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NEW TECHNOLOGIES AND TOURISTS' BEHAVIOUR – SELECTED ISSUES*

*Jadwiga Berbeka**, Krzysztof Borodako****

Abstract

Background. Information and communication technologies significantly influence tourists' behaviour. They create the independence of consumers through facilitation of dynamic access to information and saving it, as well as sharing it via social media and other on-line channels. More and more new ICT tools including mobile technologies are being used by tourists. The problem has not been empirically investigated in Poland yet, and this was a reason to conduct research to fill this gap.

Research aims. The aim of this paper is to evaluate the role of selected mobile technologies in tourism in Poland.

Methodology. The questionnaire survey was conducted in the summer of 2016 among Polish tourists in the city of Krakow. The selection of the sample was of a purposive-quota character. The adopted control variables were respondents' gender and age (the general population was defined as the number of tourists reported during the previous year). The size of the sample was N = 1,175 of correctly completed questionnaires.

Key findings. The results of research confirm that IT solutions are growing in popularity and slowly becoming considered as standard tools. Three main aspects were considered: the use of QR code, virtual trips and geotagging by tourists. The most popular were virtual trips to venues and/or places (78% of respondents in Krakow), then using QR code readers in smartphones (45%) and the least popular – geotagging during the journey (36%).

Keywords: information technologies, consumer behaviour, geotagging, QR code technology.

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** Associate Professor, Cracow University of Economic, Faculty of Management, Department of Tourism, 27 Rakowicka Street, 31-510 Krakow. E-mail: jadwiga.berbeka@uek.krakow.pl

*** Associate Professor, Cracow University of Economic, Faculty of Management, Department of Tourism, 27 Rakowicka Street, 31-510 Krakow. E-mail: borodako@uek.krakow.pl

INTRODUCTION

Information and communication technologies in the 21st century are the main factors of changes in the tourism market operation. They lead to modification of activities, processes and structures of the tourism market agents, they are a key tool of innovation. Besides transformation of the market supply side structure, ICT play crucial role in creating the independence of consumers through facilitation of dynamic access to information and saving it, as well as sharing it via social media and other on-line channels. Moreover, they open new possibilities to experience tourism products.

The most recent changes connected with the development of mobile technologies have caused further turn in terms of service, people and technology mobility. They have dynamised the process of travel preparation and realisation: from static search for information to dynamic access to information and services in experiencing tourist travel.

Academic literature can hardly follow the descriptions of a fast-changing reality, particularly when technological solutions are considered. In English-language literature one can find a lot of publications on communication technologies (Pesonen & Horster, 2012) and augmented reality (Fiore et al., 2014; Yovcheva et al., 2012; 2014; Wei et al., 2014), and the role of smartphones and their impact on the consumer experience (Wang & Fesenmaier, 2013; Wang et al., 2014). However, in Polish literature there are few publications devoted to these issues in terms of tourism (Pawlicz, 2012; Dejnaka, 2012), therefore the choice of the topic of this article.

Moreover, not many empirical findings from the Polish tourism market have been published. The discussion is conducted on the basis of literature review or the results relating to the mature tourism markets. It was therefore considered that conducting research on the Polish market shall be cognitively valuable. The study area became Krakow, renowned for its undeniable position of one of the most important destinations for tourists in Poland.

The main purpose of this article is to assess the use of selected information and communication technologies by tourists visiting Krakow. The compilation consists of the subject literature review, both Polish and English, presentation of the research methodology, presentation of findings, discussion and conclusions.

NEW TECHNOLOGIES AND TOURIST BEHAVIOUR – LITERATURE REVIEW

One of the strongest trends of consumer behaviour on tourism market nowadays is the pursuit of new experiences. This is the main concept of experience economy (Pine & Gilmore, 1999), discussed in Polish literature i.e. by Marciszewska (2010) and Stasiak (2012). This trend shows that the basic goods are not particular products but emotions experiences and impressions which may be provided by the products. Experiences refer to different spheres, i.e. pursuit of experience of educational, entertaining, aesthetic and escapist nature (Pine & Gilmore, 1999; Fuglsang, Sundbo & Sørensen, 2011). And new technologies perfectly fit here with their offer, as the consumers may experience completely new adventures, impressions and emotions.

Tourists use new technologies in multiple ways. The base is the Internet and the access to its tools and resources. However, equally important are mobile technologies available thanks to various devices like smartphones, iPhones, tablets equipped with diverse applications.

The basic features of mobile technologies (Grantham & Tsekouras, 2005, pp. 85–104; Gebauer & Shaw, 2004, pp. 19–41) are the following:

- directness, immediacy,
- easy quick connection,
- any location,
- data mobility,
- uniqueness,
- client-oriented,
- permanent access to Internet resources.

One of the biggest changes achieved by new technologies is the capability to allow consumers to identify, customise, and purchase tourism products and support the development and distribution of offerings worldwide. The latest underlying trend of all developments is through the integration of hardware, software, and intelligent applications through networking and advanced user interfaces (Werthner & Klein, 1999). This has led to a number of new technological creations and experiences which technology is able to provide to tourists.

A tourist uses mobile technologies during all stages of the trip. Amongst the most useful programs one can list i.al. geotagging (which

allows photo report from the trip), location-based applications (which allow on-line browsing of interesting places, finding information about attractions), Google Goggles (which allows finding information on the Internet by visual search), 3D guides (replacing printed guide books), travel interpreter (facilitating communication in case of language problems) and World Travelers (so-called travel assistant).

Geotagging is marking one's current location on the Internet maps, thus creating one's location journey log, i.e. a modern form of a diary.

Certainly, Google Earth maps are of a great use for tourists, as they help prepare for different types of tourism at the travel planning stage, and also during the trip. From the conceptual viewpoint there can be distinguished: Maps for travelling, StreetView for exploring and Earth for visualising. It is noticeable that the objectives for these three above applications differ. Each one of them has different history and different personality (Abhishek, 2016).

The Internet resources are extremely useful while preparing a trip, particularly thematic fora, travel blogs and microblogs. Some of them are created particularly for sharing the knowledge (word-of-mouth) and experiences, e.g. Triphackr (http://triphackr.com).

Particular usefulness of ICT products is revealed during the trip. They increase tourists' independence by enabling tourists to find the place, facility or other attraction. The consumer has access to information about transport, weather conditions, exchange rates, programme of events organised in the region or news on the town hall website. They may book transportation, accommodation, catering or cultural services (Kęprowska, 2014). From the level of the smartphone they also have access to mobile versions of social platforms, hence they can share information, impressions from holidays, photos and videos with the families and friends, being permanently connected (connected travel).

A characteristic feature of contemporary markets is the high data transfer rate. One of the tools which has significantly contributed to it are the QR codes (Quick Response Code). These are alphanumeric, two-dimensional, matrix, square bar codes which allow saving vast amount of data (in case of alphanumeric characters – 4,296 characters). They were invented in Denso-Wave in 1994, and they enable coding Kanji/Kana characters, therefore they are popular in Japan, but they also allow coding signs from Arabic, Greek, Hebrew alphabets or Cyrillic and other symbols defined by the user.

There is a number of applications allowing QR code reading. They allow scanning the QR codes with pages preview, they allow access to scanning history, and some of them allow sending the codes. To name a few such applications: Google Goggles (of respective numbers) Kaspersky QR Scanner (of respective numbers), or QR Droid (of respective numbers).

The proliferation of the Internet and other technological innovations has affected the way tourism destinations and other tourism products are perceived and consumed. The 3D virtual world provides opportunities for destination marketing organisations to communicate with targeted markets by offering a rich environment for potential visitors to explore tourism destinations. However, as of yet, there is little understanding about how to effectively market tourism destinations to virtual world participants who are technology users as well as potential consumers. In literature the technology acceptance model (TAM) is used to investigate how tourists use a 3D virtual world (Huang et al., 2015).

Virtual reality (VR) in tourism is particularly useful (Berbeka, 2016). It is a computer-generated three-dimensional environment allowing the user to move and interact, which results in stimulation of one of the five senses (Guttentag, 2010). According to R. Kanye (2014) virtual reality is an interactive, computer-generated, three-dimensional environment. It may be static or dynamic. S. Bryson (1996, p. 62), like other scientists, stresses the difference between static and dynamic virtual world. In static terms, the virtual world uses the environment that was created before. In a dynamic world, the user may use an avatar to interact with other people, animals or things. The main difference between the static and dynamic systems is the type of contact with the user.

The study shows that there are three different virtual reality systems (Isdale et al., 2002):

– full-immersive,
– non-immersive,
– semi-immersive.

Non-immersive involves observation of the virtual environment with the use of a high-resolution monitor. A newer type is a semi-immersive virtual reality system. It uses much more advanced graphics software. This type may be connected to the projection system on a big screen or even to a multi-television projection system (Lauwerijssen et al.,

2014). Full-immersive virtual system affects many, if not all possible senses by virtual world. Usually, Head Mounted Display system (HMD) is used (Witmer & Singer, 1998, p. 227).

An intermediate form between virtual and real world is Augmented Reality (AR), introduced chronologically later than VR. It involves enriching the real surroundings with the computer-generated content, which is mainly graphic (Hyun et al., 2009).

Azuma (1993) identifies AR as a system linking the real world and virtual reality, interactive in real time, allowing freedom of movement in three dimensions. Augmented reality does not create new fully virtual 3D world, but "augments" real-world environment (which remains unchanged) with new pictures or information (virtual overlay). This may be the augmentation in the form of a simple information (street name, navigation information) or augmentation based on complicated photorealistic objects which immerse into the real world and become a part of it (Dejnaka, 2012).

Obviously, the emergence of Augmented Reality applications have altered the way of experiencing the destinations by tourists leading to interactive and diversified adventures (Fritz, Susperreguin & Linaza, 2005; Kourouthanassis et al., 2015). For tourists, the applications open possibilities to become familiar with unknown surroundings in an exciting and interactive way (Tom Dieck & Jung, 2015). Growing situational insight of tourists resulting from linking the provided information with the elements of real world is more and more commonly used in many areas of building rapport with consumers.

Mobile phones have become a very attractive platform for augmented reality technology in recent years (Rosenblum & Julier, 2009, pp. 1–4).

It should be stressed that augmented reality does not have to be limited to the picture alone. The real world may be enhanced by some devices or sounds, and even scent. AR is not a new concept but the progress in terms of hardware, bandwidth of links and technological possibilities, and also the increase in demand for mobile devices has speeded up its development (Johnson, 2012). Those devices which allow using AR are smartphones and tablets, displays mounted to devices worn on the heads, mounted interactive screens or projectors (Carmigniani et al., 2011).

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In English-language literature one can find a lot of publications on communication technologies (Pesonen & Horster, 2012) and augmented reality (Fiore et al., 2014; Yovcheva et al., 2012; 2014; Wei et al., 2014), and the role of smartphones and their impact on the consumer experience (Wang & Fesenmaier, 2013; Wang et al., 2014). However, in Polish literature there are few publications devoted to these issues in terms of tourism (Pawlicz, 2012; Dejnaka, 2012), therefore the choice of the topic of this article.

The increasing value of experience for tourists may explain the reasons of their interest in the above technological solutions.

Both virtual and augmented reality affects human senses, notably sight. The majority of consumers are "visualisers," thus perception with sight is of key importance, and this is what determines the effectiveness of communication with the aforementioned technologies and applying them in order to enhance the attractiveness of tourism products. The study results show that visual information is learned 60k times quicker by the recipients than written text (Manic, 2015).

The pursuit of experience and certain pragmatism is connected with another trend: trying, called trysumerism (Mróz, 2013, p. 139). And again, it is virtual reality that allows this trying certain new products via simulation of using them, looking at them before even considering the purchase.

The potential of new technologies for development of tourism market is huge, which is clearly stressed in the literature by many authors (Buhalis & Licata, 2002; Frías, Rodríguez & Castaneda, 2008; Irvine & Anderson, 2008).

Already in 1992 C. Cruz-Neira et al. (1992) indicated that the virtual environment may be an effective communication medium. Currently many hotels, restaurants, offices and tourist attractions offer a virtual trip to their interiors (Guerra, Pinto & Beato, 2015) and use the integrated System of Visual Sales in their operations. Today, the pioneers go even further and try to appeal to all the senses of the customer.

It should be stressed that virtual reality is an expanded tourism product, not the substitute product. Referring to the definition of tourism, definiens includes the change of the place of stay, that is a real trip. In this context, watching objects by means of virtual reality is a form of cognition, spending free time, but there is nothing like virtual tourism, there is a logical contradiction in the name itself.

Virtual tourism is coined through the implementation of virtual reality technology into day to day tourist's activities. Virtual environment is augmented by various sensory simulations such as sight, sound, and even touch, together with some respective feedback, which creates an excellent way to access, conceptualise and manipulate tourism information. Tourists are highly dependent on accurate, relevant and also timely information in order to help them in their travel decisions. The provision of certain elements such as video clips, animation and also virtual walkthroughs of tourism destinations, hotel attractions and local environment are able to give tourists added value, therefore VR technology is likely to have a major impact on the future of tourism industry (Shang, Zakaria & Ahmad, 2016).

New display method obtained due to smartphones which stems from the synergy of new mobile devices, context-awareness and AR has a vast potential to enhance tourists' experiences and make them exceptional (Yovcheva, Buhalis & Gatzidis, 2012). As such, it is possible to say that mobile AR applications allow users exploring the world by adding new layers to their reality, thus resulting in a new interactive and highly dynamic experience (Kounavis, Kasimati & Zamani, 2012).

It can be observed in many types of tourism. For example, tourists seek to travel to scenic spots where popular movies and TV dramas have been filmed. Filming tourism has become a popular selling point in the tourism industry. Scenic spots where popular movies and TV dramas have been filmed attract tourists in their multitudes. An augmented reality mobile service for the Google Android system is used, it can integrate location-based service (LBS) and human-computer interaction (HCI) for a 'Film-Induced Tourism' app using 'Junaio' browser technology. With this service, users can view shooting scenes of film or dramas when they are near the same locations as detected through GPS on their mobile phone. AR techniques ensure interactivity in real time, and registration in 3D spaces. Users also can search for other information such as scenic spots or restaurants near the locations of shooting spots through the AR mobile service. Additionally, in order to extend AR technology for the Film-Induced Tourism App, a mobile service concept of interactive AR Game that can provide a further immersive experience App or Web game is proposed (Tung, 2015).

Attempts are also taken to create the application generating a postcard with the view of the visited object including information about

the place and a photo of the tourist, which may be sent by means of mobile devices at hand (Shang, Zakaria & Ahmad, 2016).

ICT give multiple opportunities of communication with customers in effective way. Facebook allows so-called rotary ads (the sequence of graphics creating consistent story), and YouTube ensures 360° video format. Thanks to such virtual reality solutions the tourist before purchasing a product gets the chance to become familiar with the offer of a given object, i.e. its interior, surroundings, or move to the centre of an event taking place in the object and make decisions being fully aware.

The study carried out amongst young (Y generation) Czechs prove that the technology with the most potential of development is 3D visualisation and virtual world (Janeček & Čechurová, 2014).

Summing up, the literature review, mainly foreign, proves that virtual reality and augmented reality are more and more commonly used by the tourism market agents. The susceptibility of tourists to the use of applications applying VR and AR results from their pursuit of new experiences and adventures, which refers to the experience economy. The customers do not want to be just the consumers, but they want to feel the product, immerse into it, succumb. They expect information, entertainment, active participation in experiencing and stimulation of many senses coupled with innovative elements of the project (Pine & Gilmore, 2011). An important feature of the above applications is their capability to present stories – storytelling, which enhances the attractiveness of the product with history.

Using mobile apps utilizing VR and AR decreases the asymmetry of information on the market by providing tourists with information and at the same time shaping their knowledge about the products, their specificity and possible uses.

METHODOLOGY

The purpose of the study was to become familiar with the behaviour of Polish tourists relating to the use of new mobile technologies referring to the operation of QR code technology, use of information materials and solutions connected with virtual trips and the use of geotagging during the trip. Achieving this goal was based on the data obtained from the questionnaire survey carried out in direct form in Krakow on

the population of 1,175 respondents. The survey was conducted in the period: June–September 2016. The sampling used was purposive-quota, adopted control variables were: gender and age of respondents (general population was a population of tourists from a previous year). Out of the whole sample there was a subgroup selected. They responded to the questions relating to the research issues in question. This way for further analysis the base of N=382 records was adopted. The newest version of Statistica 13 software was used to analyse the quantity and structure, and analyse the contingent tables with the calculation of test probability *p*. Additionally, cluster analysis was conducted to discover the relation between the area of implementation of virtual trips and technologies/services used for this purpose. The below analysis presents the results without the missing data and including the absolute number of responses.

SAMPLE DESCRIPTION

The research sample was diversified by key features of the respondents, mainly age, sex, professional and financial status, place of living, education and operating system of smartphones used by respondents.

The dominating age groups refer to young people, because over 40% were respondents under the age of 26 years. One quarter of studied people represent ones aged between 27 and 35 years. The last group of respondents represented by more than one tenth were people 36–45 years. The sample was slightly dominated by men (55%) and people living in mid-sized and big cities (respectively 31% and 30%).

Most of those who participated in the research have higher education (53%) and they are white collar workers (29%) and students (28%). These two latter groups of respondents constitute almost 60% of the sample. The financial status of the respondents plays important role in case of the potential of buying new smartphones that can be assessed as expensive tools. Almost half of the sample declared good status (exactly 47%) and almost one twentieth (18%) declared very good financial status. The last feature of the respondents was their selected smartphone operating system (OS) that proves another feature of respondents identifying them as users of Apple's iOS or Google's Android. In the research sample more than 45% were users of Android and more than one third were users of iOS (Table 1).

Table 1. Sample description

	Number	Percent		Number	Percent
Age, N = 379			Professional status, N = 376		
Under 18 years old	15	3.96	White collar worker	112	29.79
18–26 years old	147	38.79	Student	106	28.19
27–35 years old	93	24.54	Manual worker	51	13.56
36–45 years old	60	15.71	Entrepreneur	44	11.70
46–55 years old	36	9.42	Pupil	26	6.91
56–65 years old	21	5.50	Stay-at-home person	18	4.79
66–75 years old	5	1.31	Pensioner	13	3.46
75+ years old	2	0.52	Unemployed	6	1.60
Sex, N = 380			Financial status, N = 380		
Woman	168	44.21	Very good	68	17.89
Man	212	55.79	Good	177	46.58
Place of living, N = 375			Average	123	32.37
Village	89	23.73	Poor	9	2.37
Small city	54	14.40	Very poor	3	0.79
Mid-sized city	118	31.47	OS of respondents' smartphone, N = 378		
Big city	114	30.40	IOS/Apple	130	34.39
Education, N = 377			Android	175	46.30
Higher	201	53.32	Windows Phone	43	11.38
Secondary	161	42.71	BlackBerry	13	3.44
Other	15	3.97	I don't know	12	3.17
			Symbian	4	1.06
			Other	1	0.26

Source: own elaboration.

FINDINGS

The results of the survey were presented in three groups of data. The first one is the general overview of the percentage of the respondents who use different technical solutions (mostly appreciate software). And in this aspect the lowest level of use was noted in case of geotagging during the journey (36%), then using QR code readers in smartphones (45%), and the highest level of use was recorded in relation to virtual trips to venues and/or places (78%) – Table 2.

Table 2. Responses concerning the use of selected new technologies during the journey

Subject	Responses	Number	Percent
Using geotagging during the journey	Yes	137	**35.96**
	No	244	64.04
Using QR code readers in smartphones	Yes	169	**44.59**
	No	210	55.41
Using virtual trips to venues or places in Krakow	Yes	297	**77.75**
	No	85	22.25

Source: own elaboration.

The second set of data collected during the study was the structure of venues or places visited virtually by respondents and the technology/applications used for this purpose. In the first topic the most commonly virtually visited part of the city of Krakow were the streets (55% of respondents). Streets are usually viewed by Google application called Street View and it is a part of both Google Maps and Google Earth services (Abhishek, 2016). Two groups of respondents (both 37%) visited virtually the accommodation (i.e. hotels) or cultural venues, like museums. Only one fifth of the respondents viewed the landscapes by virtual trip. Considering the applications used, the leader was Street View by Google (41%), Google Earth by Google (36%) and virtual tours on the site's website (26%) – Table 3.

Table 3. Responses concerning the use of virtual trips and used technology/applications

Aspects	Number of respondents who used it	Percent of respondents who used it
Venues or places visited by virtual trip		
Accommodation (i.e. hotel)	143	37.43
Cultural venue (i.e. museum)	143	37.43
Streets	211	55.24
Landscape	82	21.47
Technology/Applications used for virtual trips		
Google Earth	139	36.39
StreetView	155	40.58
Virtual tours on the site's website	99	25.92

Source: own elaboration.

The third set of data concerned the relations between the selected features of the respondents and their responses. Two features that were statistically significant ($p<0,05$) were selected. These features were age and place of living. In the case of the first feature younger people often indicated the use of geotagging (50% of respondents aged between 18 and 26 years old) and over one quarter (28%) of respondents under 18 years old declared the use of geotagging.

Very similar results were noted in case of the use of QR code readers in smartphones, but in this case the group of respondents at the age of 46–55 years also declared active use of this solution (15%). Two youngest groups declared respectively 32% (under 18 years old) and 38% (18–26 years old). In the third area of the study – virtual trips, the difference between age groups was smaller because there were more older people who declared the use of them. The highest share in the responses belonged to the group at the age of 18–26 years, next shares to the ones under 18 years old (26%), 46–55 years (18%) and 36–45 years (11%). These results confirm the common opinion that the most new technology oriented generation is the youngest one (under 26 years old) – Table 4.

Table 4. Responses concerning new technology in relation to the age of the respondents

Activity	Under 18 years old	18–26 years old	27–35 years old	36–45 years old	46–55 years old	56–65 years old	66–75 years old	75+ years old	p value
	Percent								
Using geotagging during the journey	28	50	5	7	6	2	2	0	p = .00009
Using QR code readers in smartphones	32	38	5	7	15	3	0	0	p = .01169
Using virtual trips to venues or places in Krakow	26	33	4	11	18	6	1	1	p = .00526

Source: own elaboration.

The next feature of the respondents that influenced their responses (as statistically significant) was the place of living. The highest level of respondents who use geotagging were people living in big cities (45%) and mid-sized cities (26%). One fifth of the respondents who use geotagging were the residents of villages.

QR code readers are most often used by respondents from big cities (41%) and mid-sized cities (31%). In the analysis of the use of virtual trips the dominating part of the respondents using it were from big cities (46%) and villages (24%) – Table 5.

Table 5. Responses concerning new technology in relation to the place of respondents' living

Activity	Big city	Mid-sized city	Small city	Village	p value
	Percent				
Using geotagging during the journey	45	26	9	20	p = .00009
Using QR code readers in smartphones	41	31	14	14	p = .00007
Using virtual trips to venues or places in Krakow	46	22	8	24	p = .00233

Source: own elaboration.

Cluster analysis allowed finding links between indicated types of virtually visited venues and the technology/service used. The respondents who used virtual trips to accommodation or cultural facilities declared making use of the virtual 3D visiting on the facility's website. On the other hand, in the second cluster the responses relating to virtual landscape visits were linked to responses relating to the use of Google Earth technologies/services. The third cluster was composed of the declarations of visiting virtual streets with the use of Google StreetView. The conducted cluster analysis confirmed the specificity of the application of certain services and technologies to particular categories of discovered places and venues.

In conclusion of the empirical data it was stated that the new technologies are more and more often used by tourists who visited Krakow. In the research sample the dominant share of the sample were young respondents who prefer to implement new technology in problem solving. The differences observed in the selected groups regarding the age and place of living confirm that younger users are more mobile-friendly and the people from big cities more frequently use this technology than people from other groups, but these differences are not so significant. The respondents confirm that some kind of technologies/services are suitable for particular purpose.

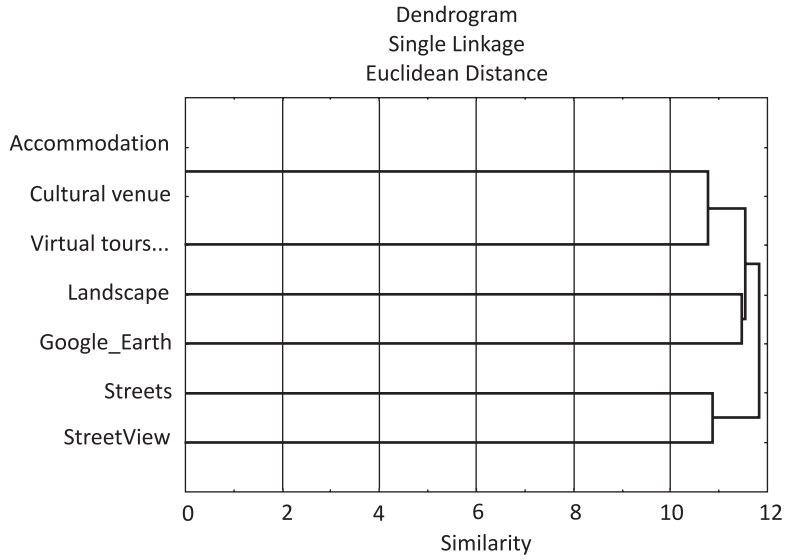

Figure 1. Cluster analysis for type of venues visited virtually and applied technologies/services

Source: own elaboration.

DISCUSSION

The application of information technology in tourism is more significant each year. The results of literature review and the empirical data collected in Krakow among tourists confirm that IT solutions are growing in popularity and slowly becoming considered as standard behaviour. The custom of using the geotagging is still in back positions to the rest of analysed services, and there are three possible reasons for that. The first one is that still not many tourists know about this possibility in their smartphones and do not care about sharing regularly their position with all the people around the world. The second reason might be no need to do it. They share or send photos, but the location is not usually shared. And, last but not least, reason might be the social media. Actually, all young tourists (however not only young ones, but they can be treated as the leader in the introduction of this tool) usually switch on the option of sharing the location. It means that each photo posted on the profile timeline of each tourist can be tagged with the geolocation and many other descriptions. It is done automatically and tourists do not need to make additional actions to

show where they are at this time. Leung, Vu and Rong (2017) partly confirm this assumption in their research, where they analysed the photo sharing with geotagged photos. Very interesting in further studies would be to ask at the same time if the respondents use geotagging, use the social media and if they share their location. It can bring much deeper conclusions about the tourists' behaviour in area of geotagging and location sharing. Moreover, the analysis of social media content based on geotagging information creates new research area to identify consumer behaviour. For example, tracking geotagged photos on Flickr website has opened a considerable opportunity for discovering valuable geographic information about tourists interests. Such an exploration was conducted in Taiwan and the results allowed identification of tourists' points of interest (POI) and regions of interest (ROI) (Kuo, Chan, Fan & Zipf, 2018).

The next area of research concerned QR codes application in tourism. As presented in the results of this analysis still only a small group of tourists use this solution during the travel time. This technology has already been studied in tourism in case of cultural heritage (Solima & Izzo, 2018), as on-site tourism information source (Wee-Kheng & Yu-Chung, 2011), or for virtual tours of geological heritage (Martinez-Grana, Gy & Cimarra, 2013). Results of the research conducted in Krakow confirm still underexplored potential of this solution and tourism industry seems to be excellent area for developing it in the future.

Virtual trips and 3D services seem to have the great potential in the nearest future. The results of the above study confirm that 3D visualisations have development potential on the same level as it was stated in the research of Janeček and Čechurová (2014). Virtual reality is the topic of many discussions in tourism, whether it is efficient and what the return on investment is. It refers usually to the destination like city or region, but for many tourism stakeholders this question is important for the next few decades. This research confirmed that over three quarters of the respondents used this kind of virtual trips to experience visited city better – its streets, marketplaces, cultural venues and other unique places valuable to judge before spending time there. These data are in line with the results conducted in Hong Kong and the United Kingdom, where the authors tried to understand the effectiveness of VR experience in inducing more favourable attitude towards tourism destinations (Tussyadiah et al., 2018). The feeling

of being in the observed place results in stronger desire to visit this destination in reality and increase the level of visitation intention. This research allowed to confirm the dominant preference of new technological solutions by younger adults, who were the promoters and lead users of this solutions.

CONCLUSIONS

The application of new technology in tourism is currently very important area of research. It is the subject of study from the perspective of tourists' behaviour, destination marketing, user friendly interface and competition on the tourism market – strengthened by the application of new technologies (like virtual reality or augmented reality). The attitude of tourists towards more frequent use of appreciated applications corresponds with their need for new experiences, thus pulling the technological development. It continually offers the new possibilities that tourists are ready to use in order to save time, money and enjoy the comfortable condition of accessing and/or buying the tourism products.

The results obtained in one of the most recognized Polish tourism city allow formulating some recommendations for host cities to use new technology in tourism industry on destination level (on corporate level these technologies are implemented very fast, because firms are more flexible in market scanning and trend recognition).

This research had some limitations since it only concerned Polish tourists and young respondents were dominating. It would be interesting to develop such study in other countries in Europe or worldwide to get better outlook on how such technologies interact with other cultures and economic development of the destinations (countries). It would be recommended to focus on the efficiency of different technologies in different age groups on the destination level (not only in buying phase, but during the stay in the destination and during on site decisions what and when to visit).

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