

AUTOMATION AND ROBOTIZATION IN TOURISM, NEW SERVICE DELIVERY FORMATS AND STAKEHOLDERS' ATTITUDE TO SELF-SERVICE SYSTEMS

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Abstract: *Authors examine the topic of decrease of the need for human intervention in tourism services, which arises in the context of human workforce being replaced by artificial intelligence. Gradually, all tourism services become less personal and more self-served. This topic has not yet been researched in a complex manner from the point of view of tourism stakeholders. This work evaluates current state of automation and robotization in tourism and presents concrete examples from the industry, where human factor is being replaced by technology solutions. The article present results of a study examining the participants' attitude to self-service systems while travelling. The study was carried out through a questionnaire distributed to a randomized sample of respondents representing a wide range of age, educational background, and region of residence within the Czech Republic. Key findings indicate high potential for the development of new technologies, automated processes and artificial intelligence in tourism establishments, particularly in regard to competitiveness, service quality, and lack of qualified workforce. There are two equally significant opinion streams within the respondents' answers: One group denies fundamental need for human presence in tourism services and prefers self-service systems, the other group considers the personal touch and human factor irreplaceable. The discussion considers the possibilities for application of automated technology and its acceptability in tourism services in the Czech Republic. The conclusion can be a motivation for further studies of the impact that automated and robotic instruments have on individual stakeholders, not only in the tourism sector but in the service sector in general.*

Key words: *Tourism, Robotization, Automation, Self-Service*

1. INTRODUCTION

Progressive technology enables novel development of many industries, including tourism. Focus is not only on the positive aspects, but also on the negative points of these changes. One of the most discussed issues is the replacement of human workforce with artificial intelligence (AI). Since the eighties, academic literature has been discussing the decrease of need for human intervention in manufacturing as well as services. Nowadays, there are several questions being debated, such as whether automated systems are a positive development, which lowers the need for people to perform mundane, repetitive tasks and allows them to focus on strategic and creative aspects of work. There are also concerns regarding the capital need for implementation of novel technologies, lack of qualified experts able to implement the technology in the industry and maintain the AI systems. The threat of increased unemployment in positions performing routine work is also being considered.

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Robotization has never been underestimated or considered simply the next step after automation and self-service system implementation, on the contrary there have been published numerous studies debating the impact of technology. However, only rarely do they consider the tourism industry. The aim of this study is to find out the attitude of tourism stakeholders towards new technologies and self-service systems, which they encounter while travelling. The research analyzes both stakeholders' attitude towards this topic on a theoretical level as well as personal experience with self-service systems.

Tourism is an industry, where the human factor plays a very important role, as it influences directly the provision of tourism service and influences greatly the stakeholder's experience. The study also showed that in the Czech tourism market, stakeholders have rather vast experience with self-service systems.

2. AI AND ITS INFLUENCE ON TOURISM STAKEHOLDERS

First, several keywords will be established. Automation can be defined as autonomous and self-service systems which direct machinery as well as processes. In contrast to mechanization, which simplifies human work via machinery, automation in a certain sense decreases the need for human workforce. Self-service systems in the form of AI with various functions are therefore meant to replace human personnel. Part of automation is also robotization, that is implementation of AI-based robotic systems in the industry. According to a study carried out by the Ministry of Industry and Trade of the Czech Republic, AI offers technologies for machine sensing, interactions between humans and machines, and their communication in natural languages [12].

AI is already commonly implemented in the industry. "Intelligent" refers to complex analytical, predicting, optimizing and visualizing functions with the aim to obtain improved operational decisions [1]. In the tourism industry, the term "smart tourism" has been established. Intelligent tourism includes novel forms of information and communication technologies, predominantly using the mobile phone platform. According to experts, the inclination towards smart tourism is significant and tourism is a field, which widely uses intelligent technologies [7]. Work with the so-called "big data" is then closely connected with the usage of and investments in information and communication technologies. Extensive data analysis and interpretation plays an important role in the concept of "Industry 4.0", particularly in connection with the availability of such data on a central cloud, where it can be accessed simultaneously by multitude of users, who are able to connect with each other and share the data [30]. "Industry 4.0" – the fourth technology revolution, appears under similar names also in Germany (Plattform Industrie 4.0) and France (d'Industrie 4.0) [17]. This initiative presents transformation of self-sufficient automated units into fully integrated and regularly optimized manufacturing environment. Manufacturing machinery will be connected through global networks into cyber-physical systems, which constitute the base of so-called intelligent factories [12].

2.1 IMPACT ON THE WORKFORCE

Robotization has been increasing in the USA since the eighties of the 20th century. At that time, there were two sociological approaches to the topic: viewing robotization as a positive development, freeing humankind from work and poverty, or as a negative factor causing unemployment and class division [8]. The literature differentiated between the research and development of machines that improved human work, but did not replace people in the

manufacturing process, and the development of robots meant to replace the human factor [3]. Experts expected competition between robots and humans, with the premise of low requirements for visual and tactile abilities, relatively low intelligence, not considering the ability to solve problems. Highlight was on use cases at home, in medical care – especially in the treatment of the disabled, in the military and in challenging conditions – in mines, underwater or in space [3]. Thirty years later however, we encounter rather different outcomes in the industry.

A recent study explored the impact of technological developments in the context of low employment growth in the USA in the nineties of the 20th century. The authors focused on mid-qualified positions with considerable number of repetitive tasks, which could be replaced by new technology, particularly during economic recession. In such cases, workers are either re-trained for a different position, or they need to relocate for work. Both options could in the end cause slowness of the job positions growth in the period of economic recovery. Research focused on retrospective exploration of the role of technology on job recovery after recession gathered data on 71 recessions, which took place in 17 developed countries between 1970 and 2011. The study practically disproved the negative influence of technological changes on employability in developed regions outside of the USA. Countries that went through recession did not experience increased unemployment of mid-educated workforce tasked with routine activities during the recovery period [6].

In respect to strong uncertainty caused by the development of robotics and AI, discourse debates the risk of the so-called technological unemployment, particularly of the young generation. Robotization should however be considered as a challenge the humankind can control and not as a threat to which humans will succumb [19]. Global impact of automated processes has been evaluated for the second time on a yearly basis by the global agency ManpowerGroup. In 2016 and 2017, the agency carried out research in 42 countries, surveying 20 000 employers. According to the majority of employers, automation will be beneficial for employability in the near term. In fact, 86 % employers claim not to plan any staff lay-off, and even expect to hire new employees in the next 2–3 years due to automation [22].

Nowadays, it can be expected that automated and robotic systems will still need human intervention in the near future. Therefore, it is important to respect people and create favorable conditions for their effective contribution [13].

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2.2 COMPANIES' APPROACH

New technologies have been approached with respect ever since the initial discussions. Companies of all sized have faced technological challenges. The benefits of IT, growing competition on domestic as well as international markets and especially growing payroll costs have contributed to the implementation of novel technologies. Particularly small and medium-sized companies with the goal to remain competitive have been forced to solve effectivity in terms of both the income and expenses and have searched for methods the would decreased production and overhead costs, increase productivity, and strengthen the quality of their offering.

One of the first technological changes that significantly influenced the business of small and medium-sized companies was numerical control, which allowed businesses to use coding as a mean of machinery control. What followed was a massive revolution in hardware computer technology usage. Companies implemented IT in their processes primarily because of the need to process rapidly increasing number of transactions (customer databases, inventory, sales volume, cost management). Additionally, there was growing competition in the national and international markets [5]. It is undeniable that efficient automated technologies help improve production effectiveness and its sustainable development. In connection to the dynamic development of supply and demand on the global market, there are growing demands on manufacturing and assembling systems able to flexibly adapt to these changes [13].

The implementation of new technologies in the industry does not happen in individual leaps but in a gradual process. The reasons for this are fairly quick obsolescence, financial and human capital intensiveness of implementation and maintenance [10]. Only large companies, such as e.g. Nestle in Japan, can afford the use of specific systems and robots so far.

2.3 NEW TECHNOLOGIES, INDUSTRY AND SOCIETY

Experts consider four possible types of impact of technology in manufacturing and services [16]:

- I. Employment rate in automated fields;
- II. Changes in demands on working hours, employee skills and mandatory trainings;
- III. Changes in corporate organization;
- IV. Impact of robotization on the society – households, free time, work.

It is crucial to highlight the influence on society itself and the need for reaching a consensus, so that the wealth produced by technological changes brings overall positive impact. Economy with high competitiveness, productivity, and quality can be compatible with high unemployment rate caused by the new technology [16]. If economy and the overall income of the citizens grow equally, is a certain level of unemployment tolerable. However, if certain members of the society will not be able to participate in the common wealth (e.g. in the form of social benefits), the political and social tension will increase [14].

The age of information and automation present freedom from the majority of usual work tests. It has brought not only decrease in working hours and changes in the manufacturing structures, in employment, and professions, but also in the service and entertainment sector. Also, social relationships and the concept of role division have gone through a transformative process due to change in the working conditions [29]. Even though automation is linked mainly with manufacturing, the service sector also uses increasingly automated technology, which require

handling by qualified employees. The concerns surrounding automation are therefore not limited only to stakeholders in the manufacturing industries. Automation and robotization, as new technologies in the workplace, require not only specific employee training concerning usage and maintenance, but also managerial training for those preparing cost and income plans without having direct experience with the novel technology. Managerial staff is required to keep up with the technological changes and leverage them for tackling novel challenges and responsibilities [26].

In conclusion of this chapter, it can be summarized that technology in manufacturing and services bring positive impact in the form of general education improvement as a direct result of science and research.

3. CURRENT STATE OF AUTOMATION AND ROBOTIZATION PROCESS IN TOURISM

Technological development in the form of automated processes and robotic equipment used in usual activities has become normal. In medical, military, construction industries as well as in households, robot-based technologies are used for mundane tasks. The center of the global robotic market are Japan and South Korea, while Europe accounts for only one third of the industrial robot sales so far [28]. Within two decades, gradual implementation of robotics can be expected also in the tourism services. In parallel with robotization and further automation, the human factor will be gradually substituted; it will however not be completely eliminated but will rather undergo a complex transformation toward improved knowledge and abilities [31]. Regarding the customer service performed by robots, the challenges of thinking flexibility and the ability to deal with nonstandard situations remain.

How the travelling public sees robots in the tourism services can be seen in a study carried out by Travelzoo as a part of "The Future of Travel" project with 6 211 travelers in Asia, Europe, North America and Latin America (countries: Brazil, Canada, China, France, Germany, Japan, Spain, UK, USA) [27]. A positive attitude of travelers to robotic systems can be observed particularly among Chinese and Brazilians (over 90 % are content with the positive impact of the technology). They name effective data handling, data storage, translation options, and constant energy of the robots as positive points. Some nations appear to be more careful in their positive evaluation. Particularly German and French respondents have a more conservative opinion and worry that their holidays might become a depersonalized experience. The survey did not involve central and east Europe. The attitude of Czech travelers, as a country representing the central European region, will be presented in the later part of this article. Generally, the study showed that the public sees future value in a combination of human and robotic work.

There are many opinions and speculations regarding the impact of the ongoing robotization process, experts debate that over half of the current workforce may lose their jobs due to increased robotization, while some theories expect the work processes to become so efficient due to robotization that humans will not be required to work at all [15]. Overall, the current though streams agree that automation and robotization

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change the job market, where some positions disappear while others are being created to cover the demand for qualified workers. Human capital is one of the basic factors of economic development based on knowledge, as the level of human capital leverage determines the level of innovation on the particular country, which include new products, technologies, as well as new methods of organizational structure [28].

3.1. NEW FORMS OF TRAVEL SERVICE PROVISION

Based on the available literature, forms of new (that is, those that appeared in the travel industry within the last 10 years) travel service provision can be summarized in the following categories:

- virtual visits and 3D reality (hotels, destination, conferences, remote trips);
- drones replacing a tour guide and enabling unusual angles of monuments from a distance live or via video recording;
- autonomous transport;
- travel service robots replacing human personnel.

The visit of conference space is offered by Disney Business Solutions, for example, which offers congress space in Paris [11]. Virtual hotel visits are available in the largest accommodation search engines such as expedia.com or booking.com.

In the context of tourism, not only physical robots but also smart IT systems are discussed. For example, Facebook, a social network company, is developing a personal AI assistant which would not only use algorithms to mimic human brain, but also to understand human behavior [20].

Robotization is a great opportunity for the provision of novel tourism services. One of the examples can be the usage of humanoid robots (so-called androids) in tourism sector with the goal to strengthen the experience of the customer. Nestle in Japan implemented in 2014 a humanoid robot named Pepper to sell Nescafé coffee machines. The robot is 120 cm tall, has human-like appearance with white plastic body and a tablet placed in the chest area. An advantage of this robot is ability to recognize and analyze human emotions and react to them. It has technology enabling the recognition of voice emotions and facial expressions [18]. The robot does not fulfill only the seller function with simple explanation about the machine function and usage, but is also able to converse with the customers. The technology itself became a marketing tool in this case, as the act of purchase becomes a unique experience.

Some foreign museums (The National Museum of Australia, Fine Arts Museum of San Francisco) use robots for guided tours – not only to provide a unique experience for example for school tours, but especially to enable physically disabled visitors to see the exhibition from home via a remotely controlled robot [23]. These robots can be guided over internet connection, and the visitor has the opportunity to view the gallery through the robot's panoramic camera and to communicate with the tour guide.

In a similar manner, robots offering virtual guided tours anywhere in the world can be used in locations with difficult accessibility. Robots can capture photos from inaccessible angles or locations. They help to abolish physical barriers, but also language barriers, as they can communicate in any language that is comfortable for the tourist and facilitate translation. Multilingual robots communicate with guests in tourism agencies and replace the insufficient language knowledge of the human staff.

Tourism is an industry with specific requirements on the work of humans. The demand for workers is irregular in the course of a year, week and a day, often work in evening hours or on weekends is required [32]. Lack of qualified personnel causes complications in the tourism sector, which can be solved by the incorporation of robots in the daily tasks. They can help cover 24-hour service, such as during night shifts which most employees wish to avoid and most guests seek services seldomly. First use case of robots in hotels occurred in Japan in 2015. Humanoid robots at the hotel provide informational and concierge services. The goal of the hotel owner is to rapidly decrease the need for human workforce by 90 % via the use of robots [21]. Also, other companies such as Marriott or InterContinental Hotels Group continue with the implementation of robots into communication with clients. In Aloft Cupertino hotel in the USA, robot called Botlr brings towels or refreshments into the room [9]. Robot barmen mix cocktails onboard the ship company Royal Caribbean [24].

3.2. SELF-SERVICE SYSTEMS

The fast development of AI brings considerations of the wider range of tasks that could be taken up by robots instead of humans, which is then followed by the fear of humans being removed from job positions. Simultaneously however, demand for qualified technicians rises. Similarly, in personal service sector, which is difficult to automate, demand for less qualified workforce rises as well [2]. Typical example of tourism sector application, where routine positions are removed, is the check-in process at airports. Tourists can nowadays usually avail of self-catering check-in kiosks, which provide fast identity check of all passengers, which shortens check-in queues. Similar automated systems can be also found in hotels, where they enable check-in, card payments and other functions without any interaction between the guest and human personnel. These services are also available on the Czech market [25].

Typical self-service systems used in the tourism industry in the Czech Republic as well as abroad include among others:

- self check-in airport kiosks;
- self-service automated reception;
- ordering tablets in eateries;
- digital concierge enabling communication between guests the hotel reception;
- interactive “Lifetables” with built-in screens enabling custom meal selection and ordering.

The benefits of self-service technology are the possibility to let human staff focus on other than routine activities. Simultaneously, customers can order services without pressure to decide quickly and can use card for payments without the need to carry cash. Queues are reduced as there is usually a higher number of the self-service kiosks.

4. RESEARCH

In correlation with the increasing volume of technology use in the tourism service sector, the number of situations where a guest must use a self-service system solely with the use of technology is increasing as well. How this trend is perceived and accepted by Czech customers? To what degree they are willing to use self-service systems? Which factors influence their attitude to self-service? Answering these questions was the primary goal of the following study carried out in autumn 2017 in the Czech Republic among a large sample of the public.

4.1.METHODS

Primary source of information for the study were personal interviews carried out by students majoring in tourism at VŠE Prague between October and December of 2017. Respondents were sought according to particular quota (sex, age group, size of residence) in order to obtain a representative sample. 250 respondents have answered, 6 answers were eliminated due to incompleteness or untrustworthiness of data, 244 questionnaires were evaluated. The following statistical methods have been used during the evaluation.

The sample of respondents is relatively small, however within the scope and goals of the study it can be considered sufficiently representative. The selected sample consists of:

- balanced gender representation (43 % male, 57 % female),
- 34 % age group 15 – 29, 33 % age group 30 – 55, and 33 % age group over 65,
- 39 % respondents live in Prague, 34 % live in a city with over 40 000 citizens, and 30 % live in a smaller residence.

Through the inquiry, three areas of consumer behavior were researched:

- travel experience,
- relationship toward technology in general,
- usage of self-service options while travelling (respondents evaluated 16 forms of self-service options). At the end of the interview, respondents were asked to express their opinion on self-service in tourism.

4.2.RESEARCH EVALUATION

Altogether 63 % of respondents have used in the past 2 years at least one of the self-service options in tourism. Roughly, one third of respondent has positive attitude to technology in general, however 24 % consider technology stressful and 14 % require assistance for the use of technology.

The representation of different types of attitude toward self-service systems in tourism is spread out equally, as can be seen in table 1.

Opinion on the implementation of self-service systems in tourism	% responses
I prefer self-service options	24
I cope easily with self-service systems	34
I cope with self-service systems with some difficulties	16
I prefer services provided by human employees	16
Self-service discourages me from availing of the service	10

Table 1: Opinion on the implementation of self-service systems in tourism

The frequency of self-service use differs according to the type of self-service. Most respondents have used self-service elevators and toilets (have been used by 93 %, resp. 95 % respondents), which are long established self-service systems. Very often (in 60–75 % of the cases) the services related to accommodation, transport or culture have been used (for example accommodation booking, breakfast buffet, self-service purchase of tickets, airport check-in at self-check-in kiosks), with the exception of self-service hotel check-in, which has been used the least frequently (only 18 % respondents have had experience with it). The least used services have been contracting of travel insurance online (51 %), smartphone tour guides (48 %) and self-service check-in (33 %). Detailed data are presented in table 2.

Customers' attitude towards usage of self-service systems in tourism (% replies)				
	has used	prefers	is stressed	is discouraged
Self-service elevator	95	87	8	2
Self-service WC	93	82	10	8
Self-service breakfast buffet	82	75	6	4
Self-service parking	75	61	15	2
Self-service supermarket payment	73	51	20	8
Self-service public transport ticket purchase	73	64	7	5
Self-service accommodation booking	70	62	7	5
Self-service ticket purchase	66	64	7	4
Self-service long-distance transport ticket purchase	62	48	15	4
Self-service meal order (McDonald's)	62	51	6	7
Self-service airport check-in	59	34	23	8
Self-service gas stations	51	43	8	4
Self-service travel insurance purchase	51	46	4	10
Smartphone tour guide	48	44	4	4
Self-service luggage check-in	33	23	7	15
Self-service hotel check-in (code-based)	18	7	0	16
Average	63	52	9	7

Table 2: Customers' attitude towards usage of self-service systems in tourism (% replies)

From the data summarized above, it could be expected that usage of self-service systems is common, however detailed analysis shows that in many cases, the usage of self-service is forced and is preferred by only about half of consumers (52 %). In fact, 4–20 % is stressed by the need to use self-service, and 16 % consumers are discouraged from the use of services by their being automated.

The most commonly named advantages of self-service systems are the speed of service provision, unlimited availability, time savings, flexibility, avoiding of direct communication, and overcoming language barriers. As a disadvantage, the need to control the technology, difficult handling, insufficient instructions, insecurity, tiredness (they prefer to be cared for rather than expand energy to self-service), unreliable function of the system, worries of making a mistake when inputting data, and inability to resolve unexpected situations. Some respondents said that they used self-service systems out of curiosity, but for their next travel, they preferred to use the traditional service provided by human personnel.

Even though 60 % respondents said in one of the questionnaire phases their more or less negative attitude to technology, only 15 % are willing to pay more for a personal service, 33 % would certainly refuse to pay a premium for personal service, and 52 % were unable to decide on a general level, whether they would be willing to pay a premium for personal service and they would decide depending on the situation.

To identify factors influencing the attitude of consumers to the usage of self-service systems, correlation analysis was used. The most important factor with important dependency is, as expected, the respondent's attitude to modern technology in general (correlation coefficient 0.7). High correlation was shown also in the relation to the number of travels carried out (correlation coefficient 0.38). Dependency on demographic factors of age and residence was

shown in the mid-range (0.31, resp. 0.24). There was no correlation with sex (0.03). Age was recorded only in intervals, it is therefore not possible to determine, whether there is a border where attitude to technology in tourism significantly changes. The questionnaire showed that people need longer time to become acquainted with technology, learn to operate them and start trusting them.

The analysis shows that frequency of self-service system use is influenced by multiple factors, among the objective/external factors the following can be counted:

- how widespread this service type is;
- service type;
- length of time over which the service is being given;
- existence/accessibility of an alternative personal service.

Subjective/internal factors are:

- individual approach to technology;
- willingness and ability to operate them;
- travel experience.

5. CONCLUSION

Current academic discussion mirrors the development in the field of automation and robotization and they relate to the creation of new models in the industry. The vision of "Industry 4.0" in Germany, France as well as the Czech Republic includes the inclusion of technology, such as AI and robots, sharing networks or big data management. This concept emphasizes the strong impact on social and economic processes worldwide, both negative (disappearance of certain jobs, increased unemployment) and positive ones (increased productivity, new job creation, increased education).

Innovation of the tourism service offering is, as a result of the development and implementation of technology, very dynamic and is headed in the direction of increasing self-service systems. Close to two thirds of the respondents have already encountered self-service systems in tourism. It can be predicted from the presented study that increased reliance on technology and greater de-personalization of services can become an important barrier against their purchase, or a factor increasing the discomfort of tourist. Up to 42 % respondents prefer human personnel, and they have trouble coping with self-service or it causes them stress and discourages them from availing of the service.

Technology in the form of robots, androids and virtual reality overcomes barriers. People who cannot travel personally due to physical disability can travel virtually in real time with the assistance of VR robots. Innovative robotic systems bring new opportunities and options how to make travelling easier and improve the experience gained through it. However, the way in which the general public understands and accepts new technological solutions plays an important role in the development of automation and robotization. Conclusions of this study can be a call for more research into the impact of automated and robotized tolls on individual tourism stakeholders in the future, as well as other service sectors.

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