

Perception of Innovative Technologies and Smart Systems as a Way of Sustainable Urban Tourism

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Abstract *The paper deals with the smart technologies as an inseparable part of modern tourism. Its main aim is to approach the issue of smart cities in connection with the development of tourism. Through the questionnaire research; it examines the connections between satisfaction with information about smart city possibilities and the perception of the level of smart tourism development. On the other hand, it determines the connections in the perception of the development of smart tourism in selected cities in the Slovak Republic. Using Pearson chi-square data test and Cramer's-V coefficient, in 2 out of 4 cities it was confirmed that perception of the development of smart tourism" could be perceived in a diversified manner due to gender of tourism participants. Spearman's rank correlation coefficient of the data dominantly confirmed that there is a connection between satisfaction with information about smart city elements and the perception of the level of smart tourism development. Based on these findings, individual cities can adapt tourism products in the future, while also respecting other specificities.*

Keywords: *Intelligent Technologies, Smart Cities, Smart Tools, Smart Tourism, Tourism Development*

INTRODUCTION

The digital revolution is radically changing the world we live in. Industry 4.0 is signalling the end of well-established patterns and is asking scholars, managers and citizens willing to survive in this ever-changing and increasingly complex environment to observe it through different lenses and new paradigms (Pencarelli, 2020). The pace of technological change affecting the world today is unprecedented, with advances in computing power over the past five decades made significant progress and have more exponential in nature (Li et al., 2019). The term "smart" or "intelligent" is increasingly being applied to aspects of our daily lives. It is linked mainly to technology that makes routine tasks easier for us (Vila et al., 2020). The term "smart" has become widespread and has been used for cars, homes, power grids,

cities and even for common use devices such as smartphones or smart watches, however its concept is wide-ranging. What is intelligent includes intelligence-generating technologies, such as sensors, data processing, information sharing, artificial intelligence, and action (Rafael, 2020). Authors Lee et al. (2020) describe the concept of 'smart' as the one, that refers to technological, economic and social developments enriched by information and communication technologies revolutions, that rely on data, new ways of connectivity and exchange of information.

Because of the COVID-19, the digital transformation of global world and hospitality and tourism speeds even up much faster (Cheng et al., 2023). The tourism sector, also, is very much involved in digital transformations, increasingly qualifying them with expressions such as Tourism 4.0 or Smart Tourism (Pencarelli, 2020). The way of consuming

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information and the way we communicate is evolving thanks to advances in technology, the digital transformation breaks new ground in the tourism sector when communicating its services, offers and messages to customers. One of the challenges facing tourism professionals is understanding technological trends to innovate and reinvent their services towards clients (Pumaleque et al., 2021). Emergent application of smart technologies and their development also, in the case of tourism has a consequence of the evolution of the sector, and a result of the current needs and consumption habits of tourists (Vila et al., 2020). Smart/intelligent tourism is based on the use of novel technologies that improve the quality of visitors and local experiences, while enabling destinations to take steps towards achieving their sustainability goals (Križaj et al., 2021). Due to the rapid progress in the tourism market, many studies have been carried out within the issue, which are based on the concept of smart tourism. Systematic and quantitative review of published papers on smart tourism was implemented by the authors Mehraliyev et al. (2019). They analysed 96 papers about smart tourism from the databases WOS, Scopus and EBSCOhost, where they found out, that destination related articles are dominant in smart tourism research, where the geographical limitation is high concentration of smart tourism studies in Korea.

Smart Cities and Their Tools for Tourism Development

Over the last decade, the concept of 'Smart Cities' has gained enormous popularity that has resulted in the emergence of the topic of 'Smart Tourism Destinations (Buhalis, Amaranggana, 2014 in Tyan et al., 2020). The term 'smart cities' has been used to identify urban contexts that have adopted innovative technology to optimize the use of resources and to favour efficient governance processes that aim for sustainability and high quality of life for the citizenry. In other words, a Smart City is a city that brings together technology, government, and society, including six components: smart economy, smart mobility, smart environment, smart people, smart living and smart governance (Pencarelli, 2020). The reality of the current market points to the fact, as claimed by the author collective Lee et al., that cities and tourism entities invest massive resources into smart system initiatives as information technologies are a key factor for a city's destination competitiveness (Lee et al., 2020). The ultimate goal is to use the system to enhance the tourism experience and increase the effectiveness of resource management to maximize both destination competitiveness and consumer satisfaction while demonstrating sustainability over time (Križaj et al., 2021).

Several dozens of tools have been created for the management of smart/intelligent tourism destinations, which

contribute to their development and efficient operation. The research of the tools of intelligent tourism destinations has so far been carried out from several points of view by many authors. For example, the author's collective Boes, Buhalis, and Inversini (2016) was exploring the core components of smartness to present a framework for the development of the smart tourism destination. Gajdošík and Marciš (2019) reviewed artificial intelligence tools used in tourism and to identify its role in smart tourism development. In order to examine the use of artificial intelligence in tourism, best practice examples as multiple case studies were chosen in their case. Rafael (2020a) presents the results of his research conclusions about the trends and dynamics of the investigation of smart tourism and smart destinations, trying to analyse the influence of technology and sustainability for the sector. Tyan et al. (2020) aimed to shed light on the potential of blockchain technology in Smart Tourism Destinations. Discusses the potential role of blockchain technology in achieving goals pursued by Smart Tourism Destinations as well as the possible challenges of blockchain implementation in Smart Tourism Destinations. While there are many tools which could be implemented for such endeavours, the evaluation of the tourist preferences in relation to their use and importance needs to be done so as to ensure at least the sustainability of investments and of the local development strategies (Castillo Vizuetete et al., 2021).

Smart Tourism Innovations and Their Sustainability

Tourism is an unstoppable growth activity with an impact on global and local economies and the role of destinations is becoming increasingly important, once this growth is an opportunity to increase the sustainable development of the regions and counterbalance other less dynamic economic activities (Rafael, 2020). The term Smart Tourism has recently gained prominence, especially as a strategic tool for sustainable tourism development (Križaj et al., 2021).

Smart Tourism followed in the footsteps of the earlier concept of sustainable tourism and quickly established itself as the reference adjective when discussing tourism in politics, economics, and academia (Križaj et al., 2021). Moreover, cities around the world are increasingly recognizing the smart tourism city concept and related strategies as means of optimizing sustainable environments. Particularly for cities facing emerging issues of residents' negative perceptions towards tourism, a smart tourism city empowers a city to rise to this challenge by creating urban spaces that residents and visitors can enjoy together (Lee et al., 2020). Smart Tourism Destinations widely use information and communication technologies (ICTs) and promise to gain a market advantage and positively contribute to sustainable tourism development by implementing sustainability initiatives (Tyan et al., 2020).

A sustainable transformation of tourism with digital elements can help tourism participants to overcome physical travel in times of adversity such as the COVID-19 pandemic, and help governments support international organizations for positive future change (Bijlani, 2021). It is becoming increasingly apparent that the future of smart cities and smart tourism destinations will be intimately linked to their resilience to future challenges (Zhu et al., 2019). Sustainability through smart technologies is also confirmed by Castillo Vizueté et al. (2021) who confirm that the use of the state-of-art information and communication technology enhances the effectiveness and sustainability of the tourism industry and many countries have chosen to implement smart tourism tools as a strategy to adapt to the continuously changing profile of tourists.

For this “intelligent/smart” generation of tourism destinations, one of the key challenges to be addressed relates to a fundamental change in strategic mindset. Although sustainability will remain a key issue, wise tourism cities will need to look beyond it through a more comprehensive understanding of developing trends (Coca-Stefaniak, 2020). What is important to not forget as authors Boes et al. (2016) found out, that however information-communication technologies, is a critical enabler for smart tourism destinations, it is insufficient on its own to introduce smartness. The ideal combination of factors should be based on technologies, leadership, innovation, and social capital supported by human capital which can only subsequently present real core components of smartness.

The study was based on the thesis that the technological attributes of smart tourism have a positive effect on satisfaction with smart tourism in tourism destinations on the example of selected cities. This resulted in research questions:

- R.Q1: Is there any relationship between satisfaction with information about smart city possibilities and the perception of the level of smart tourism in selected cities?
- R.Q2: Is there any relationship between the gender of the respondents and the perception of the development of smart tourism in selected cities?

AIM OF THE STUDY, METHODS AND METHODOLOGY

The main aim of the study was to examine the connections between satisfaction with information about smart city possibilities and the perception of the level of smart tourism development, as well as to determine the connections in the perception of the development of smart tourism in selected cities in the Slovak Republic.

For the purposes of this study, 4 cities located in the Slovak Republic were selected. In concrete they were Košice, Prešov, Poprad and Bardejov (Fig. 1). All four cities are located in the eastern part of Slovakia, in which there is a high possibility of tourism development. The second largest Slovak city, Košice, is the centre of eastern Slovakia and forms a link between east and west. Prešov is the third largest city, with a high potential for cultural, religious or sports tourism, etc. Košice and Prešov represent the landmarks of eastern Slovakia. The city of Poprad is the starting point for the most important mountain region of Slovakia, the High Tatras, and for three national parks (High Tatras, Low Tatras and Pieniny), which represents a high accumulation of domestic and foreign tourists. Bardejov is a city known for its spas, it is considered one of the most beautiful cities in Slovakia, and its historic centre is included in the UNESCO World Cultural and Natural Heritage List.

Table 1: Distances among Selected Cities

City	Košice	Prešov	Poprad	Bardejov
Košice	*	39,9 km	113 km	76,8 km
Prešov	39,9 km	*	79,4	41,5 km
Poprad	113 km	79,4 km	*	121 km
Bardejov	76,8 km	41,5 km	121 km	*

Source: Own processing.



Source: Own processing using map from www.alamy.com

Fig. 1: Map of Analysed Smart Cities and the Sight of their Smart Tourism Development

Based on the theory of Um and Chung (2019) and inspired by it, the research and its results presented in this paper provide an insight into the selected tourism destinations in Slovakia and determine the perception of development in the context of satisfaction with the attributes of smart tourism technology in them. They state in their study, that based on smart tourism technology attributes and destination services, it is possible to examine how the smart tourism satisfaction and service satisfaction affect the overall satisfaction of smart tourism city (Um & Chung, 2019).

A questionnaire research method was chosen to assess the state of smart tourism in the mentioned selected cities in eastern Slovakia. 283 respondents - visitors to selected cities - were willing to participate in the research, which took place from May 2022 to October 2022. The lowest age limit was set at 18. Questionnaire was distributed in online version in MS Forms platform in random as well as non-random way.

Research hypotheses were created reflecting on the aim of the research:

The first basic hypothesis was aimed at examining the relationship between the gender of the respondents and the perception of the development of smart tourism in selected cities. Subsequently, it was adjusted to a group of hypotheses (H1, H2, H3, H4) aimed at selected cities.

H1: There is a relationship between the gender of the respondents and the perception of the development of smart tourism in the city of Košice.

H2: There is a relationship between the gender of the respondents and the perception of the development of smart tourism in the city of Prešov.

H3: There is a relationship between the gender of the respondents and the perception of the development of smart tourism in the city of Poprad.

H4: There is a relationship between the gender of the respondents and the perception of the development of smart tourism in the city of Bardejov.

The second basic hypothesis was aimed at examining the relationship between satisfaction with information about smart city possibilities and the perception of the level of smart tourism development in cities. Subsequently, it was adjusted to a group of hypotheses (H5, H6, H7 and H8) aimed at selected cities.

H5: There is a relationship between satisfaction with information about smart city options and the level of smart tourism development in the city of Košice.

H6: There is a relationship between satisfaction with information about smart city options and the level of smart tourism development in the city of Prešov.

H7: There is a relationship between satisfaction with information about smart city options and the level of smart tourism development in the city of Poprad.

H8: There is a relationship between satisfaction with information about smart city possibilities and the level of smart tourism development in the city of Bardejov.

As part of the analytical part, the author's questionnaire was used for research, followed by mathematical-statistical methods (descriptive statistics - maximum, minimum, arithmetic mean) - Pearson chi-square test, Spearman's rank coefficient, Cramer's V coefficient for the purpose of verifying hypotheses.

Pearson chi-square test - measures the strength of two-sided linear dependence between two random variables. The coefficient takes on a value from the interval $\langle -1; 1 \rangle$, if the absolute value is closer to 1, the closer the linear dependence is.

$$\chi^2 = \sum \frac{(f_0 - f_E)^2}{f_E}$$

Formula 1 Pearson's chi-square test

Variables measured on a nominal scale were evaluated using the Cramer-V coefficient. The coefficient takes on values from 0 to 1, while the higher the value of the coefficient, the stronger the relationship between the variables.

$$V = \sqrt{\frac{\frac{\chi^2}{n}}{\min\{k-1, r-1\}}}$$

Formula 2 Cramer's-V coefficient

When evaluating the second hypothesis, as part of the correlation analysis, Spearman's rank coefficient was used when measuring data on an ordinal scale. The coefficient takes on values from -1 - perfect indirect dependence, to +1 - perfect direct dependence, while a value of 0 indicates no dependence.

$$r_s = 1 - \frac{6 \sum_{i=1}^n P_{x,i} - P_{y,i}}{n(n^2 - 1)}$$

Formula 3 Spearman's rank correlation coefficient

RESULTS AND DISCUSSION

The research sample consisted of 283 respondents. According to the gender of the respondent, 60.2% of the total number of respondents were women and 39.8% were men. The age of the respondents was determined as a real number. The youngest respondent who participated in the research was 18 years old and the oldest was 67 years old. The average age of all respondents was 34, 4 years old.

As part of the study, the number of respondents who visited selected cities was also monitored. 28.3% of respondents visited Prešov and the same number of 28.3% of respondents also visited the city of Košice. 23.9% of respondents chose Bardejov as the visited city and 19.5% of respondents visited Poprad. Rest, sports, relaxation (43%) were most often mentioned by the respondents as the motive for visiting the selected city. Another large group consisted of respondents who visited the selected city for the purpose of getting to know, culture, participating in events (37%). The third large group were respondents who visited their family,

acquaintances, and friends (15%). The last-mentioned reason was business trip, meeting, and conference (5%).

36% of respondents were very satisfied with the information regarding the possibilities of the smart city, which the respondents could use as tourists. To a significant extent, these were respondents above the age average (34.39 years). Women, 58% of the mentioned group of respondents, with an average age of 34.39 years and older, were more positive than men. At the same time, the respondents of the “older generation” stated that the information was rather sufficient for their needs, 48%. At the same time, however, they stated that the information about the smart city was rather insufficient, 32%. In this case, it could be respondents who had more experience with smart city offers in other (including foreign) cities. The “younger generation”- the group of respondents below the age average, was more critical. 62% of respondents stated that the awareness of smart city options was rather insufficient, at the same time they said that they expected a greater selection of offers, given the nature and importance (not the size) of the cities.

In general, the respondents expressed that the elements of smart tourism that they encountered during their stay in the selected cities and were important to them with a certain degree of importance are as follows:

- The city’s mobile application, where 28.3% of all respondents answered that it was very decisive for them. It was decisive for 36.3% of respondents. 15% of respondents said that the application was less decisive for them and 20.4% of respondents said that it was very indecisive for them.
- Free Wi-Fi network, which was very important for 28.8% of respondents. It was decisive for 36.7% of respondents. The free Wi-Fi network was less decisive for 19.5% of respondents and 15% of respondents said that it was very indecisive for them.
- Bike-sharing and Bolt scooters were very decisive for 33.6% of respondents. 22.1% of respondents indicated

that they are decisive for them. 10.6% of respondents could not express or specify their opinion, saying that they do not use this method. Bike-sharing and Bolt scooters were less decisive for 19.5% of respondents, and the largest number of respondents, 14.2%, indicated that this type of transport is indecisive for them, who stated that they use it. The last group of respondents stated that they occasionally use the given type of transport, but also use and prefer another type of transport (for example, green transport, walking when exploring the city, but also a car because of personal comfort).

- Charging stations for electric cars are used and are very important for 27% of respondents when deciding how to spend their vacation. 17% of respondents consider them decisive. 19% of respondents consider them to be a less decisive element, and 37% of respondents consider them non-decisive. None of the respondents used the option on the Likert scale - I cannot comment.
- Weather stations are considered very decisive by only 29% of respondents. According to 19% of respondents, they are decisive. 16% of respondents consider them less decisive. The largest number of respondents, 36%, consider them indecisive.
- According to 17% of respondents, intelligent parking systems are very decisive. 26% of respondents consider them decisive. 12% of respondents could not determine their opinion. 14% of respondents consider them to be less decisive, and the largest number of respondents, 31%, consider them to be non-decisive.

A more detailed view of the investigated smart elements that can be used by tourists and are important for them when choosing a holiday destination within individual cities is presented in Table 2. The answers of the respondents point to the fact that the selected smart elements of tourism are known and used by visitors in the selected cities.

Table 2: Display of Respondents’ Answers to Individual Tools According to Selected Cities (In %)

Smart Tourism Tool/City	Košice – Respondents In %					Prešov – Respondents In %				
	1	2	3	4	5	1	2	3	4	5
Evaluation criteria	1	2	3	4	5	1	2	3	4	5
Mobile application of the city	8	12.4	0	1.7	6.2	7.1	12	0	4.4	6.2
Free Wi-Fi network	7.9	14	0	2.7	3.5	8.9	8.8	0	7.1	3.5
Bike-sharing, Bolt scooters	9.7	9.7	3.5	3.5	1.8	9.7	7.1	1.8	5.3	4.4
Charging stations for electric cars	8.6	5.5	0	4.4	9.7	3.7	7	0	7.1	10.5
Weather stations	10.4	6.2	0	3.5	8	6.2	5.3	0	5.3	11.5
Intelligent parking systems	5.3	7.4	5.3	0.9	9.7	3.6	7.1	3.7	4.4	9.8
	Poprad – Respondents In %					Bardejov – Respondents In %				
Evaluation criteria	1	2	3	4	5	1	2	3	4	5
Mobile application of the city	8	5.3	0	3.5	2.7	5.2	6.6	0	5.4	5.3

Smart Tourism Tool/City	Košice – Respondents In %					Prešov – Respondents In %				
Free Wi-Fi network	5.5	6.6	0	4.4	2.7	6.5	7.3	0	5.3	5.3
Bike-sharing, Bolt scooters	3.6	1.8	5,3	3.5	5.3	10.6	3.5	0	7.1	2.7
Charging stations for electric cars	8.7	2.4	0	2.7	3.5	6	2.1	0	4.8	13.3
Weather stations	8.8	4	0	3.7	3.5	3.6	3.5	0	3.5	13
Intelligent parking systems	4.4	6.2	3	3.5	2.7	3.7	5.3	0	5.2	8.8

Legend: 1 – 5 is Likert scale, where 1 = very decisive, 5 = absolutely indecisive

Source: Own processing.

The perception of the smart city from the point of view of the respondents, as tourists, was conditioned by the choice of the option that they perceive as the closest. According to 36.3% of respondents, a smart city is a city that provides visitors (and its residents) the highest quality thanks to a greater degree of digitization – mobile applications, intelligent parking systems, intelligent lighting. Smart city is perceived as a city based on intelligent technologies and modern solutions by 26.5% of respondents. 23.9% of respondents think that a smart city is an intelligent city that is energy efficient, saves resources and produces a minimum of emissions. Out of the total number, 13.3% of respondents marked the answer I don't know, I don't register this term, the given characteristics in the question are foreign to me.

The perception of the development of smart tourism was positively assessed by respondents above the indicated average age of respondents (44%), while the development (application of smart elements in the tourism of selected cities) was more positively assessed by women (65%), while respondents from the age group above the indicated average age (34.39 years) were again more positive in case of 39% of respondents.

Of the total number of respondents, there were 64% who perceive the level of smart tourism in general (accumulation of answers for all selected cities) as average. The level of smart tourism was mainly linked to the quality of the elements within the research. A total of 13% of respondents indicated an above-average level of smart tourism and 23% of respondents indicated it was below average (rather insufficient). Within the individual cities, the level of smart tourism was perceived as slightly above average in the cities of Košice (47%) and Bardejov (39%), the average level of smart tourism was indicated by the most respondents in the city of Poprad, 53%, and rather below average by the most respondents, 58% in the city of Prešov. At the same time, men (67% of respondents) evaluated the level of smart tourism more critically than women (43%).

The respondents' opinion on the area in which they would welcome new smart solutions in selected cities related to different areas. New solutions in the field of economic development would be welcomed by 10.6% of respondents. According to 13.3% of respondents, new solutions should be in the field of transport. 11.5% of respondents consider new solutions necessary in the field of security. In the area

of the environment, 25.7% of respondents would welcome new solutions. According to 15.9% of respondents, the field of education needs new solutions. 23% of respondents think that new smart solutions should be in the field of tourism and culture.

In the open question, where the respondents expressed what they would welcome in the selected cities, the most common answers were smart benches (with charging portals, free wi-fi, digital advertising space), digital touch LED kiosks (acquiring information), a digital form of payment while driving by taxi, an intelligent parking system (finding a car, the possibility of reserving a place) as well as a concrete decontaminating pavement (it transforms harmful gases into harmless ones through a natural oxidation process).

The first basic hypothesis (H1) assumes the existence of a connection between the gender of the respondents and the perception of the development of smart tourism in selected cities. The hypothesis was divided into a group of hypotheses that were targeted at selected cities. A null and an alternative hypothesis were established for each hypothesis, which were subsequently tested (Table 3).

Table 3: Pearson Chi-Square Data Test “Gender” and “Perception of the Development of Smart Tourism” According to the Selected City

<i>We assume that there is a connection between the gender of the respondents and the perception of the development of smart tourism in the city.</i>			
<i>H1 Košice</i>	Pearson chi-square test = 2.31884	df = 3	p-value = 0.508921
	Cramer's-V coefficient V = 0.2692		
<i>H2 Prešov</i>	Pearson chi-square test = 0.858874	df = 3	p-value = 0.835339
	Cramer's-V coefficient V = 0.1638		
<i>H3 Poprad</i>	Pearson chi-square test = 11	df = 3	p-value = 0.0117259
	Cramer's-V coefficient V = 0.7071		
<i>H4 Bardejov</i>	Pearson chi-square test = 9.92102	df = 4	p-value = 0.0417794
	Cramer's-V coefficient V = 0.6062		

Source: Own processing.

The level of significance tested by the Pearson chi-square test in the city of Košice is p-value = 0.508. The given

value is greater than the chosen one (p -value = 0.05), which means that in the city of Košice it is not possible to reject the statutory hypothesis. Consequently, it can be concluded that there is no statistically significant connection between the variables of the respondent's gender and the perception of the development of smart tourism in the city of Košice.

Based on the calculation of the Cramer-V coefficient ($V = 0.2692$), it can be seen that the relationship between the gender of the respondent and the perception of the development of smart tourism can be assessed as very weak.

In the city of Prešov, the level of the Pearson chi-square test reached p -value = 0.858. This is a greater value than the established level of significance (p -value = 0.05). This means that the established hypothesis cannot be rejected for the city of Prešov. Based on this, it can be concluded that there is no statistically significant relationship between the variables of the respondent's gender and the perception of the development of smart tourism in the city of Prešov.

Based on the value reached by Cramer's-V coefficient ($V = 0.1638$), it can be concluded that the relationship between the variables is even weaker than in the case of the city of Prešov.

In the city of Poprad, it can be seen that the level of significance with a value of p -value = 0.011 of the Pearson chi-square test is a smaller value than the chosen level (p -value = 0.05). This means that the null hypothesis can be rejected and hypothesis H3 can be accepted, and therefore it can be concluded that there is a dependence between the variables gender of the respondent and the perception of the development of smart tourism in the city of Poprad.

The calculation of the Cramer-V coefficient ($V = 0.7071$) indicates that the relationship between the variables in the city of Poprad is the strongest compared to the cities of Košice and Prešov.

The level of significance in the city of Bardejov is p -value = 0.041. The p -value calculated by Pearson's ch-square test is less than the chosen level of significance (p .value = 0.05). It is possible to accept hypothesis H4 and claim that there is a connection between the variables gender of the respondent and the perception of the development of smart tourism in the city of Bardejov.

Based on the calculation of the Cramer-V coefficient ($V = 0.6062$), it was found that the relationship between the variables is stronger than in the cities of Košice and Prešov, but weaker than in the city of Poprad.

The second group of hypotheses assumes that if a tourist is informed about the conveniences and elements that a smart city brings to him, he is more willing to accept and positively perceives the level of smart tourism. The prerequisite is sufficient information about what the smart city offers him.

Subsequently, the tourist is willing to contribute to the development of a smart destination. The tourist can support the smart concept with his ideas, suggestions, or solutions in the area in which he sees possible shortcomings. On the other hand, if the tourist is dissatisfied with the information regarding the smart city, he cannot participate in the concept and thus is not willing to support and accept this concept.

The second basic hypothesis was re-elaborated for each investigated city separately (Table 4).

Table 4: Spearman's Rank Correlation Coefficient of the Data, Satisfaction with Information about Smart City Options" and "Perception of the Level of Smart Tourism" According to the Selected City

<i>We assume that there is a connection between satisfaction with information about smart city possibilities and the perception of the level of smart tourism in the city.</i>	
<i>H5 Košice</i>	Spearman's rank correlation coefficient (ρ) = 0.49672796 p -value = 0.0038
<i>H6 Prešov</i>	Spearman's rank correlation coefficient (ρ) = 0.11315933 p -value = 0.5375
<i>H7 Poprad</i>	Spearman's rank correlation coefficient (ρ) = 0.61641130 p -value = 0.0017
<i>H8 Bardejov</i>	Spearman's rank correlation coefficient (ρ) = 0.64875344 p -value = 0.0003

Source: Own processing.

The level of significance for the variables of satisfaction with information about smart city options and perception of the level of smart tourism in the city of Košice was based on the result of Spearman's correlation coefficient p - value = 0.0038. The given value is smaller than our chosen level of significance (0.05). This means that hypothesis H5 can be accepted. Thus, we can claim that there is a connection between satisfaction with information about smart city elements and the perception of the level of smart tourism development in the city of Košice.

Spearman's rank correlation coefficient (ρ) = 0.496 defined the relationship between the variables. Since the given value is greater than 0, we can say that there is a direct relationship between the variables, even if only to a small extent.

In the city of Prešov, based on calculations, it was found that the p -value of the Spearman coefficient was 0.5375, which is greater than the significance level chosen by us. This leads to the statement that we cannot reject the null hypothesis. We can therefore claim that there is no connection between the variables of satisfaction with being informed about smart

city options and the perception of the level of smart tourism development in the city of Prešov.

In the city of Prešov, Spearman's correlation coefficient (ρ) = 0.113 was achieved, defining the relationship between the variables. Since the value of the coefficient is greater than 0, we can say that there is a direct dependence between the variables, but only to a very small extent.

The level of significance for the city of Poprad, based on the Spearman correlation coefficient, is p -value = 0.0017. The calculated value is less than the established level of significance (0.05). Based on the above, it is possible to accept hypothesis H7. It is true that there is a connection between satisfaction with information about smart city elements and the perception of the level of smart tourism development in the city of Poprad.

Again, it can be seen that the value of Spearman's rank correlation coefficient is greater than 0, specifically 0.616. The value is positive, so we can conclude that there is a direct relationship between the variables.

The level of significance for the selected variables, measured by the Spearman coefficient, for the city of Bardejov was p -value = 0.003. This value is smaller than the chosen level of significance (p -value = 0.05). Which means that H8 can be accepted again. It can be argued that there is a dependency between the variables of satisfaction with information and the perception of the level of smart tourism development in the city of Bardejov.

The coefficient of dependence (ρ) = 0.648 defined the relationship between the variables satisfaction with information and the perception of the level of smart tourism in the city of Bardejov. Based on the value of the coefficient, which is greater than 0, it can be concluded that there is a direct relationship between the variables.

CONCLUSION

The processing of the obtained results revealed how tourists perceive the state of smart cities in selected cities in eastern Slovakia. The presented results serve as basic information and background for destination management and city representatives. The fact that the number of respondents was balanced within the selected cities made it possible to determine the state of smart tourism in the selected cities more or less equally. Respondents were asked about selected elements of smart tourism, which were decisive for them when choosing or visiting the selected city. The cities' mobile applications and free Wi-Fi network were decisive. Charging stations for electric cars, weather stations, Bike-sharing, Bolt scooters and intelligent parking systems were of the least importance to the respondents.

The respondents, residents of Slovakia, clearly stated that they have a more comprehensive idea of smart tourism in selected cities. Their suggestions of what they lack in the cities (what they would like) speak of their knowledge and/or experience from visiting foreign countries. Respondents would welcome more elements of smart tourism, they mostly mentioned smart benches within the market. Smart city districts as well as payment and ordering of services via QR codes.

At the end of the analytical part, we can state that the research was beneficial. We found out how the gender of the respondent is related to the perception of the development of smart tourism in the selected cities (H1 - 4), and how satisfaction is related to the awareness of smart city possibilities and the perception of the level of smart tourism in the selected cities (H5 - 8). We can consider the division of hypotheses into sub-parts according to individual cities a successful step towards their evaluation. Subsequently, it can reflect on the further development and application of new smart elements with regard to selected types of tourism. These are often related to gender preferences in domestic conditions. As part of the first basis of the hypothesis, when dividing it by individual cities, we found that the dependence between the variables exists only in the cities of Poprad and Bardejov. In the cities of Košice and Prešov, there is no dependence between these variables. In the second basic hypothesis, by re-dividing it into sub-hypotheses according to selected cities, dependence was confirmed only in the cities of Košice, Poprad and Bardejov. In the city of Prešov, the dependence between these variables was not confirmed. The result can be connected to the fact that Košice is the largest city, the city with the highest tourism performance of all four selected cities, as well as to its progressive development strategy.

The study can serve as a basis for further studies, possibly for its expansion. For example, re-conducting the study in the case of expanding the number of elements of smart tourism (since development in this area is also moving forward and cities are trying to apply smart tourism to a greater extent), eventually expanding the sample of tourists to include foreign ones and finding out their opinions on the level of smart tourism in selected cities. At the same time, it serves as a comparison for the state of smart tourism in the given cities, which we believe will improve (also on the basis of the respondents' opinions and observations).

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REFERENCES

- Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities*, *60*, 234-245.
- Alamy. (2023). *Map of Slovakia*. Retrieved April 10, 2023, from <https://www.alamy.com/stock-photo/slovakia-map.html?sortBy=relevant>
- Bijlani, V. A. (2021). Sustainable digital transformation of heritage tourism. *2021 IoT Vertical and Topical Summit for Tourism*, 1-5. Cagliari, Italy. doi:10.1109/IEEECONF49204.2021.9604839
- Boes, K., Buhalis, D., & Inversini, A. (2016). Smart tourism destinations: Ecosystems for tourism destination competitiveness. *International Journal of Tourism Cities*, *2*(2), 108-124. doi:10.1108/IJTC-12-2015-0032
- Buhalis, D., & Amaranggana, A. (2014). Smart tourism destinations. In Z. Xiang, & I. Tussyadiah (Eds.), *Information and Communication Technologies in Tourism 2014* (pp. 553-564). Springer.
- Castillo Vizuete, D. D., Gavilanes Montoya, A. V., Muñoz Jácome, E. A., Chávez Velásquez, C. R., & Borz, S. A. (2021). An evaluation of the importance of smart tourism tools in the Riobamba Canton, Ecuador. *Sustainability*, *13*, 9436. doi:https://doi.org/10.3390/su13169436
- Coca-Stefaniak, J. A. (2020). Beyond smart tourism cities – Towards a new generation of “wise” tourism destinations. *Journal of Tourism Futures*, *7*(2), 251-258. doi:10.1108/JTF-11-2019-0130
- Gajdošík, T., & Marciš, M. (2019). Artificial intelligence tools for smart tourism development. In R. Silhavy (Eds.), *Artificial Intelligence Methods in Intelligent Algorithms*. CSOC 2019. Advances in Intelligent Systems and Computing, 985. Springer, Cham. doi:10.1007/978-3-030-19810-7_39
- Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic Markets*, *25*, 179-188.
- Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015a). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behaviour*, *50*, 558-563.
- Cheng, X., Xue, T., Yang, B., & Ma, B. (2023). A digital transformation approach in hospitality and tourism research. *International Journal of Contemporary Hospitality Management*. doi:https://doi.org/10.1108/IJCHM-06-2022-0679
- Križaj, D., Bratec, M., Kopic, P., & Rogelja, T. A. (2021). Technology-based innovation adoption and implementation analysis of European smart tourism projects: Towards a smart actionable classification model (SACM). *Sustainability*, *13*, 10279. doi:https://doi.org/10.3390/su131810279
- Lee, P., Hunter, W. C., & Chung, N. (2020). Smart tourism city: Developments and transformations. *Sustainability*, *12*(10), 3958. doi:https://doi.org/10.3390/su12103958
- Li, M. Y., Su, S. K., Wong, H. S. P., & Li, L. J. (2019). How 2D semiconductors could extend Moore’s law. *Nature*, *567*(7747), 169-170.
- Mehraliyev, F., Choi, Y. & Köseoglu, M. A. (2019). Progress on smart tourism research. *Journal of Hospitality and Tourism Technology*, *10*(4), 522-538. doi:https://doi.org/10.1108/JHTT-08-2018-0076
- Pencarelli, T. (2020). The digital revolution in the travel and tourism industry. *Information, Technology and Tourism*, *22*, 455-476. doi:https://doi.org/10.1007/s40558-019-00160-3
- Pumaleque, A. A. P., Fernandez, I. R., Perez, D. D. I., & Bedriñana, M. A. A. (2021). Digital transformation model for the development of tourism companies. *3C Empresa. Investigación y pensamiento crítico. Edición Especial Tourism and University: Backbone of Peruvian Economy*, 47-61. doi:https://doi.org/10.17993/3cemp.2021.specialissue1.47-61
- Rafael, C. (2020). *Analysis of scientific production - Smart tourism destination, technology and sustainability*. Smart Innovation, Systems and Technologies book series. Conference paper (p. 171).
- Rafael, C. (2020a). Analysis of scientific production - Smart tourism destination, technology and sustainability. Advances in tourism, technology and smart systems. *Smart Innovation, Systems and Technologies*, *171*, 599-613. doi:10.1007/978-981-15-2024-2_52
- Tyan, I., Yagüe, M. I., & Guevara-Plaza A. (2020). Blockchain technology for smart tourism destinations. *Sustainability*, *12*(22), 9715. doi:https://doi.org/10.3390/su12229715
- Um, T., & Chung, N. (2021). Does smart tourism technology matter? Lessons from three smart tourism cities in South Korea. *Asia Pacific Journal of Tourism Research*, *26*(4), 396-414. doi:10.1080/10941665.2019.1595691
- Vila, N. A., Toubes, D. R., & Brea, J. A. F. (2020). Smart experiences in tourism. In A. Rocha, A. Abreu, J. de Carvalho, D. Liberato, E. González, & P. Liberato (Eds.), *Advances in Tourism, Technology and Smart Systems. Smart Innovation, Systems and Technologies* (vol. 171). Singapore: Springer.