3).

The pandemic has led to a cross-border distance problem, giving numerous constraints and new intra-firm distancing challenges imposed on employees (Caligiuri, 2020), bringing a prefund and immediate effect on organisations and workplaces worldwide (McGuire, 2021). On an economic level, the pandemic effect decreases the manufacturing of goods, causes losses to national and international businesses, and causes a significant slowing down of revenue. On the other hand, the social outcome suffers from the closure of places of entertainment, the social distancing of members, avoiding national and international travelling, etc. (Haleem, 2020).

Thanks to this context, many people work from home, and accordingly, to the survey conducted by Mateescu (2020) 88% of the organisations encouraged or ask employees to work from home, yet Carnevale (2020) and Gai (2020) also discovered that some workers lack informal social engagement, loneliness, isolation, and exacerbated mental health concerns increased exponentially, difficulties that became an increasing struggle to organisations that are trying to find strategies to improve speed, adjust traditional technical methods, and accuracy of information provided for social management (Zhou, 2020).

Collings (2021) describes this crisis as fundamentally a human one, making human resources (HR) leaders the focus in enabling organisations through and ultimately exit the crisis successfully. Given this environment, all organisation's functions started to prioritise and optimise spending or postpone tanks that will not bring any value in the current environment (Donthu, 2020) which companies implement an immediately indefinite freeze turning into online communication, entertainment, and shopping (Donthu, 2020).

This became an opportunity for HR managers to strive for a transparent and fair way of communication about the immediate negative effects of COVID-19 on companies (Rudolph, 2021). From a different and positive perspective, HR can approach this issue as a challenge that can be addressed as a calling for new ways to problem solve, make choices and make decisions, grow, develop and innovate (Watkins, 2020).

Carnevale (2020) explains that due to recent pandemic events, organisations should remain alert and adaptive to unforeseen events, and with the help of human resources management (HRM), the workforce can cope and adjust to their newly altered work environment. HRM continuously needs to manage people in organisations to enable continuity and ensure work-life balance (Gigauri, 2020) and work towards converting analogue information into digital information for processing purposes (Strohmeier, 2020).

Digitalisation needs to be exploited for a broad range of companies' activities (example: payroll or processing to course administration) and to develop HRM strategies (Burbach, 2012) which could establish systematic quality improvements across this department (HR) and work on new approaches (Strohmeier, 2020).

Methodology

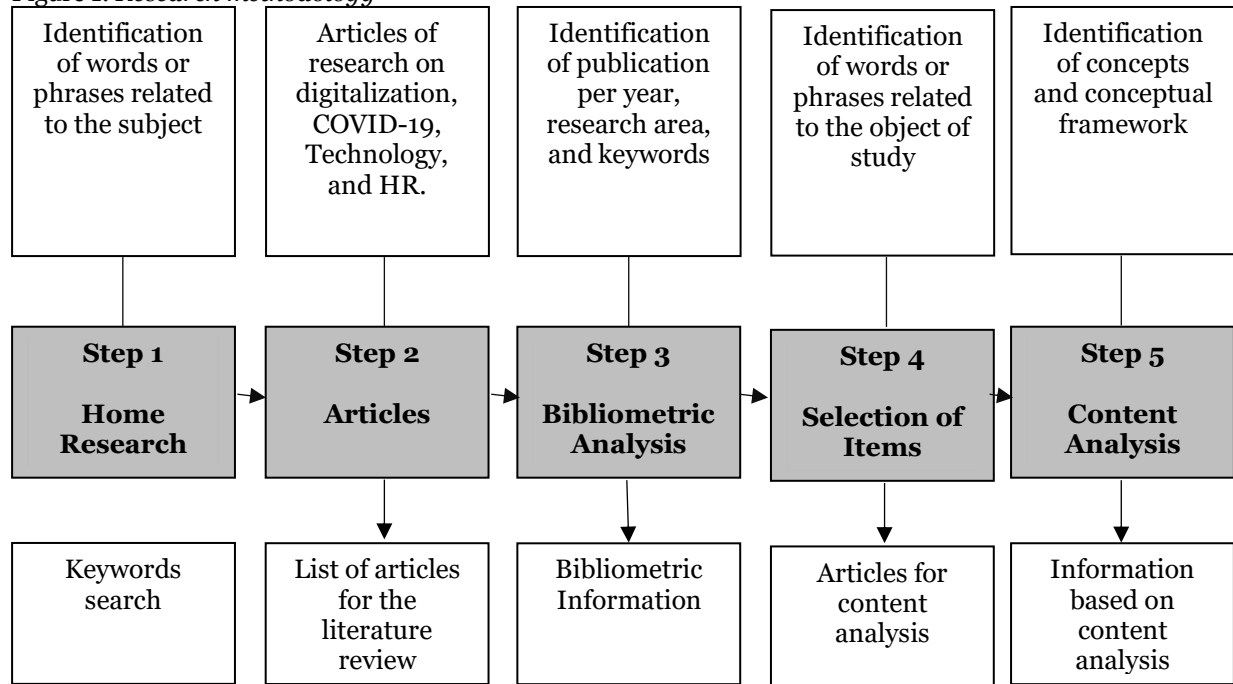
Investigation procedure

To meet the objectives of our research trajectory about the digitalisation effects of the pandemic crisis regarding technology, human capital, and processes, we conduct a bibliometric study to enable a systematic review of the literature of international research journals using the Web of Science (WoS), from 2012 to 2022.

The search for relevant articles started with WoS by using the keywords related to the study, namely, "Digitalization" AND "COVID-19" OR "Pandemic Crisis" AND "Technology" AND "Human Capital" AND "Processes", giving a total of 852 results. Then, refining the data by management and business categories made it possible to reach a total of 141 articles. The articles were written in English, providing a result of 139 articles, and after we refined by articles as a document type, it was possible to reach 95 results.

Finally, we extended our search into publication titles, and after the refinement and excluding of the research articles that weren't relevant to this study, we reached a total of 92 results.

Figure 1: Research methodology



Source: Own elaboration

Table 2: Journals and Number of articles

Journals	No of articles
<i>Annals of Medicine and Surgery</i>	2
<i>Anatolia</i>	1
<i>Asia Pacific Journal of Administration</i>	1
<i>Advances in Developing Human Resources</i>	1
<i>Administrative Sciences</i>	1
<i>BRB Business Research Quarterly</i>	1
<i>Business Information Review</i>	1
<i>British Journal of Management</i>	1
<i>Baltic Journal Management</i>	1
<i>California Management Review</i>	1
<i>Computing Ind.</i>	1
<i>Central European Business Review</i>	1
<i>European Management Review</i>	1
<i>Economic Sciences Series</i>	1
<i>European Business Review</i>	1
<i>FIB Business Review</i>	1
<i>Gender, Work, and Organization</i>	1
<i>Geography and Sustainability</i>	1
<i>German Journal of Human Resource Management</i>	1
<i>Human Resource Management Review</i>	2
<i>Human Resource Management Journal</i>	1
<i>International Journal Surgery</i>	2
<i>Information Management Review</i>	1
<i>Information systems Management</i>	4
<i>IEEE Internet of Things Journal</i>	1

<i>International Journal of Innovative Tech. in Economy</i>	1
<i>Innovation Organization Management</i>	1
<i>International Journal of Information Management</i>	7
<i>Information and Organisation</i>	3
<i>Journal of Business Research</i>	6
<i>JMIR Public Health and Surveillance</i>	1
<i>Journal of Manufacturing Technology Management</i>	1
<i>Journal of Org. Computing and Elec. Commerce</i>	1
<i>Journal of Information Technology</i>	2
<i>International Journal of Construction Management</i>	1
<i>International Journal of Automobilitic Technology</i>	1
<i>Journal of Applied Psychology</i>	1
<i>Journal of Manufacturing Technology</i>	1
<i>Journal of Global Operations and Strategic Sourcing</i>	1
<i>Journal of Knowledge Management</i>	1
<i>Journal of International Business Studies</i>	1
<i>Journal of Science and Technology Policy Management</i>	1
<i>Journal of Strategy and Management</i>	1
<i>Journal of World Business</i>	1
<i>MIT Sloan Management Review</i>	1
<i>Management Learning</i>	1
<i>Management Research Review</i>	1
<i>NMIMS Management Review</i>	1
<i>New Technology and Work and Employment</i>	2
<i>Operations Management Research</i>	2
<i>Public Management Review</i>	2
<i>Perspectives on Science and Practice</i>	1
<i>Technology Analysis Strategic Management</i>	2
<i>Procedia</i>	1
<i>Planning and Control</i>	1
<i>Polish Journal of Management Studies</i>	1
<i>Resources, Conservation and Recycling</i>	1
<i>Research Technology Management</i>	1
<i>Software System Model</i>	1
<i>Sustainable Operations and Computers</i>	1
<i>Tecnovation</i>	2
<i>Technological Forecasting and Social Change</i>	2
<i>TQM Journal</i>	2
<i>Transformations in Business Economics</i>	1
65 Journals	95 results

Inclusion criteria

Regarding this study, peer-reviewed articles were considered a thrust source of knowledge, maintaining out thesis, editorial notes, white papers, thesis, blogs, and books. Therefore, the publications and work related to this study were included in the inclusion criteria corresponding to digitalisation, the pandemic crisis, and the three affected variables.

Exclusion criteria

Considering the exclusion criteria, we rejected several articles that did not present any practical application of theoretical information that contributed to our research or answered our central question. In that sense, we have ruled out the following:

1. Ex1 Articles with a focus on sustainability;
2. Ex2 Articles with specific relation to medicine;
3. Ex3 Articles focus on gender issues;
4. Ex4 Articles with specific relation to marketing.

Results and Discussion

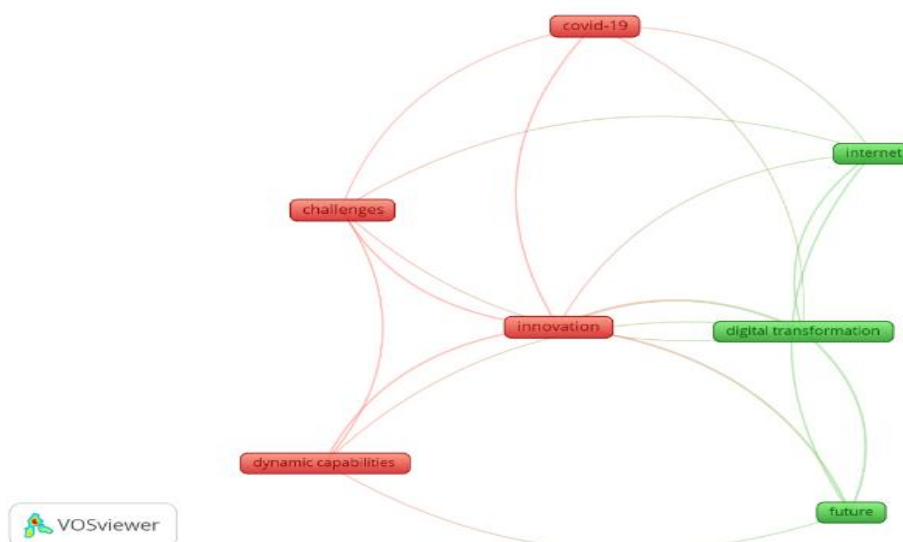
The COVID-19 pandemic changed companies' landscape, making organisations (re)focus on their goals and future perspectives. However, the pandemic also brought several opportunities for the use of technological applications and tools like (1) artificial intelligence, (2) big data, (3) cloud computing, (4) virtual reality/ augmented reality, (5) IoT, and (6) cyber-physical (Rudrapati, 2022).

The pandemic boosted the remote work trend leading organisations to reshape their processes for telework. Adopting the digital format will reshape organisations and their processes, creating new businesses or rebuilding old strategies. Also, it brings new and more practicable ways of communicating with clients, facilitating data exchange, changing the way workers see their profession, remote work, and shaping professional identities (Kateb, 2022, Papa, 2018; Scuotto, 2017).

The effect of the pandemic also had a tremendous weight on human capital due to the closure of places and considerably decreasing manufacturing and productivity (Haleem, 2020), as people were pushed to work from home and led (Mateescu, 2020) to furloughs and layoffs. Human capital also felt that social distancing brought loneliness, and isolation, exacerbated mental health, and a lack of informal social engagement (Carnevale, 2020; Gai, 2020).

Although this crisis is fundamentally a human one (Collings, 2021), organisations need to adjust their processes to ensure that people have a work-life balance (Gigauri, 2020) and work towards the conversion from analogue to digital for processing purposes (Strohmeier, 2020). However, constraints in processes can affect the relationship between producer-costumer (Fremont, 2018), difficulties in working from home (Zhang, 2020), and economic/societal changes (Brunetti, 2020).

Figure 2: Keywords analysis



Source: VOSviewer software

As moving forward in our results, we could also conceptualise the evolution and dynamics of the bibliometric studies through VOSviewer software (Fig. 2), namely the keyword analysis. The process begins by uploading an RSI file with the following parameters: (1) co-occurrence, (2) full counting, and (3) keywords. The result led us to a minimum of 5 occurrences per keyword, 21 keywords included in the threshold, giving a result of 428 total link strength.

The created network leads us to realise that the clusters were influenced by digital transformation. The cluster (digital transformation) highlighted the attachment to the internet and the future not disregarding the remaining variables. The main red cluster (Covid-19) alerts us to the existing organisational/social/transformational challenges that exist every day, and it becomes necessary to continue to innovate to overcome the challenges in the future and contribute to digital transformation. For last, the dynamic capabilities model continues to be a reference in rebuilding, integrating and reconfiguring internal and external resources/competences.

Conclusions, implications, Limitations, and Further studies

The literature database acquired from the systematic search was categorised with a focus on digitalisation throughout the pandemic, assuming the effects on the three areas of our study: (1) technology, (2) processes, and (3) human capital. Considering the data collection for the research, it becomes clear that there is an intrinsic relationship between them.

The evolution of digitalisation and its increasing usage is undeniable, but the emergence of a global pandemic has inevitably accelerated these processes around the world. Countries found themselves in lockdown and organisations needed to find momentary solutions to proceed with their business as well as to implement remote work as the new normal. Investing in new technologies that met certain needs was necessary to ensure that workers could keep their jobs, reducing the crisis effects.

Throughout the development of this essay, there was a mindset mutation as overall processes were understood. Digitalisation has brought a new checklist of needs for corporations and has implied by (Bastos, 2022), that hybrid networks may affect supply chain sustainability, as mentioned in the literature review. During the period, many workers were sent back home, some were able to do their work, but others did not. Regarding the production itself, it cannot be made remotely or even those companies who have opted to do it in a hybrid prospect have decreased, as expected, their production scale. Overall, digitalisation is seen as a major tool to provide services – which was suitable for many companies that were able to keep the activity going even within a crisis period – but it is not production friendly in this sense.

These technologies were accompanied by new processes, which still need improvement due to the short time of implementation. Although a solution has been found, the truth is that not all individuals have been satisfied with this response from companies. Social distancing has highlighted the lack of commitment of some workers and the loneliness. These drastic changes bring their mental health concerns. New strategies had to be created in companies through digitalisation to meet these new needs of employees. It should be noted that this reality has not been possible for all types of businesses.

Companies were forced to rethink plants' layouts due to the social distancing implied by the pandemic. As a solution, remote work was enforced for organisations to continue their business operations. Considering the unpredicted changes, digitalisation brings numerous benefits and gives its contribution to organisational growth. As McGuire (2020) stated, this virus brings a refund and immediate effect on organisations and workplaces worldwide. In that sense, we determine that is up to the human capital to rise above and give answers that can bring clarity to strategies, to co-workers, and the future of the organisation.

Theoretical and practical implications

This study contributes to the body of knowledge by combining digitalisation with technology, processes, and human capital during the pandemic. When evaluating the theoretical contribution of this research, it is essential to remember that the empirical results originate from the global and real-life context of the companies and therefore contribute to managers' and entrepreneurs' understanding of the weight of the pandemic crisis through technology, processes, and human capital. The path to digitalisation improved workers' lives regarding remote work and how the processes need to change and be re-arranged, as well as the emotional salary, which is possible to assess what are the talents in the organisation and what is needed to preserve them.

Our research also contributes to practitioners and also to organisational management. On a practical level, we postulate that organisations need to consider that human capital needs the right tools to be motivated to ensure a good work-life balance, integration and for the HR to continue their work in searching for more ways to increase workers value and as a result increase the organisation profile. Technology must be inserted into the new reality equation and developed to achieve a competitive advantage. As a result, the increase and access in several areas like healthcare, communication, flexibility in working, etc., allows companies to understand more quickly stakeholders' needs and act upon them. Although it is necessary to review and re-structure, Processes contributed to technology and human capital unity and achievement of organisational goals providing new organisations with the opportunity to gain new dimensions and expand to new businesses and new sources of revenue.

Study limitations

The main limitation of our work is that this study makes a narrative presentation of results that the authors previously collected. Although this was a justified seriation, the articles used in this review were based on specific databases and keywords. These searches are always very sensitive since studies with slightly different contributions may be left out depending on the words used.

Nevertheless, no review, even a systematic review, can guarantee finding all articles relevant to the topic under study. Including data (qualitative or quantitative) from other databases may improve the results of this review in a future analysis.

Further studies

This pandemic context has undoubtedly changed how organisations see the world and how they structure strategies to be more effective and continue their business activity. On a positive note, although companies are passing through high degrees of uncertainty, digital tools found new ways to be utilised and revolutionise the way processes are made, the perception of human capital, and the continuous use of technology.

In this context, it is proposed the following future academic research challenges:

- To study what strategies are used by organisations to cope with COVID-19 variants and what effect had on their stakeholders;
- To study the characteristics and outcomes of COVID-19 on global markets;
- To study how COVID-19 changes the dynamic between departments inside the organisation.

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ANALYSIS OF RELATIONSHIPS BETWEEN INNOVATIVE AND DIGITAL PERFORMANCE OF EU-27 COUNTRIES

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ABSTRACT. Background: The global digital economy is developing quickly, and innovation plays a crucial role in today's economic growth. **Aims:** The main aim was to investigate the interrelationships between the digital and innovation performance of the EU countries using the selected global indices (DESI, GII, SII). The main aim was fulfilled by 2 partial goals and subsequently set 2 hypotheses. **Methods:** To verify the hypotheses, we used the Kendall Tau coefficient (τ), panel data regression analysis and through this analysis, we created 3 models. **Sample:** We have chosen the EU-27 countries for our analyses. The length of the analyzed period was 5 years (2016-2020). **Results:** To select the resulting model from the 3 proposed models (Model 1 (OLS), Model 2 (FEM), and Model 3 (REM)), test criteria such as F-test, Breusch-Pagan test, and Hausman test were used. We consider Model 2 to be the most suitable model, which is the result of the Fixed Effects Model (FEM). **Conclusions:** The results of our analyses confirmed that a higher statistically significant positive relationship was identified between the digital performance of the EU-27 countries and their innovation performance evaluated using the SII versus the innovation performance using the GII.

Keywords: digital performance, innovation performance, panel data regression analysis, EU-27 countries

JEL Classification: O39, O40

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Introduction

The global digital economy is developing quickly. This has a significant impact on various areas of the economy (Rosario & Cruz, 2019), (Ghezzi & Cavallo, 2020). The expansion of digitization in several countries is one of the strongest current trends that are shaping today's global economy. The digitization of processes itself is driven by a strong assumption of achieving higher overall organizational performance (Kotarba, 2017) and building competitive advantages for both organizations and countries, and is important for the survival and growth of the economy.

Pan et al. (2022) claim that the digital economy has a multidisciplinary character, while the driving source of digitization is the use of information and communication technologies (ICT). Thus, the digital economy becomes a new economic form, which is influenced by the rapid development of industry and ICT. The technological changes that have emerged since the industrial revolution represent the driving force behind economic development. In this, we can find a similarity with the development of the digital economy.

Innovation plays a crucial role in determining today's economic growth patterns. In a fast - globalized world and with global competition, countries and enterprises that renew the range of their products and services take the lead (Hamidi & Berrado, 2018). Innovative activity is an important source of competitiveness, economic growth, as well as the image of each country. It is perceived to be a source of competitiveness and economic growth. New products, utility models, trademarks and creative projects are an important element of the present socio-economic reality. There are several ways to measure and evaluate the innovation performance of a country (Janoskova & Kral, 2019). In order for innovations to be properly directed and managed, they need to be measured and quantified (Hamidi & Berrado, 2018). It is quite difficult to measure the innovative activity of a country, which consists of several different areas that affect innovation performance. Two well-known ways to measure and evaluate the innovation performance of a country are the Global Innovation Index (GII) and the Summary Innovation Index (SII) (Janoskova & Kral, 2019).

The main aim was to investigate the interrelationships between the digital and innovation performance of the EU-27 countries using selected global indices (DESI, GII, SII) for the period 2016 to 2020. The originality of this study lies precisely in the combination of the mentioned three indices. To compare and analyze EU-27 data in all three indices at once is unique. From the sources that we have studied, it is clear, that the authors focus on one of the indexes, or on a combination of the selected index and another indicator. However, a summary comparison of all 3 digital and innovation indices at once was missing.

Theoretical background

Description of digital and innovation indices of countries

The competitiveness of the European economy depends on a knowledge-based economy and support for research and development (R&D). While the former is closely linked to human capital development and qualitative improvement, R&D activities presuppose the integration and development of information and communication technologies (ICT). One of the main initiatives of the EU 2020 strategy is the Digital Agenda for Europe. To achieve the targets quickly and on schedule, the proposed governance framework is based on an improved Digital Economy and Society Index (DESI). The DESI report tracks the progress made by EU member countries with respect to their digitization (Bánhidi, Dobos, & Nemeslaki, 2020) since 2014.

The Digital Economy and Society Index (DESI) is a composite index published annually by the European Commission since 2014. It measures the progress made by EU Member States in the digital economy and society, combining a set of relevant indicators (DESI, 2022).

DESI monitors the overall European digital performance and tracks the progress of EU countries in their digital competitiveness. The published reports also include profiles of individual countries, while a detailed chapter on telecommunications is added to the report on each member state. DESI country reports are a combination of quantitative data obtained according to DESI indicators in four areas as part of an index and an overview of policies and best practices in individual countries (Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2021). In 2021, the EC revised the DESI structure, replacing the previous five-dimensional structure with four main areas (Kovacs et al., 2022).

DESI is a widely used and cited measurement system by practitioners and policy makers, but it has some advantages and serious limitations. Disadvantages can also be viewed from a certain angle as advantages. The fact, that the index evaluates data for EU countries means, that the methodology is universal and applicable to everyone. For this reason, the results are also general and not suitable for in-depth analysis and explanation of certain phenomena. Another disadvantage is the often-changing selection of factors, changing the number of dimensions. The composition and number of dimensions change from year to year, making it difficult to compare the performance of time series. Also, the long period between data collection and publication leads to outdated assessments and conclusions. Regardless of the problems, the DESI collection method and system is still a robust approach that cannot be avoided in many cases and is considered the best choice for mapping Europe's digitization progress (Bánhidí, Dobos, & Nemeslaki, 2020).

The Digital Economy and Society Index (DESI) summarises indicators of Europe's digital performance and tracks the progress of EU countries. The DESI has a three-level structure with 4 dimensions, 10 sub-dimensions, and 33 indicators.

Table 1. Composition of the Digital Economy and Society Index (DESI)

Digital Economy and Society Index			
Human Capital	Connectivity	Integration of digital technology	Digital public services
- Internet User Skills (<i>dimension 1</i>) - Advanced Skills and Development (<i>dimension 2</i>)	- Fixed broadband take-up (<i>dimension 3</i>) - Fixed broadband coverage (<i>dimension 4</i>) - Mobile broadband (<i>dimension 5</i>) - Broadband price index (<i>dimension 6</i>)	- Digital intensity (<i>dimension 7</i>) - Digital technologies for businesses (<i>dimension 8</i>) - e-Commerce (<i>dimension 9</i>)	e-Government (<i>dimension 10</i>)

Source: own processing by European Commission (2021a)

The background for the concept of innovation can be found in the writings of Schumpeter in the 1930s. Innovation has been perceived as a key driving force for economic growth. It also provides a response to many societal, technological, and business challenges. Innovation inputs cover a wide range of factors including, stable macroeconomic conditions, the availability of internal and external finance, expansion in public research, reduction of anti-competitive regulations, tax incentives, and openness to foreign R&D. Similarly, innovation outputs can be defined by different elements that can be perceived as the result of innovation within an economy (e.g., number of patents, number of trademarks, the share of sales in innovative products) (Jankowska, Matysek-Jędrych, & Mroczek-Dąbrowska, 2017).

There is a positive trend in the political determination across the globe to foster innovation and related policies on the ground. A few years ago, innovation and innovation policies related to high-income economies. Today, developed and developing economies have placed innovation on their agenda to boost economic and social development. Regardless of the economic and geopolitical uncertainties over the last few years, innovations seem to be blossoming globally (Dutta, Lanvin, & Wunsch-Vincent, 2019). As a result of this trend, the measure of innovation and its impact have been the main area of interest of various institutions.

We decided to analyse the area of innovation performance using two global indexes, the Global Innovation Index (GII) and the Summary Innovation Index (SII).

The **Global Innovation Index (GII)** is one of the impulses to the latest global innovation trends. This index observes the innovation capability and efficiency levels of individual countries using input and output factors (Sohn, Kim, & Jeon, 2016). GII report is a useful and rich dataset for comparing innovation efficiency and identifying innovation trends at both the national and global levels (Jankowska, Matysek-Jędrych, & Mroczek-Dąbrowska, 2017).

It annually evaluates the performance of the innovation ecosystems of economies around the world, while highlighting the strengths and weaknesses of innovation and specific gaps in innovation metrics. The index aims to capture the most complete picture of innovation and contains approximately 80 indicators, including measures of each economy's political environment, education, infrastructure, and knowledge creation. The various metrics offered by the GII can be used to monitor performance and compare developments against economies within the same region or income group classification (WIPO, 2021). However, it does not consider potential structural relationships among factors affecting the innovation performance of a country (Sohn, Kim, & Jeon, 2016).

Table 2. Composition of the Global Innovation Index (GII)

Global Innovation Index	
Input subindex	Output subindex
▪ Institutions (dimension 1) ▪ Human capital and research (dimension 2) ▪ Infrastructure (dimension 3) ▪ Market sophistication (dimension 4) ▪ Business sophistication (dimension 5)	▪ Knowledge and technology outputs (dimension 6) ▪ Creative outputs (dimension 7)

Source: *own processing by Cornell University, INSEAD & WIPO (2020)*

The Summary Innovation Index (SII) is a composite indicator aimed at evaluating innovation performance, which is processed as part of the European Innovation Scoreboards (EIS) project for the European Commission, Directorate-General for the Internal Market, Industry, Entrepreneurship and SMEs and is published from 2001 (EIS, 2022).

The EIS provides a comparative analysis of innovation performance in EU countries, other European countries, and regional neighbors. It assesses the relative strengths and weaknesses of national innovation systems and helps countries identify areas they need to address (European Commission, 2021a). The SII is used for analyzing the level of innovative ability of European countries (Kuklyte, 2017), (Edquist & Zabala-Iturriagoitia, 2015). As an EU initiative, the Innovation Union monitors and periodically reports on the progress achieved in research, development, and innovations (Janoskova & Kral, 2019).

The Summary Innovation Index consists of four areas of assessment, namely Framework conditions, Investments, Innovation Activities, and Impacts. These areas contain ten innovation subgroups and consist of 32 indicators.

Table 3. Composition of the Summary Innovation Index (SII)

Summary Innovation Index			
Framework conditions	Investments	Innovation activities	Impacts
▪ Human resources (dimension 1) ▪ Research systems (dimension 2) ▪ Digitalisation (dimension 3)	▪ Finance and support (dimension 4) ▪ Firm investments (dimension 5) ▪ Information technologies (dimension 6)	▪ Innovators (dimension 7) ▪ Linkages (dimension 8) ▪ Intellectual assets (dimension 9)	▪ Employment impacts (dimension 10) ▪ Sales impacts (dimension 11) ▪ Environmental sustainability (dimension 12)

Source: *own processing by Hollanders a Es-Sadki (2021)*

Methodology

The main aim was to investigate the interrelationships between the digital and innovation performance of the EU-27 countries using selected global indices (DESI, GII, SII) for the period 2016 to 2020.

We have chosen countries of the European Union for our analyses. These countries currently form a group of 27 countries, and the length of the time period (5 years) was influenced by the availability of secondary data.

We obtained secondary data from the annual reports published by the European Commission (DESI and SII index) and WIPO (GII index) for the years 2017 to 2021. Considering, that the data entered for the evaluation of the analyzed indices are often from the previous year than the year of publication annual report, we decided to mark the analyzed period as 2016 to 2020.

The main goal was fulfilled by 2 partial goals, which were set in a logical sequence as follows:

- partial objective 1 → to analyse the development of the EU-27 countries using selected global indices (DESI, GII, and SII) for the period 2016-2020,
- partial objective 2 → to identify the existence of mutual relations and connections between the total score and the dimensions of the selected global indices of the EU-27 countries,

For partial objective 2, we have defined the following hypotheses, which we verified using appropriate statistical tools.

H1: We assume the existence of statistically significant relationships between the DESI score and the dimensions of the GII and SII indices of the EU-27 countries for the period 2016-2020.

H2: There is a statistically significant influence of selected dimensions of the GII and SII indices on the total DESI score of the EU-27 countries.

DESI, GII, and SII indices consist of several dimensions, respectively indicators listed in them. In Table 4 we present the designation of the analysed dimensions of these indexes, including the designation under which they enter statistical verification.

Table 4. Structure of analyzed indexes

Index	Description structure of indexes	Source
Digital Economy and Society Index (<i>DESI</i>)	The Digital Economy and Society Index (DESI) summarises indicators on Europe's digital performance and tracks the progress of EU countries. The DESI has a three-level structure as 4 dimensions, 10 sub-dimensions and 33 indicators. Dimensions of DESI: ▪ Human capital (<i>DESI_D1</i>) ▪ Connectivity (<i>DESI_D2</i>) ▪ Integration of digital technology (<i>DESI_D3</i>) ▪ Digital public services (<i>DESI_D4</i>)	European Commission
Global Innovation Index (<i>GII</i>)	The Global Innovation Index (GII) ranks world economies according to their innovation capabilities. The GII aims to capture the multi-dimensional facets of innovation. Consisting of 80 indicators, grouped into innovation inputs (5 dimensions) and outputs (2 dimensions). Dimensions of GII: ▪ Institutions (<i>GII_D1</i>) ▪ Human capital and research (<i>GII_D2</i>) ▪ Infrastructure (<i>GII_D3</i>) ▪ Market sophistication (<i>GII_D4</i>) ▪ Business sophistication (<i>GII_D5</i>) ▪ Knowledge and technology outputs (<i>GII_D6</i>) ▪ Creative outputs (<i>GII_D7</i>)	WIPO
Summary Innovation Index (<i>SII</i>)	Summary Innovation Index (SII) are data from the European Innovation Scoreboard that provides a comparative assessment of the research and innovation performance of EU Member States and selected third countries. Dimensions of SII: ▪ Human resources (<i>SII_D1</i>) ▪ Research systems (<i>SII_D2</i>) ▪ Digitalisation (<i>SII_D3</i>) ▪ Finance and support (<i>SII_D4</i>) ▪ Firm investments (<i>SII_D5</i>) ▪ Information technologies (<i>SII_D6</i>) ▪ Innovators (<i>SII_D7</i>) ▪ Linkages (<i>SII_D8</i>) ▪ Intellectual assets (<i>SII_D9</i>) ▪ Employment impacts (<i>SII_D10</i>) ▪ Sales impacts (<i>SII_D11</i>) ▪ Environmental sustainability (<i>SII_D12</i>)	European Commission

Source: own processing from annual reports of European Commission (2021a, 2021b, 2021c), WIPO (2021)

The results of the descriptive statistics of the analysed indices of digital and innovation performance of the EU-27 countries for the period 2016 to 2020 are presented in Table 5.

Table 5. The results of descriptive statistics

Variable	Mean	Median	Min	Max	Lower	Upper	Range	Quartile	Std.Dev.	Skewness	Kurtosis
DESI	40.5130	40.5181	19.3991	65.2503	33.4378	47.0231	45.8512	13.5853	9.5611	0.1207	-0.3093
GII	48.3014	47.8300	35.6000	63.8000	42.0500	54.2000	28.2000	12.1500	7.3915	0.3489	-0.8160
SII	46.2066	43.9536	15.4279	73.1306	33.6920	61.3492	57.7027	27.6573	15.2219	-0.0926	-1.0833

Source: *own processing*

To verify the hypotheses, we used the Kendall Tau coefficient (τ) and panel data regression analysis.

The value of the Kendall Tau (τ) coefficient was calculated as follows:

$$\tau = \frac{2 \sum_{1 \leq i < j \leq n} \sum_{1 \leq i < j \leq n} a_{i,j}}{(n(n-1))} \quad (1)$$

The Kendall τ coefficient is interpreted in a way like the previous cases. The coefficient is defined in a closed interval from -1 to 1 , where values closer to ± 1 represent a stronger association (Lyócsa, Baumöhl, & Výrost, 2013, p. 182-183).

Panel data combines cross-sectional and time data. For panel data, there is a time sequence for each entity used in the cross-sectional selection. Panel data is most often used to examine the time evolution of different units from the same sector, market, or geographical unit, with a typical large cross-sectional structure and only a few time periods.

Panel regression models include the following types of models according to Lukáčiková, Lukáčiková, and Szomolányi (2008):

- *Pooled Regression (OLS)* – if the individual effect is only a vector of units, which means that a single parameter α is a common constant:

$$y_{it} = \alpha + \beta_1 x_{it1} + \beta_2 x_{it2} + \dots + \beta_k x_{itk} + u_{it} \quad (2)$$

- *Fixed Effects Model (FEM)* – if individual effects Z_1 to Z_q are unobservable but correlate with explanatory variables, then the solution is to include all effects in the estimating conditional average using the relation $\alpha_i = \alpha_1 z_{i1} + \alpha_2 z_{i2} + \dots + \alpha_q z_{iq}$ while the model FEM is as follows:

$$y_{it} = \alpha_i + \beta_1 x_{it1} + \beta_2 x_{it2} + \dots + \beta_k x_{itk} + u_{it} \quad (3)$$

– fixed effect α_i means a specific constant for each cross-sectional unit.

- *Random Effects Model (REM)* – if individual effects Z_1 to Z_q are unobservable and do not correlate with explanatory variables, then the solution is the compound random variable $\varepsilon_i + u_{it}$, which, in addition to the original, also assumes a specific random component for each cross-sectional unit, while the REM model is as follows:

$$y_{it} = \beta_1 x_{it1} + \beta_2 x_{it2} + \dots + \beta_k x_{itk} + (\alpha + \varepsilon_i) + u_{it} \quad (4)$$

Results and discussions

The first goal was to analyze the development of the EU-27 countries using selected global indices (DESI, GII and SII) for the period 2016-2020, which we decided to implement in 2 levels, namely:

- analysis of the average score of selected indices of the EU-27 countries for the years 2016-2020,
- analysis of the development trend of the average total score of the DESI, GII and SII indices and their dimensions of the EU-27 countries for the individual years 2016 to 2020.

Figure 1 presents the results of the average score of DESI (brown colour), GII (blue colour) and SII (green colour) for the period 2016 – 2020.

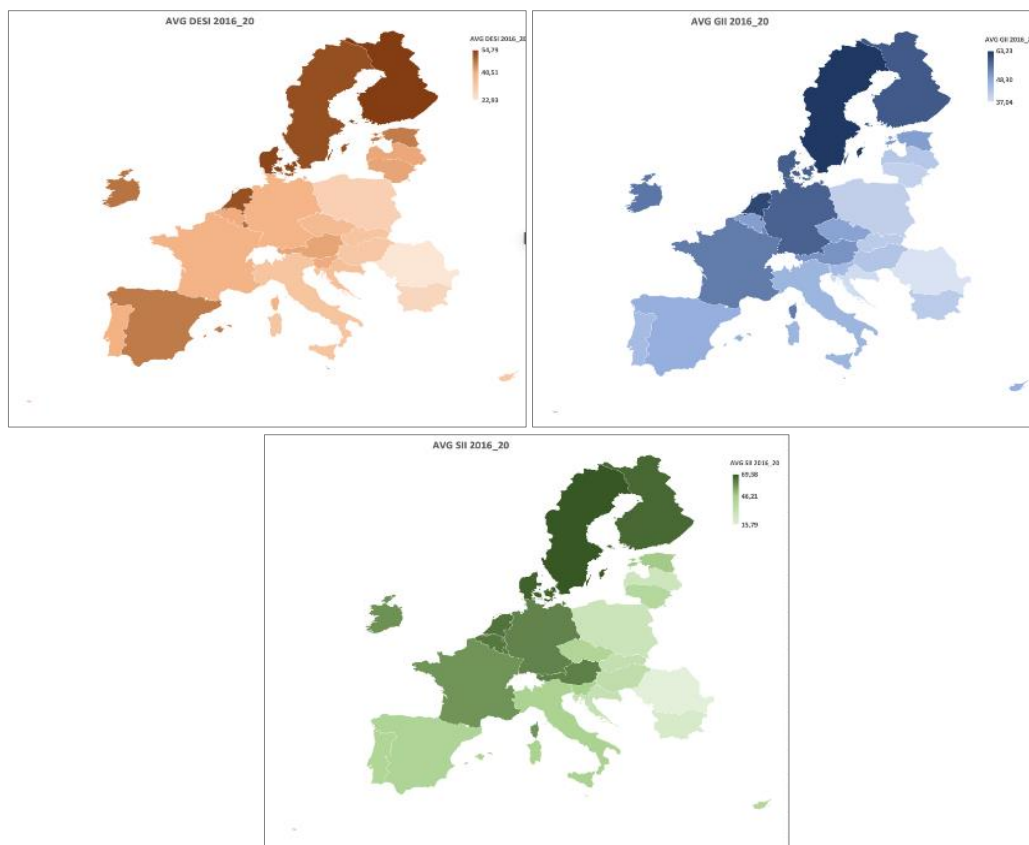


Figure 1. Average scores of DESI, GII and SII of EU-27 countries for 2016 - 2020

Source: own processing

When evaluating the average score of the analysed indices, we can state that the Nordic countries are among the leaders, as same as in the study of Kovács et al. (2022), Kinnunen, Androniceanu, and Georgescu (2019) and Androniceanu et al. (2019). Finland (DESI=57.79) and Sweden can be considered the leader in the evaluation of innovation performance (GII=63.23, and SII=69.58). On the contrary, the worst results in the evaluation of all global indices were achieved by Romania (DESI=22.93, GII=37.04 and SII=15.79). In this respect, we obtained similar results to Stoian and Nica (2016). The GII_{EU-27} index had the best average European score at 48.30, followed by SII_{EU-27} with an average score of 46.21, and the $DESI_{EU-27}$ digital performance index (40.51) achieved the lowest values.

In the following analysis, we focused our attention on the analysis of the development of the overall score of the DESI, GII, and SII indices of the EU-27 countries according to the individual analysed years, the results of which are presented in Figure 2.

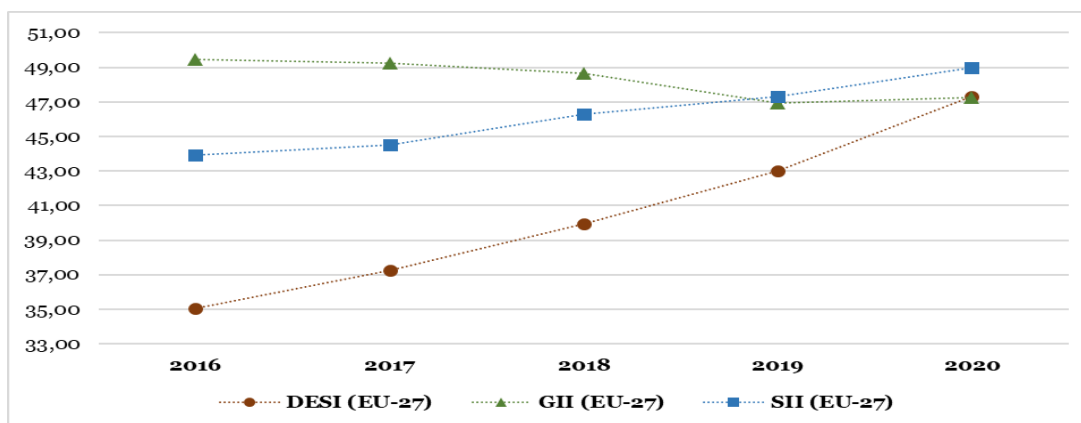


Figure 2. Comparison of the development of EU-27 indices for the years 2016-2020

Source: own processing

From Figure 2 we can see that the fastest growth rate is visible for the DESI index (EU-27), which reached a height of 35.07 in 2016, but in 2020 its overall score increased by almost 35%. We also noticed a very similar development trend for the SII index, while its total score increased by 11.5% and reached the highest total score of 48.96 compared to the other analysed indices in 2020. A different course of development is evident for the GII index, whose total score gradually decreased and reached its lowest value in 2019 (46.93). In 2020, the GII index decreased by 4.4% compared to 2016. In 2020, they achieved very similar overall scores for the 2 analysed indices, namely the DESI index (47.34) and the GII index (47.26).

The results of a mutual comparison of the development of the total score as well as the dimensions of the analysed indices of European Union countries for the individual years 2016 to 2020 are shown in the following Figure 3, 4 and 5.

The development of the scores of the 4 dimensions of the DESI index has a growing trend, as does the overall score of the analysed index. In this regard, we can find similar conclusions to the conclusions of Banhidi, Dobos, and Nemeslaki (2020) and Stavtyskyy, Kharlamova, and Stoica (2019), who also showed an increasing trend, providing on older data. So, this trend continues even in the newer analysed years. The exception is the evaluation of dimension 1 – Human capital, where the values range from 10.84 to 11.75 and thus, we did not notice significant changes as for the other dimensions.

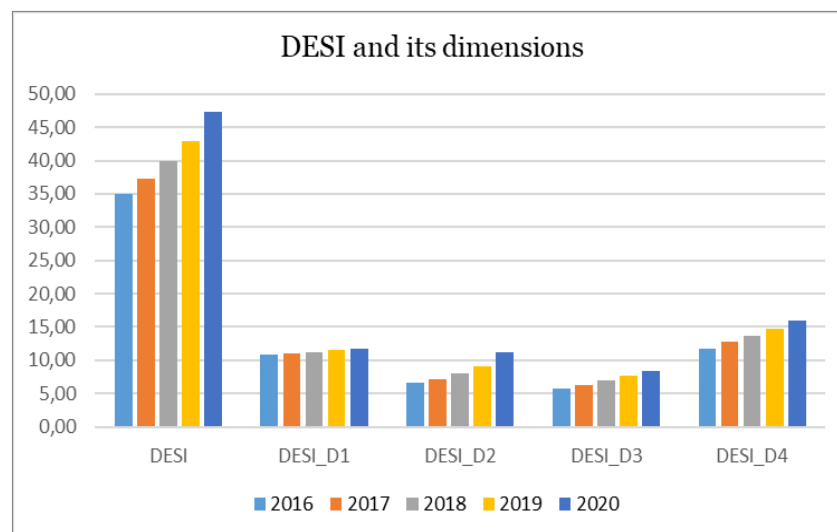


Figure 3. Development of average DESI score and its dimensions of EU-27 countries

Source: own processing

The second analysed index is the GII index, while the development of the scores of individual dimensions has a slightly fluctuating trend, except for dimension 7 – Creative outputs. This dimension was the only one that gradually decreased from the value of 46.86 in 2016 until 2019, where it reached a score of 37.94, but in 2020 we saw its increase to the level of 39.38. The highest rated dimension of the GII index was dimension 1 - Institutions, whose score was around 79.

The last analysed index is the SII index, which consists of up to 12 dimensions, and the individual dimensions developed in a positive direction, except for dimension 9- Intellectual assets, whose score gradually was falling. The most significant positive change occurred in the evaluation of dimension 7 – Innovators, which grew by more than 26% year-on-year over the last two analysed years. The highest score of the SII index dimension is visible for dimension 3 – Digitalisation, whose value reached its maximum at 63.72. The lowest rated dimension of the SII index was dimension 5 – Firm investments, which in 2016 reached a height of only 38.29. In this regard, it is interesting to see different conclusions, and how the development over time changes the position of individual dimensions. Even though the study of Janoskova and Kral (2019) was processed until 2016, the sample of countries (V4) is similar, even though in our case there are more countries (27). Janoskova and Kral (2019) demonstrated that dimension 5 - Firm investments was evaluated among others in the given period as one of the best in the V4 sample. On the contrary, the weakest results were in the Innovation dimension.

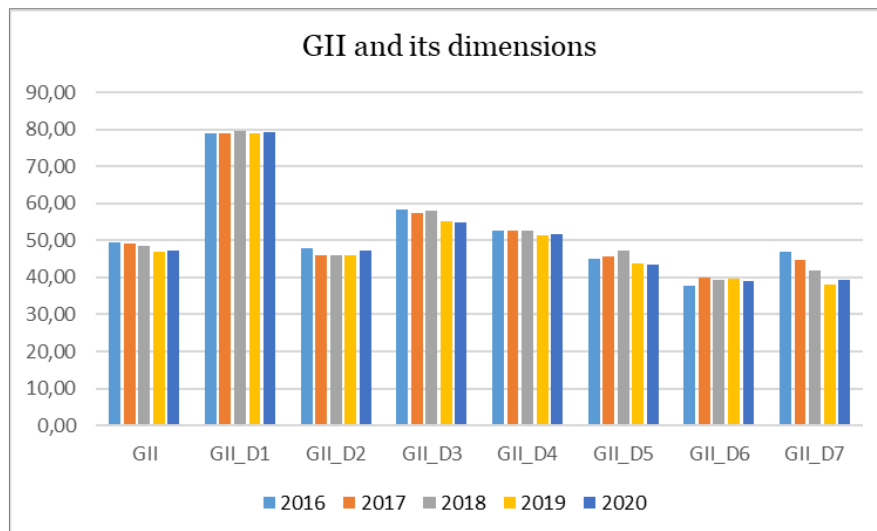


Figure 4. Development of average GII score and its dimensions of EU-27 countries

Source: own processing

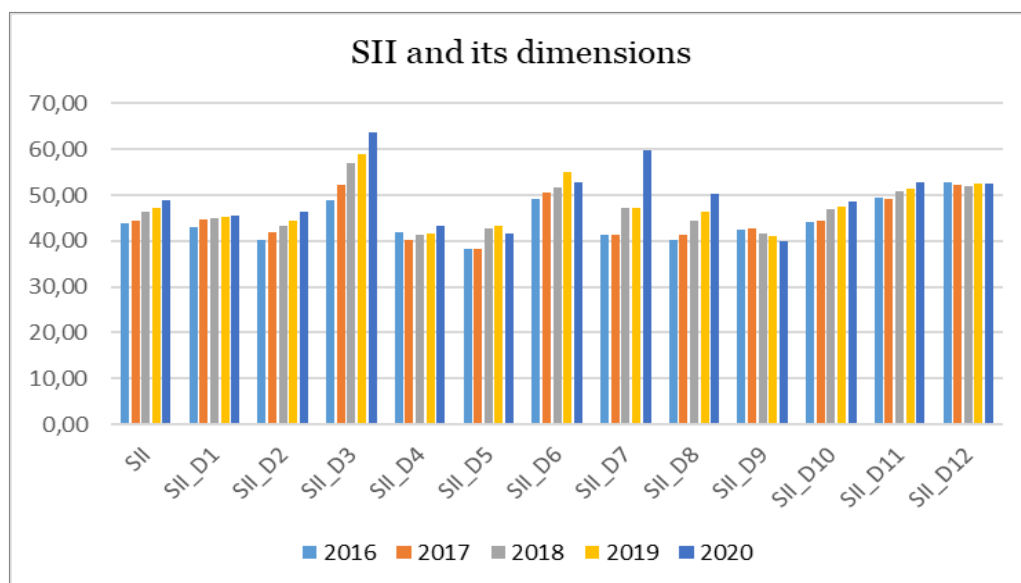


Figure 5. Development of average SII and its dimensions of EU-27 countries

Source: own processing

At the end of the analysis of the digital performance of the EU-27 countries for the period 2016 to 2020, we can state that the digital leaders are the Nordic countries - Finland, Denmark, and Sweden, while Finland was the leader in the years 2016-2019 and in 2020 it was replaced in this position by Denmark. Romania was always in the last place in the digital ranking and Greece, Bulgaria, and Poland were in front of it during the entire analysed period. Here we can also see a similarity with the conclusions of Stavytskyy, Kharlamova, and Stoica (2019), while their analysis confirmed that a more prosperous society leads to more advanced digital services. Even though the mentioned research was carried out until 2018, certain features in the conclusions adopted at that time can be seen in the development in the following years.

The study of Kovács et al. (2022) also points out to similar results as ours, for the period 2016-2021. The difference is that Kovács et al (2022) only analysed the data on the digital readiness of EU citizens from DESI, and in our case the entire DESI index was analysed.

The results of the study made by Androniceanu, Georgescu, and Kinnunen (2019) also confirm our results, that Nordic countries obtain the highest values of DESI and the lowest were in Bulgaria and Romania. The mentioned authors analysed the EU countries for 2018, which is only one year, while in this study we considered a period of up to 5 years. Another common feature with the authors is the fact, that the entire DESI index was analysed, not just a part of it. But it remains an interesting fact, that

Nordic countries were in the second cluster and Romania and Bulgaria in the third cluster by k-means algorithm during the cluster analysis by Androniceanu, Georgescu, and Kinnunen (2019).

We evaluated the innovation performance of selected European countries using two indices - GII and SII. We can unequivocally consider Sweden as an innovation leader, which was ranked 1st in both rankings, except for 2017, when the Netherlands was in the first position. Nordic countries such as Denmark, Finland, and the Netherlands belongs again to this group. The weakest analysed European Union country is Romania, which in the evaluation of innovation performance was in the last position during the analysed 5 years within both indexes. Based on the achieved results of the GII index, countries such as Greece and Croatia were placed at the bottom of the ranking ahead of Romania, and for the SII index, the unfavourable position belongs to countries such as Bulgaria, Latvia, and Poland.

The digital performance of Slovakia gradually decreases during the analysed period, until it was ranked 20th in 2016 and 2017, during the next 2 years it moved 1 place lower, and in 2020 it is the 22nd position in the DESI index. When looking at the results of innovation performance, Slovakia's position is almost at the same level as when evaluating digital performance within the EU-27 countries. A slightly better rating was achieved by Slovakia for the GII index, where its performance hovers around the 21st place, the rating through the SII index assigned the 22nd position, which worsen by 1 place downwards in 2020.

In partial objective 2, we tried to identify the existence of mutual relations and connections between the total score and the dimensions of selected global indices of the EU-27 countries for the period 2016-2020.

We established 2 hypotheses, which we verified using appropriate statistical tools. To verify H1, we applied the non-parametric Kendall Tau coefficient, which we chose based on the results of normality testing for the input secondary data. Normality was verified using three statistical tests such as the Kolmogorov-Smirnov test, the Liliefors test, and the Shapiro-Wilk test, and the results confirmed that several analyzed indices do not have a normal distribution.

The results of the performed correlation analysis are presented in Table 6. We can state, that at the level of significance $\alpha = 5\%$, Kendall Tau reached only positive values in the range from 0.1746 to 0.7045, thus confirming the positive relationship between the DESI index and the GII and SII indices and their dimensions. Between the DESI index and the GII index, a moderate positive correlation relationship ($\tau_{DESI\&GII}=0.4465$) and a largely positive relationship of the SII index ($\tau_{DESI\&SII}=0.5748$) was confirmed according to Cohen's scale. We found the highest Kendall Tau value between the DESI index and dimension 3 - Digitalization of the SII index ($\tau_{DESI\&SII_D3}=0.7045$), and on the other hand, the lowest value was between the DESI index and dimension 11 - Sales impacts of the SII index ($\tau_{DESI\&SII_D11}=0.1746$).

Table 6. Results of correlation analysis between DESI and GII and SII indices

Kendall Tau Correlations DESI GII SII 2016-2020; MD pairwise deleted Marked correlations are significant at $p < .05$							
Pair of Variables (N=135)	Kendall Tau	Z	p-value	Pair of Variables	Kendall Tau	Z	p-value
DESI & GII	0.4465	7.6821	< 0.001	DESI & SII	0.5748	9.8894	< 0.001
DESI & GII_D1	0.5239	9.0142	< 0.001	DESI & SII_D1	0.5473	9.4170	< 0.001
DESI & GII_D2	0.3459	5.9514	< 0.001	DESI & SII_D2	0.4959	8.5313	< 0.001
DESI & GII_D3	0.3364	5.7878	< 0.001	DESI & SII_D3	0.7045	12.1206	< 0.001
DESI & GII_D4	0.3488	6.0015	< 0.001	DESI & SII_D4	0.4465	7.6814	< 0.001
DESI & GII_D5	0.4409	7.5860	< 0.001	DESI & SII_D5	0.2783	4.7877	< 0.001
DESI & GII_D6	0.3227	5.5523	< 0.001	DESI & SII_D6	0.5391	9.2750	< 0.001
DESI & GII_D7	0.3237	5.5692	< 0.001	DESI & SII_D7	0.3220	5.5398	< 0.001
				DESI & SII_D8	0.5060	8.7063	< 0.001
				DESI & SII_D9	0.4056	6.9791	< 0.001
				DESI & SII_D10	0.4199	7.2251	< 0.001
				DESI & SII_D11	0.1746	3.0035	0.0027
				DESI & SII_D12	0.2767	4.7611	< 0.001

Source: own processing in STATISTICA version 13

At the end of this section, we can conclude, that when verifying H1, a statistically significant relationship between the digital performance represented by the DESI index and the innovation performance measured by the GII and SII indices of the EU-27 countries for the period 2016-2020 was found by correlation analysis at the level of significance $\alpha = 5\%$, which leads to rejection of the null hypothesis about the non-existence of dependence between the DESI index and the GII and SII indices and their dimensions.

Based on these results, we can assume, that the SII index dimensions will prevail in the analysis revealing statistically significant effects of selected dimensions of the GII and SII indices on the total

DESI score. To verify the influence of the dimensions of the GII and SII indices on the total score of the DESI index of the EU-27 countries, we used panel data regression analysis, which we implemented using OLS, FEM, and REM models.

When creating models through panel regression analysis, we estimated the following proposed models:

$$\text{Model 1 : } DESI_{OLS} = f(GII_D1, \dots GII_D7, SII_D1, \dots SII_D12) \quad (5)$$

$$\text{Model 2 : } DESI_{FEM} = f(GII_D1, \dots GII_D7, SII_D1, \dots SII_D12) \quad (6)$$

$$\text{Model 3 : } DESI_{REM} = f(GII_D1, \dots GII_D7, SII_D1, \dots SII_D12) \quad (7)$$

A total of 19 independent variables were involved in creating the regression models, which represented the dimensions of the selected innovation indices of the EU-27 countries for the period 2016-2020, while 7 dimensions were from the GII index and 12 dimensions were from the SII index. The results of our research shown in Table 7 indicate that the proposed panel regression analysis models achieved very similar results.

Table 7. Results of panel data regression analysis

	Model 1 (OLS)			Model 2 (FEM)			Model 3 (REM)		
	Coefficient	p-value		Coefficient	p-value		Coefficient	p-value	
const	16.3664	0.0656	*	15.5453	0.0871	*	16.1677	0.0672	*
GII_D1	0.1452	0.3112		0.16218	0.2754		0.1493	0.2986	
GII_D2	-0.2149	0.0042	***	-0.2082	0.0064	***	-0.2131	0.0039	***
GII_D3	-0.1248	0.2095		-0.1341	0.1891		-0.1273	0.1997	
GII_D4	0.0677	0.4084		0.0673	0.4323		0.0678	0.4096	
GII_D5	-0.1401	0.1229		-0.1281	0.1676		-0.1371	0.1297	
GII_D6	0.1192	0.0899	*	0.1105	0.1233		0.1170	0.0943	*
GII_D7	-0.1827	0.0112	**	-0.1756	0.0176	**	-0.1808	0.0112	**
SII_D1	13.5885	0.0009	***	12.63	0.0030	***	13.3958	0.0010	***
SII_D2	-17.6059	0.0002	***	-16.8691	0.0006	***	-17.4114	0.0002	***
SII_D3	36.3676	<0.0001	***	37.1086	<0.0001	***	36.5422	<0.0001	***
SII_D4	7.2209	0.0178	**	6.4022	0.0503	*	7.0062	0.0220	**
SII_D5	-12.0624	0.0006	***	-11.8806	0.0010	***	-12.0102	0.0005	***
SII_D6	10.0600	0.0040	***	10.8600	0.0076	***	10.6400	0.0039	***
SII_D7	0.3214	0.9380		0.2345	0.9550		0.3016	0.9417	
SII_D8	2.1881	0.5699		1.6347	0.7171		2.0681	0.6035	
SII_D9	4.4901	0.2100		4.7016	0.2112		4.5550	0.2052	
SII_D10	15.9522	0.0364	**	15.5639	0.0462	**	15.8384	0.0362	**
SII_D11	-0.4809	0.9006		-0.2666	0.9455		-0.4217	0.9127	
SII_D12	5.4332	0.0494	**	4.6908	0.1123		5.2400	0.0595	*

Note: * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source: own processing in GRETL

For the established hypothesis H2, using panel data regression analysis, a statistically significant influence between the total score of the DESI index and selected dimensions of the GII and SII indices for the EU-27 countries for the years 2016 to 2020 was confirmed at the level of statistical significance $p < 0.01; 0.05; 0.1$, which leads to rejecting the null hypothesis of the absence of mutual influence between DESI and the dimensions of the GII and SII indices.

In Table 8, we present the results of the panel regression analysis, where only those dimensions of the analysed innovation indices are listed, for which the regression coefficients were confirmed at the $\alpha = 1\%$ significance level.

Table 8. Final results of panel data regression analysis

Variables	The name of the index dimension	Model 1 (OLS)	Model 2 (FEM)	Model 3 (REM)
GII_D2	Human capital ad research	-0.2149	-0.2082	-0.2131
SII_D1	Human resources	13.5885	12.6300	13.3958
SII_D2	Research systems	-17.6059	-16.8691	-17.4114
SII_D3	Digitalisation	36.3676	37.1086	36.5422
SII_D5	Firm investments	-12.0624	-11.8806	-12.0102
SII_D6	Information technologies	10.0600	10.8600	10.6400

Note: $p < 0.01$

Source: own processing in GRETL

To select the resulting model from the 3 proposed models (Model 1 (OLS), Model 2 (FEM), and Model 3 (REM)), test criteria such as F-test, Breusch-Pagan test, and Hausman test were used. We consider Model 2 to be the most suitable model, which is the result of the Fixed Effects Model (FEM).

$$\text{Model 2 : } DESI_{FEM} = -0.2082GII_D2 + 12.63SII_D1 - 16.8691SII_D2 + 37.1086SII_D3 - 11.8806SII_D5 + 10.86SII_D6 \quad (8)$$

Model 2 ($DESI_{FEM}$) consists of 6 dimensions out of a total of 19 dimensions, that have a statistically significant impact on the overall digital performance score (DESI) of the EU-27 countries for the years 2016 to 2020. This model is made out from one dimension of the GII ($D2$ - *Human capital and Research*) and five dimensions of the SII index ($D1$ - *Human resources*, $D2$ - *Research systems*, $D3$ - *Digitalisation*, $D5$ - *Firm investments*, $D6$ - *Information technologies*). By comparing the independent variables in the regression model, we can conclude, that the DESI indicator was significantly determined by three variables (SII_D1, SII_D3, and SII_D6) with a positive impact, while the highest impact was recorded for the dimension focused on digitalisation (SII_D3), followed by the impact of human resources (SII_D1) and information technologies (SII_D6). On the other hand, in the proposed regression model (Model 2) there are 3 independent variables that negatively affect the digital performance of the EU-27 countries. The variable Research systems (SII_D2), then the variable Firm investments (SII_D5), and the variable GII_D2, which represents Human capital and research, had the most significant negative impact on the digital performance of the EU-27 countries.

In the end, we can conclude, that despite the fact, that we managed to create a regression model affecting the digital performance of the EU-27 countries using selected dimensions of innovation performance measured by the GII and SII indices, it is necessary to continue the research in the future. Further research direction should be focused on individual indicators that are input variables for evaluating the innovation performance of the EU-27 countries, and the analysis of these independent variables can reveal important positive or negative effects on increasing the digital performance of the countries of the European area or the world on a larger scale.

Conclusion

The results of our analyses confirmed that a higher statistically significant positive relationship was confirmed between the digital performance of the EU-27 countries and their innovation performance evaluated using the SII ($\tau_{DESI\&SII}=0.5748$) versus the innovation performance of the EU-27 countries evaluated using the GII ($\tau_{DESI\&GII}=0.4465$). The results of our further analyses confirmed that the following independent variables had a statistically significant (positive or negative) impact on the assessment of the digital performance of the EU-27 countries during the years 2016 to 2020:

- digitalisation (SII_D3), human resources (SII_D1), and information technologies (SII_D6) have a positive impact on the evaluation of the digital performance of the EU-27 countries,
- we recorded a negative impact on the research system (SII_D2), firm investments (SII_D5), and human capital and research (GII_D2).

Of course, this research has some limitations. The initial limits are based on the methodologies of the individual indexes. On their composition and on the other hand, in the changes in the indicators and the methods of calculation. The sample of the countries can be considered as another limiting factor. Even though the countries are part of the EU-27, there are still significant differences between countries' level of the studied indices, innovation, and digital areas. The last limitation of this research also follows from this, namely, that there is a high probability of endogeneity problem when examining the impact (linkage).

The results obtained in this study are very interesting. For future research, it would be good to verify the mentioned relationships over a longer period. Because we can see that similar studies by other authors obtained sometimes similar results, even if they were performed during a different period.

Alternatively, it would also be possible to set up a similar study that would analyse countries all over the world using similar methods. But here comes the problem, not all the indices listed here also evaluate countries outside the EU. In this regard, it would be advisable to find a replacement for such indices and repeat the study with changed inputs and an expanded sample of countries.

It would be interesting if we could use and compare another model containing similar parameters as a subject for further investigation. However, while processing this article, we did not come across a similar model for EU countries.

In any case, innovation, digitization, and the subsequent growth of the country's competitiveness are broad issues subject to constant developmental changes. Increased interest in these

areas brings with it new knowledge, features, and relationships. And therefore, we cannot consider this study as our last in the given area.

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HOW BEING AT HOME CHANGED US: AN EMPIRICAL STUDY ON CONSUMER BEHAVIOR CHANGES DURING THE COVID-19 PANDEMIC

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ABSTRACT.

Background: Worldwide COVID-19 pandemic created unprecedented challenges for societies significantly altering the lives of all people. The consequences resulted in changes in habits including those related to shopping. Information on how consumers reacted to the pandemic and restrictions imposed by governments is limited and lacks detailed implications based on the opinions of consumers. **Aims:** This research aims to fill this gap by exploring major changes in consumer behavior that occurred during the pandemic. **Methods:** A nation-wide survey was conducted in Slovakia in 2022 to collect data. The sample file consisted of 347 consumers. **Findings:** The findings include information on how the consumers perceived the pandemic. The frequency of visiting shops drastically decreased, however, the majority of consumers stayed loyal to familiar brands of products. Older consumers were more likely to decrease the amount of products bought during a pandemic. Slovak consumers increased the use of delivery services, however less drastically than was expected based on a major increase in home office type of work. **Implications:** Organizations providing products can expect further changes in consumer behavior, which they can stimulate since the influence of media increased during the pandemic.

Keywords: COVID-19 pandemic, consumer behavior, home office, delivery, consumption

JEL Classification: D12, D14, E21

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Introduction

Consumption has become a major phenomenon since the conclusion of the Second World War. Since then, consumer behavior has developed its trends and major factors influencing it. Moreover, consumers have experienced some significant disruptions related to major incidents affecting them as individuals and also societies as a whole. The COVID-19 pandemic, whose influence European countries began to feel in 2020, has affected global and national economies and individual consumers. National and regional governments addressed the effects of the pandemic by introducing various measures to stop the spread of the virus, such as lockdowns and later to support those who were negatively affected by both the pandemic and those measures. The major changes brought about by the pandemic have resulted in an economic crisis. Both of these factors have significantly influenced consumer shopping behavior and altered their general patterns due to new factors of influence that had not been previously experienced by the majority of people.

This research study examines how the COVID-19 pandemic has affected consumers' behavior related to lockdowns. Many people were forced to stay at home to study, work or care for their loved ones. This novelty was a significant lifestyle change for many of them, resulting in altering their habits, even those related to shopping. Since there is not yet much information on how these changes related to societies as a whole, the main aim of this study is to find out how the COVID-19 pandemic changed consumer behavior based on various socio-economic characteristics of consumers.

Theoretical background

Consumer behavior, as an essential marketing variable, is characterized as people's behavior related to the acquisition, use and disposal of consumer products (Solomon et al., 2016). Consumer behavior is mainly individual and hidden. It is influenced by a number of factors, which are generally not directly measurable, thus influencing behavior only in the consumer's mind. We can examine consumer behavior e.g. through the stimulus-organism-response model (S-O-R framework), which is based on the general psychological model of behavior Stimulus - Reaction. The essence of this model is the influence of external stimuli on the consumer, who processes the stimuli based on his own internal characteristics, and the result is a reaction in the form of a specific purchase (Han et al, 2022).

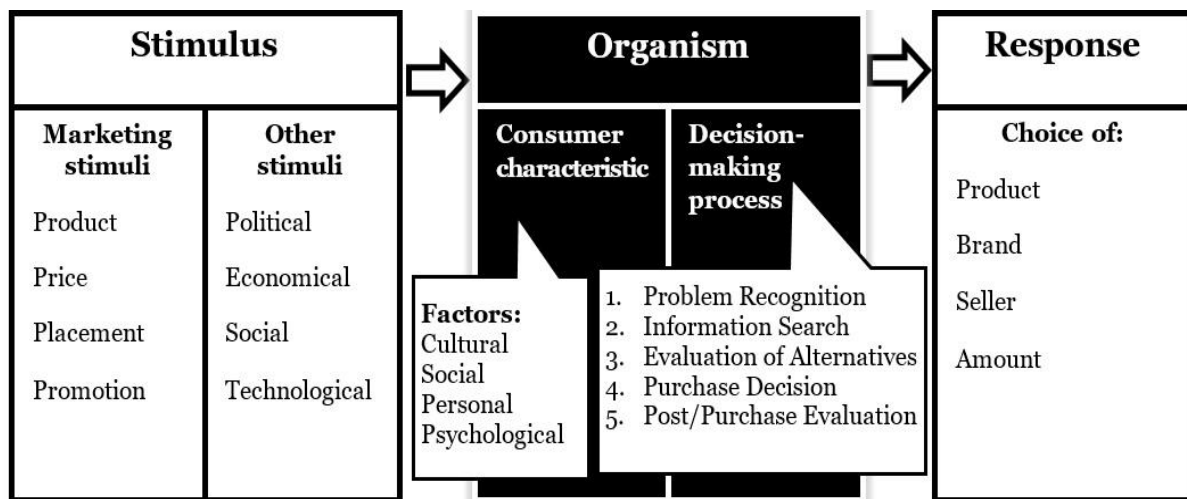


Figure 1 Stimulus-organism-response model of consumer behavior

Source: *own data*

Individuals' consumption behavior is influenced by marketing stimuli (Djafarova & Bowes, 2021). Among the basic marketing stimuli, we can include the offer of individual products on the market, the price at which the products are sold, distribution, i.e. in which ways and in which places the products are available, and the marketing communication of individual companies, i.e. the way in which companies inform consumers about their offer.

Among the other stimuli, we can include the factors of the external environment, while the basic ones are political, economic, social and technological factors (Blythe & Megicks, 2010). The life of the inhabitants of individual countries is strongly influenced by developments in the political and legal environment. Government creates the climate in which a country finds itself and in which businesses and individuals make their decisions. Changes in the government are important, or government stability and the electoral cycle. These factors affect the amount of taxes, the amount of the minimum wage, the social policy of the state, employment opportunities, etc.

The economic environment is made up of factors that affect the purchasing power of the population. These are the main factors that affect the overall economic situation of the country and thus also the economic situation of individual consumers. The social environment affects the purchasing power of consumers through people's tastes and preferences. Social environment factors influence consumer behavior and can generally be divided into cultural, social and demographic. One of the most significant forces of the external environment is the technological environment, the changes of which are the source of technological progress, which makes it possible to achieve a higher standard of living for the country's inhabitants.

In the case of a pandemic caused by the new coronavirus, we can consider the disease COVID-19 itself as an external factor. The disease COVID-19 is a respiratory disease caused by the virus SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2) originally discovered in December 2019 (Zhu et al, 2020). The first case of infection caused by the new coronavirus was discovered in the city of Wuhan, Hubei Province, China (Liet al, 2020). The virus is primarily spread from person to person through droplets from infected people coughing, sneezing or during a conversation (Chukwuma et al, 2022).

In connection with the effort to slow down the spread of the disease, various restrictive measures have been introduced worldwide. Slovakia adopted the first measures in this regard already on January 27, 2020. At that time, the disease was not yet found in Slovakia, but in Europe, France already began to report the first cases of infection (Ministry of Health SR, 2020a). On March 6, the first case of COVID-19 was confirmed in the Slovak Republic in a 52-year-old man from the Bratislava Region. It was a secondary transmission of the disease, as he lived in the same household with a person who had stayed in an area with the occurrence of the new coronavirus a few weeks before (Ministry of Health SR, 2020b).

Each consumer reacts to the situation differently based on their own personality traits and predispositions (Pandita et al, 2021). Among the basic characteristics of consumers, we include cultural, social, personal and psychological factors of consumer behavior (Kotler & Keller, 2014).

Culture is a fundamental factor influencing the wishes and behavior of a certain person. It is a set of values, perceptions, preferences and behavior that a person acquires through family and institutions throughout his life. People learn the culture, it is not innate. They also learn consumer culture, consumers gradually adopt cultural expressions of consumer behavior. Each culture consists of smaller subcultures that provide a more specific identification and socialization of its members. Cultural factors also include social or social classes or layers. These are relatively homogeneous and hierarchically dividing groups in society when members of classes share similar values, interests and ways of behaving. Social class influences product and brand preference, social classes show different preferences in product selection in many areas including clothing, furniture, entertainment, automobiles, electronics, etc.

Another group of determinants of consumer behavior consists of social factors, i.e. how other people influence people and their behavior. Every person needs other people for their successful development. It is characterized by a tendency to associate, to live in a social environment that is made up of people and their mutual relationships, their joint activities, or the products of these activities and relationships.

Consumer behavior is often influenced by an individual's personal characteristics. By personality, we understand a set of different psychological traits that lead to relatively consistent and permanent reactions to environmental stimuli. Basic personal factors include the buyer's age, employment and economic circumstances, lifestyle and values.

Marketing stimuli and environmental stimuli enter the consciousness of consumers. A set of psychological processes is associated with the characteristic features of a person and leads to decision-making processes and purchasing decisions (Tuncer, 2021). Consumer responses to various marketing stimuli are substantially influenced by four key psychological processes: motivation, perception, learning, and memory.

In connection with the COVID-19 disease, unprecedented changes have occurred in society. People stayed at home overnight. Some groups of the population were more at risk, therefore they required special measures. In connection with that, for example, established special opening hours in establishments intended for seniors over 65, who are considered the most vulnerable group.

In connection with the closure of establishments and the ordered lockdown, there have been dramatic changes in the labor market. Working from home was the most common measure chosen by employers in Slovakia at the beginning of 2020 (Profesia.sk, 2020a). In addition to the possibility to work from home, as part of other measures, companies have stopped business trips or modified the rules for the performance of work at the workplace. Reducing or canceling working hours were the last options. Some companies also adopted other, specific measures, such as testing employees for COVID-19 as a benefit, transferring employees to other projects, and increasing the level of management communication and employee awareness. Despite the fact that for many employers the corona crisis brought a reduction in sales, companies tried to do everything so that they did not have to reduce salaries, rewards or benefits. However, several were ready to proceed with reducing salaries or rewards at the management level, or for people who earn above a certain level. A frequent measure that also concerned ordinary employees was the recommendation or order to take a vacation (Profesia.sk, 2020b). Thus, employment and economic conditions were one of the main factors that ultimately influenced consumer behavior in Slovakia.

In addition to operations, schools were also closed at the beginning of 2020. They began to open only gradually, and strict anti-pandemic measures meant that entire classes were often closed again and children had to learn from home. Parents of school-age children under the age of 11 had to stay at home with them, which they could solve by the home office or by receiving the pandemic OCR. In these cases, it became necessary to furnish the household with the necessary information technologies, as work and teaching moved to the online space, which necessitated adapting the equipment of the household with several computers, headphones with microphones, cameras and a sufficient Internet connection. Such a purchase can be very burdensome for the household budget, therefore the income and financial situation of consumers was an important factor influencing consumer behavior in general, not only when purchasing IT.

How consumer reactions have changed within their behavior still remains unclear. Few research studies tried to provide some clarity on specific issues. Naeem (2021) proved that customers have become more aware and take their time to make the best possible decision. On the other hand Higashi *et al.* (2022) argued that the pandemic lead to more isolationist behavior, which often resulted in selfishness. Navickas *et al.* (2021) and Jin and Ryu (2022) focused on the positive impacts of the pandemic believing that it has brought out the best in out in people resulting in an increase in community involvement, helping others and even altruism. The subject of this research paper aims to add more light on changes in consumer behavior in the Slovak republic.

Methodology

The main aim of the research was to characterize how the COVID-19 pandemic changed consumer behavior based on various socio-economic characteristics of consumers. The methodological approach selected for this study was empirical research. A survey was conducted in January – September 2022 in order to analyze changes in consumer behavior related to the pandemic of COVID-19 disease. The questionnaire was created and distributed among consumers for this purpose which consisted of 14 closed and semi-closed questions that collected data on consumer behavior changes and 5 closed questions aimed to provide consumers' socio-economic characteristics such as age, gender, level of education household structure, and level of income. Empirical research was selected as the main research method to collect primary data since the data needed to sufficiently describe the changes in consumer behavior needed to include opinions of consumers on specific matters that are not yet available in any public databases of statistical bureaus. Therefore, a national survey was conducted on a sample of people in the Slovak republic. This allowed a comparison of findings as applied by other researchers in similar surveys (Golob *et al.*, 2018; Kucharska & Kowalczyk, 2018; Osvaldová & Vrabcová, 2021). During the survey, the data was collected electronically using a questionnaire in the Slovak language. The potential respondents were approached through selected partner consumer organizations, university students and senior university organizations in order to achieve the largest data collection. The survio.com online platform was used to collect raw data in electronic form. All collected questionnaires were checked by members of the research team. Incomplete or inconsistent ones were discarded and not used further. In total 14 questionnaires were discarded and were not incorporated into the second sample file. Table 1 presents the final structure of the sample file and information on how it related to a base file which consisted of all Slovak citizens older than 18 years.

Table 1. Base file and sample file

Age	Base file		Sample file	
	Female	Male	Female	Male
18 – 25	231,761.00	243,391.00	17	19
26 – 45	828,505.00	871,910.50	66	68
46 – 65	736,705.00	705,587.00	59	54
over 66	499,118.50	321,201.50	38	26
Total	2,296,089.50	2,142,090.00	180	167
18 – 25	5.22%	5.48%	4.90%	5.48%
26 – 45	18.67%	19.65%	19.02%	19.60%
46 – 65	16.60%	15.90%	17.00%	15.56%
over 66	11.25%	7.24%	10.95%	7.49%
Total	51.73%	48.27%	51.87%	48.13%

Source: *own data*

The representativeness of the sample file was verified and confirmed using Pearson's chi-squared test (χ^2 - test). The age of consumers was used as the criterion. The null hypothesis was set with the assumption that the sample is representative. The alternative hypothesis is an assumption of non-representativeness of the sample. From the mathematic point of view, the hypotheses are formulated as: $H_0 = F(x) = G(x)$; $H_1 = F(x) \neq G(x)$. Statistic testing in SPSS software is based on the following formula (1):

$$X^2 = \sum_{j=1}^r \frac{(n_j - m_j)^2}{m_j} \approx X^2_{(r-1)} \quad (1)$$

where: X^2 - is Pearson statistics; r - is a line; n - is the overall frequency in the base file and m - is the measured frequency.

Consequently, we find the critical value of X^2 distribution for $(r-1)$ degrees of freedom and selected level of significance α from tables of critical values of chi-square. The test in this research was performed at a significance level of 95 %. If the critical value is lower than the value of tested statistics, the null hypothesis is rejected and an alternative hypothesis H_1 is accepted. The calculated Chi-square value for this sample was at level 0.844. This result can be interpreted as the confirmation of the null hypothesis. Therefore, it can be concluded that the research sample file is a representative sample of the base file (Veselovská et al, 2022). The Pearson Chi-square was also used to analyze the correlation between ordinal and nominal variables and complemented by Cramer's V to identify the intensity of correlation. We also used Spearman's Rho to analyze the correlation between ordinal variables especially the correlation between various factors. Spearman's Rho is a non-parametric test based on the Pearson correlation coefficient and is used to measure the strength of correlation. It acquires the values between -1 (perfect negative correlation) and 1 (perfect positive correlation). Statistic testing in SPSS software is based on the following formula (2):

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2-1)} \quad (2)$$

where: n - is the number of data points of the two variables; d_i - is a difference in ranks of the "ith" element. Before we analyzed the intensity of correlation we needed to find out if the correlation between variables exists. We set the null hypothesis H_0 (variables are independent) and alternative hypothesis H_1 (variables are not independent). The evaluation was carried out on the basis of the p-value. If the p-value is lower than the alpha value (in our testing 99.95% significance or confidence) null hypothesis is rejected and an alternative hypothesis H_1 is accepted (Hudáková, 2013). Microsoft Excel and the SPSS software were used to analyze data and to test potential relationships between variables.

Results

It is already a well-known fact that the COVID-19 pandemic significantly altered living conditions in modern societies, not just because of the disease itself, but also by introducing new phenomena that people had no prior experience with. This research aims to help bring an understanding of these conditions, therefore a survey was conducted to collect data on consumers' opinions. It was discovered that consumers drastically changed their shopping habits during the pandemic. Figure 2 provides the data on how the frequency of visiting shops changed. Only 5.3 % of Slovak consumers

reported that they visited shops more often during the pandemic than before the outbreak. Interestingly, the majority of them were men in age group 26 – 45 years old.

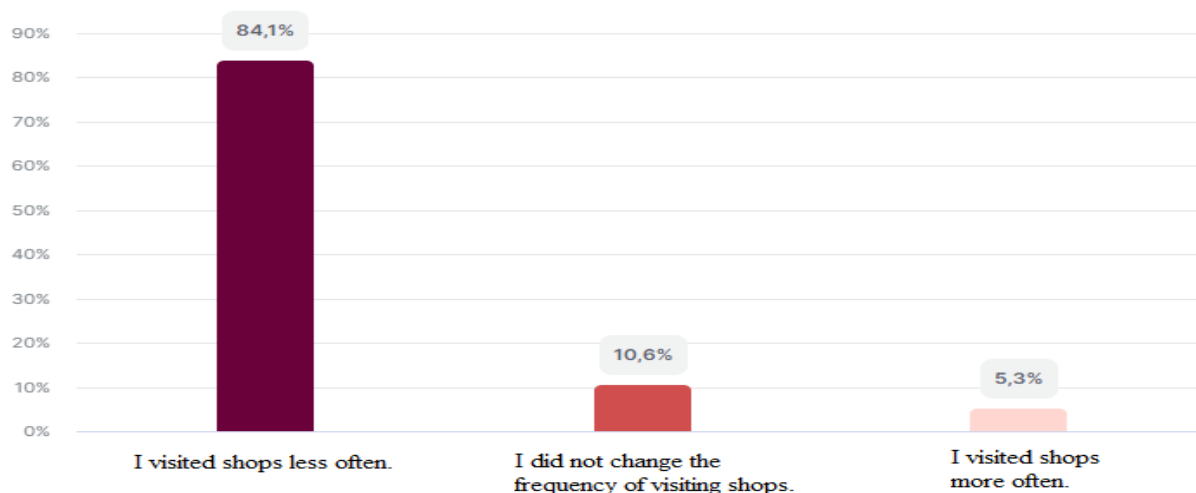


Figure 2. Frequency of visiting shops during the COVID-19 pandemic

Source: *own data*

Since gender seemed to play a significant role in pandemic perception, we decided to further look into how this consumer characteristic affected the behavior changes. Table 2 shows the changes in goods the consumers bought during the pandemic in comparison to the number of products they had bought before the outbreak. Again, we can observe differences between female and male consumers. According to the data, for more than half of female consumers, the amount of products bought during the pandemic decreased. This share was slightly less significant for male consumers. Moreover, men were less likely to change their habits. The research also explored which products were affected by these changes to most. Up to 37.9% of consumers reported that they changed the amount of daily consumption goods they bought during the pandemic. The purchase of entertainment and travel products was also significantly affected, as almost 30% of consumers changed the purchased amount of these products. Significant changes also occurred in the purchase of electronics, as 12.1% of consumers stated that their changes in purchasing behavior were related to these products. In this case, however, it is a positive change, since mostly their purchases increased. Spearman's Rho was used to verify the possible connection between the age of consumers and changes in the amount of products bought during the pandemic in comparison to pre-pandemic times. It was discovered that there is a medium-strong indirect dependence between these factors. Therefore, it can be concluded that older consumers were more likely to decrease the amount of products bought during a pandemic than younger consumers were.

Table 2. Changes in amount of products bought during the pandemic

Gender	More	Less	No change
Female	14.53%	52.99%	32.48%
Male	16.98%	45.28%	37.74%

Source: *own data*

During the time of the COVID-19 pandemic 26.8% of Slovak consumers reported that the income of their household decreased from its pre-pandemic level in 2019. Only 19.6% of consumers experienced an increase in their incomes. The majority of Slovak people (53.6%) stated no change in the income of their household during the pandemic. The situation was slightly worse for women since 27.78% of female consumers experienced a decrease in income and only 17.78% of female consumer's incomes increased whereas 21.56% of male consumers reported an increase and 25.75% a decrease. Table 3 shows how the income changes were experienced by different segments of consumers based on their age. According to the data, the biggest perceptual increase was in the youngest age segment. The highest portion of consumers who experienced no change in their incomes was discovered in the oldest age segment. The biggest portion of consumers who experienced a decrease in the income of their household was noted in the age segment 26 – 45-year-old consumers since nearly a third of them reported this negative outcome of the pandemic on their financial situation.

Table 3. Income changes of consumers during the COVID-19 pandemic

Age segment	Increase		Decrease		No change	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
18 – 25	15	41.67%	5	13.89%	16	44.44%
26 – 45	27	20.15%	44	32.84%	63	47.01%
46 – 65	16	14.16%	33	29.20%	64	56.64%
over 66	10	15.63%	11	17.19%	43	67.19%

Source: *own data*

Since income has always been a major factor influencing consumer behavior, it is necessary to explore its changes in context with the household income of consumers (Table 4). The lowest degree of change can be observed in households with the highest incomes since 32.61 % of them did not change the products they bought during the pandemic for any substitutes. Moreover, this segment of consumers also did not factor in the price of products as the reason for changes. Households with incomes between 401 and 1000 euros were the segment that was mostly affected by the availability of products. People with their household income of less than 400 euro only exchanged the products for substitutes because of price or availability. No other reason for changes was observed in this consumer segment. Nearly one-third of consumers replaced the products they used to regularly buy for substitutes due to problems with availability. This result was observed in all consumer segments regardless of their household income. It can be therefore concluded that this was a nation-wide issue. On the other hand, there were clearly no problems with decreased quality of products since almost no consumers chose replacements because of this reason. The Spearman's Rho was used to evaluate the possible relationship between household income and changes in amount of products bought during the pandemic. It was discovered that the dependency was not significantly strong, therefore, we can conclude that the income changes were not the main cause for consumers' decisions to neither less nor more products. Other factors, such as the pandemic itself could have been the cause of the change.

Table 4. The reasons for exchanging purchased items for other replacement products during the pandemic

Household income	price	quality	availability	other reason	no change
less than 400 euro	42.86%	0.00%	28.57%	0.00%	28.57%
401 – 1000 euro	34.62%	3.85%	32.69%	5.77%	23.08%
1001 – 1600 euro	30.77%	4.62%	30.77%	3.08%	30.77%
more than 1600 euro	21.74%	4.35%	30.43%	10.87%	32.61%

Source: *own data*

The COVID-19 pandemic and restrictions imposed by the government to stop the spread of the virus forced many people to stay at their homes much more than they had used to before. Being at home for study, work and free time meant that consumers had less direct contact with other people. Therefore, the influence of colleagues and friends on shopping decisions significantly decreased (by 42.3 %). On the other hand, the influence of family drastically increased (by 38.47 %) and even the influence of media slightly increased (by 12.81 %). Mandatory quarantines have become new phenomena that also impacted how consumers behaved during the pandemic. It was reported in the survey that up to 50.59 % of people had to ask others outside of their household to do the shopping for them. Furthermore, the delivery of goods has become more common. Up to 14.12 % of Slovak consumers have started regularly using food delivery.

Conclusion

In connection with the rapid spread of the coronavirus in the world, with effect from March 16, in Slovakia, retail sales and the sale of services in establishments were prohibited for 14 days, with some exceptions (food stores, medical devices, drug stores, propellants and fuels, newsstands, stores of feed and supplies for animals, including veterinary clinics, operations of telecommunications operators, postal, banking and insurance services, and operations of online stores and delivery services). Public catering establishments and fast food stalls remained open, but it was forbidden to eat on their premises,

it was possible only outside their establishments (Ministry of Health SR, 2020c). Therefore, consumers did not have the opportunity to make their usual purchases in brick-and-mortar stores, and a large part of purchases moved to the online space. In connection with this, the method of payment via payment cards has increased (ZBK, 2020). The findings of this research reached the same conclusions, however, the increase in both uses of delivery services and credit card payment were not as significant as expected. Only 14.12 % of Slovak consumers have started regularly using food delivery.

At the end of March, several businesses that had been closed until then (optical opticians, gardening, haberdashery, hardware stores and others) were opened, but the hygienic conditions in the shops were tightened. It became mandatory to wear protective masks in store operations, and disinfection or protective gloves became mandatory, which the businesses themselves were obliged to provide. It was mandatory to ensure two-meter distances between people waiting in lines. The number of people in the operation was also limited: one person had to have 25 square meters. The time in shops was also defined preferentially for people over 65 years old as a result of the fact that they represent the most endangered group (Ministry of Health SR, 2020d). These measures caused people to leave their homes less to avoid contact with other people and shopping was not a priority. Our research proves the severity of the impacts these measures had on consumers. The frequency of visiting shops decreased drastically (84.1 %).

All these circumstances influenced the consumer behavior of the Slovak population. In addition, there have been some changes in the offer of the marketing mix by companies. This had the most significant impact on distribution, as brick-and-mortar stores were closed and many purchases moved to the online space. Despite this, it took some time for consumers to adapt to the new way of shopping, and thus there was a significant drop in purchases, especially in the first weeks after the outbreak of the disease in the Slovak Republic. Many researchers worldwide reported on panic shopping during the initial stages of the pandemic when people feared the possibility of shortages (Sim et al, 2020; Omar et al, 2021; Veselovská, Závadský, & Bartková, 2021). However, the survey of Slovak consumers proved that only a small number of people actually increased the amount of items they bought. The general trend was leaning towards a decrease.

In addition, the composition of the offered assortment also changed, when the demand for goods used to protect human health, such as facemasks, disinfections, etc., increased sharply. Demand for hygiene products and long shelf life products also increased due to the effort to supply the household due to store closures. Up to two-thirds of consumers reported on exchanging the products they bought regularly for substitutes.

Based on these findings, it can be concluded that the COVID-19 pandemic significantly altered consumer behavior in the Slovak republic. The positive outcome of these changes is the newly discovered adaptability of Slovak businesses that could have been observed by consumers who experienced almost no issues with the availability of products on the market. In the future, the managers of businesses should pay close attention to this issue, however, as the findings indicate they are not likely to be surprised by such a large-scale disruption. The recommendation that results from these findings is related to the need to carefully monitor trends in the market. It is likely that consumers will continue to be influenced by a feeling of safety in store, therefore managers should always incorporate these factors into their strategic planning and even marketing strategies. The limitation of this study is its narrow focus on Slovak consumers. Therefore, the findings and their implications cannot be generalized to the global level. However, the provided comparison of them with international studies partially overcomes this limitation. The natural extension of this study would be the prediction of how consumers will continue to be affected by the pandemic and to conduct a more detailed international comparison. The findings of this study contribute to a larger pool of knowledge that has been focusing on mapping the reactions of consumers with the aim to predict their future reaction to such major events as the COVID-19 pandemic.

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