Innovative tourist products during the Industrial Revolution 4.0

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Abstract

It is considered, that Industrial Revolution 4.0 will dominate the economic sector in all areas of activity. In the literature on the subject technological changes are referred mainly to the manufacturing industry sector [Ślusarczyk, 2018, pp. 232-248]. However, this is a narrowing of the problem because in other sectors, even in the service sector, especially tourism industry, can also be observed a strong impact of new technologies that directly affect the creation of innovative tourist products. The aim of the research is to review innovative tourist products based on technologies 4.0.

Keywords

tourism, tourist products, Industrial Revolution 4.0

Introduction

It is recognized that the economic sector in all areas of activity will be dominated by the Fourth Industrial Revolution. It is based on four groups of new technological systems: nanotechnology, biotechnology, computerization and communication as well as cognitive technologies. The observed changes mainly refer to the manufacturing industry sector [An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy, 2016]. An important point of Industry 4.0 changes is the creation of self-sufficient and self-learning machines to improve the efficiency and management of production processes and shorten the time of placing on the market. The main goal of the introduced technological solutions is to improve the technologies and production process, as well as to meet the requirements related to research areas, development and ecology [Vaidya, Ambad, Bhosle, 2018, pp. 233-238].

1. Literature review

In the subject literature, it is noted that Industry 4.0 is primarily associated with improvements in the areas of:

- collecting and exchanging large amounts of data between enterprises via a computer network, computers and other devices. Improvements in this area allowed for the separation of Internet of Things and the concept of the Cloud. The Cloud concept makes it easier to store and transfer data between enterprises and people in general. It allows to store an unlimited amount of data and quickly download them, as well as transmission, achieving fast response time and saving it in decision-making processes [Vaidya, Ambad, Bhosle, 2018, pp. 233-238]. The effect of automation related to IoT was to exceed the number of people in the world with the number of connected Internet devices in 2008-2009 [Evans, 2011, pp. 2-3]. The most important features are optimization and ubiquity that relate to the flow of a lot of information [Vaidya, Ambad, Bhosle, 2018, pp. 233-238];
- processing of large amounts of data in general, their diversity, speed of generating new data and analysis, data values. The possibility of their processing streamlines the production process by faster detection of threats and forecasting possible future complications and selecting solutions. Big Data has already become a standard for not only production processes, but also business decision processes [Vaidya, Ambad, Bhosle, 2018, pp. 233-238];

- improvement of mechanics and automation in terms of precision and accuracy, directly related to the use of artificial intelligence and robot technology and the CPS (Cyber Physical System), which has the greatest use in transport by detecting machine failures and repairing them. The 5C structure combines through the use of the Cloud machine with the machine, as well as the machine with people. An example of this is an intelligent vehicle that uses the data mining method to predict the route with an accuracy of up to 80% [Vaidya, Ambad, Bhosle, 2018, pp. 233-238];
- reduction of production time and minimization of technological errors in the product testing phase, which is related to the use of 2D and 3D technologies. In addition, the use of simulation, reflecting the real world in the virtual space, affects the quality of the decision-making process and ergonomic aspects [Vaidya, Ambad, Bhosle, 2018, pp. 233-238];
- automation of production processes, which also means automation of communication and cooperation, in connection with system integration as well as self-optimization. These are the two main mechanisms used in the industrial sector [Vaidya, Ambad, Bhosle, 2018, pp. 233-238];
- improve efficiency in production processes through additive manufacturing. Decentralized spatial printing systems will help speed production and reduce costs. There are several techniques of this printout (e.g. *Selective Laser Sintering*, *Fused Deposition Modelling*, Selective Laser Melting) which, due to the growing digitization and penetration of technologies, are gaining in popularity and are developing quickly [Vaidya, Ambad, Bhosle, 2018, pp. 233-238];
- the proliferation of information systems in the field of science and life, which have never been examined by computer systems thanks to augmented reality. AR systems are based on adding advanced functionality to IT systems, mainly in tourism, marketing and medicine, constantly developing and creating innovative applications [Szymczyk, 2013, p. 261];
- making transactions between two parties that have never been in contact with each other before and entered into a contract without intermediaries through Blockchain. It is an integral agreement, adapting to specific conditions, thanks to which the implementation of this contract is efficient and proper. Incorrect familiarization with programming may harm the development of this technology [Hulicki, Lustofin, 2017, pp. 29-49].

Taking into account literature review, Industry 4.0 is directly related to technologies: Internet of Things, Big Data, Blockchain, augmented reality, stimulations,

system integration, artificial intelligence and additive manufacturing [AutomatykaB2B, 2017]. It is forecast that the result of the Fourth Industrial Revolution will be a large increase in the efficiency of companies and the emergence of new business models, services and products, including tourist products. We can observe a strong impact of new technologies that directly affect the creation of innovative tourist products [Bendkowski, 2017, pp. 22-24].

A tourist product in tourist services is subject to a purchase and sale transaction. It is made up of a set of goods and services produced and bought in connection with going outside the place of permanent residence, both before the start of the journey, while traveling and during the stay outside home town. It contains tangible and intangible elements, thanks to which the purpose of the trip is realized, and the consumer gets a feeling of satisfaction, as well as allows to provide economic benefits to the seller [Gołembski, 1998, p. 24; Kaczmarek, Stasiak, Włodarczyk, 2005, pp. 72-74].

There are several tourist product classifications in the literature on the subject. Tourist product is considered from the point of view of the entrepreneur and the area. The company's product creates a set (package) of services that will meet the needs of tourists and those that are sold in tourist enterprises. The tourism product of the area includes such elements as: natural and anthropogenic values, infrastructure and services of the destination, as well as its accessibility, image and price paid by the consumer [Middleton et al., 2009, pp. 120-123; Marcinkiewicz, Kowalski, 2012, pp. 49-50]. Another division divides a tourist product according to the types of goods and services used by a tourist in a tourist place, for goods and services for which tourism is a direct demand-generating factor, goods and services that meet the needs of residents and tourists [Marcinkiewicz, Kowalski, 2012, pp. 49-50]. A quite universal, generalized division of a tourism product is the division of a tourist product from the viewpoint of complexity. Distinguished are simple tourist products (thing, service, event) and complex tourist products (tourist party, object, trail, area).

Considering the above division, the tourist product – thing can function alone or exist as an addition to other products. They can be guides and tourist maps, tourist equipment, souvenirs. Currently, multimedia tourism products are being created in the Internet era (e.g. electronic maps, virtual guides). Tourist products – services include any activity that is not material when one party can offer something other. The service includes a single tourist service (e.g. hotel service, transport service, catering service and guide service). A tourist product – event can consist of several other products or operate independently. It is characterized by a specific spatial and temporal location, as well as thematic and organizational cohesion. It is characterized by unconventionality, and sometimes also cyclical. In addition, the event does

not include accommodation. The tourist product – tourist party includes a set of several services or material goods and services offered by tourism organizers (e.g. tourist agents or tour operators). In contrast to the event, the tourist party includes accommodation. The tourist party can be otherwise called a tour package or an all-inclusive party. A characteristic feature of the tourist product – object is the occurrence of one main attraction and several accompanying services occurring in one place (e.g. Bartek Oak, Church of Our Lady of Czestochowa, Marriott hotel). The tourist product - trail includes many places and objects concerning the superior idea and connected with the marked route. It may have interesting landscape values or a variety of tourist infrastructure located along the route. Examples of trails are: the Eastern Green Bicycle Trail, the Tatar Trail, and the Piast Trail. The tourist product – area is defined by a graphically determined collection of elements, located in a specific space and covering numerous tourist values. In addition to the sales focused on objects located in a precise location, the services of the tourist and paratourism base are provided [Kaczmarek, Stasiak, Włodarczyk, 2005, pp. 74-77; Oleksiuk, 2007, p. 124]. Currently, a tourist product is driving the global economy. The analysis of megatrends in tourism indicates that the development of the tourism product will be strongly influenced by the development of technologies, including digitization, automation, artificial intelligence, augmented reality and Blockchain [WEF, 2016], in particular because the digitization market is entering the tourist market [Yoon, 2019].

The above factors cause that the authors undertook to investigate the problem: Whether and to what extent the solutions characteristic for Industry 4.0 affect the development of tourist products.

2. Research methods

Realization of the research aim was carried out using the theoretical model of "Tourist Product 4.0". For the construction of the model, the literature analysis in the field of Industry 4.0 and the tourist product, and also the logical analysis method were used (Fig. 1).

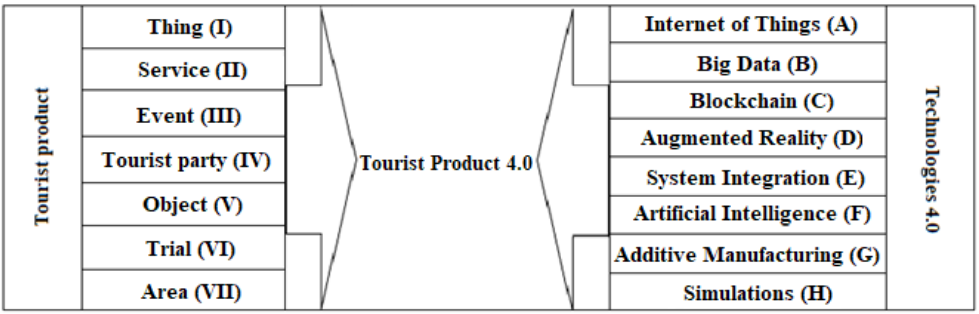

Fig. 1. Tourist Product 4.0

Source: author's elaboration on the basis of [Kaczmarek, Stasiak, Włodarczyk, 2005, pp. 74-76, 90; Polarczyk, 1971, pp. 197-198; Vaidya, Ambad, Bhosle, 2018, pp. 233-238; Szymczyk, 2013, p. 261; Hulicki, Lustofin, 2017, pp. 29-49].

The research was carried out in three stages. The first stage included a review of literature in the field of Industry 4.0 and the tourist product. On this basis, the theoretical model of logical analysis was built. In the second stage of the research, literature, industry journals and research reports were reviewed to identify innovations in tourism. The research was conducted by 28 students of Tourism and Recreation at the Faculty of Engineering Management at Bialystok University of Technology. 102 innovations implemented in the world in the tourism sector have been identified. The next research step using the grouping method was to assign innovation to one of the seven categories of the tourist product and their types and the one from eight analyzed technologies 4.0. The assignment of appropriate technologies for individual tourist products resulted in the division of innovative tourist products into collections with the same properties. As a result of grouping, sets of innovative tourist products compatible with modern technologies 4.0, defined as a Tourist Product 4.0, have been separated. The results were described and presented graphically.

3. Research results

102 innovations in the tourism sector were identified, out of which 87 innovations were selected, as 15 innovations turned out to be similar. As a result of grouping, there was no innovation in the tourist product – Area (VII) and the tourist product – Tourist party (IV). In the field of tourist product – Thing (I) 35 innovations were selected. In the field of tourist product – Service (II) 29 innovations were selected. In the field of tourist product – Event (III) 1 innovation was chosen. In the field of tourist product – Object (V) 19 innovations were selected. Two innovations

were identified in the tourist product – Trial (VI). Due to the different types of innovations related to each tourist product, the following methodology was specified. The tourist product – Thing (I) was divided into 4 types of innovations: tourist attractions (a) (3 innovations were selected), amenities for tourists (b) (7 innovations were selected), addition to other products through the use of technology to increase the quality of the offer (c) (7 innovations were selected), addition to other products through the use of smartphone electronic devices for communication and data processing (d) (18 innovations were selected). The tourist product – Service (II) was divided into 2 types of innovations: distribution service (e) (5 innovations were selected), recreational service (f) (24 innovations were selected). The tourist product – Event (III) was distinguished by one type of innovation: tourist attractions (g) (1 innovation was selected). The tourist product – Object (V) was also distinguished by one type of innovation: tourist attractions (h) (19 innovations were selected). The tourist product – Trial (VI) was also distinguished by one type of innovation: travel related amenities (i) (2 innovations were selected). Then, based on the theoretical model of "Tourist Product 4.0", individual innovations were qualified for eight technologies 4.0. In total, 33 innovations were collected corresponding to technologies of Industry 4.0, which is 37,9% of the researched innovations (Fig. 2). In the field of tourist product – Thing (I) and the type - addition to other products through the use of technology to increase the quality of the offer (c) one innovation was selected to the technology 4.0 – Internet of things (A), also one innovation was selected to the technology 4.0 – Blockchain (B), and another one innovation was selected to the technology 4.0 – Simulations (H). As before in the field of tourist product – Thing (I) but in the type - addition to other products through the use of smartphone electronic devices for communication and data processing (d) two innovations were selected to the technology 4.0 – Internet of Things (A), one innovation was selected to the technology 4.0 – Big Data (B), also one innovation was selected to the technology 4.0 – Blockchain (C), and another one innovation was selected to the technology 4.0 – Augmented Reality (D), eleven innovations were selected to the technology 4.0 – System Integration (E), and two innovations were selected to the technology 4.0 – Simulations (H). In the field of tourist product – Thing (I) and the types – tourist attractions (a) and amenities for tourists (b) no innovations matched to technologies 4.0. In the field of tourist product – Service (II) and the type – distribution service (e) one innovation was selected to the technology 4.0 – Internet of Things (A), and two innovations were selected to the technology 4.0 – Big Data (B). As before in the field of tourist product – Service (II) but in the type - recreational service (f) one innovation was selected to the technology 4.0 – System Integration (E), and three innovations were selected to the technology 4.0 – Simulations (H). In the

field of tourist product – Event (III) and the type – tourist attractions (g) no innovations matched to technologies 4.0. In the field of tourist product – object (V) and the type – tourist attraction (h) one innovation was selected to the technology 4.0 – System Integration (E), and three innovations were selected to the technology 4.0 – Artificial Intelligence (F). In the field of tourist product – Trial (VI) and the type - travel related amenities (i) one innovation was selected to the technology 4.0 – Simulations (H).

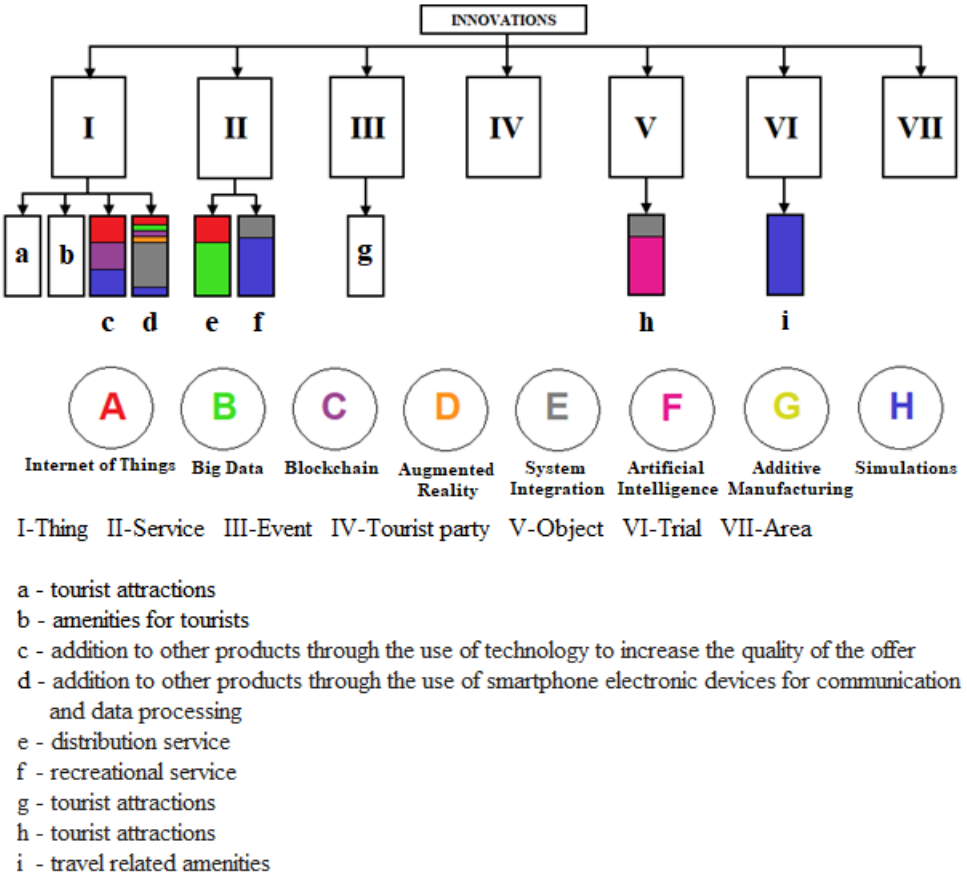

Fig. 2. Assignment of innovations to the technologies 4.0

Source: author's elaboration.

The grouping method demonstrated that to the technology 4.0 – Internet of Things (A) 4 innovations were assigned (12,12%). To the technology 4.0 Big Data – (B) 3 innovations were assigned (9,09%). To the technology 4.0 – Blockchain (C) 2 innovations were assigned (6,06%). To the technology 4.0 – Augmented Reality (D) 1 innovation was assigned (3,03%). To the technology 4.0 – System Integration (E) 13 innovations were assigned (39,39%). To the technology 4.0 – Artificial Intelligence (F) 3 innovations were assigned (9,09%). To the technology 4.0 – Simulations (H) 7 innovations were assigned (21,21%). No innovations were chosen to the technology 4.0 – Additive Manufacturing (G). In summary, the most innovations belong to the group characterized by technology 4.0 System Integration (E) (Fig. 3).

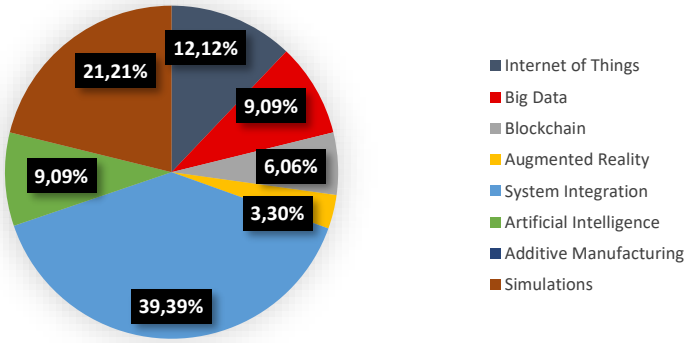

Fig. 3. Percentage figure of the amount innovations of each technologies 4.0

Source: author's elaboration.

Conclusions

Considering the growing number of innovations implemented in all economic sectors and the technologies that are developing in relation to them, there is a growing impact of technological changes that cover a wide range of tourist goods and services. The newly emerging technologies of Industry 4.0 decide about making the tourist experience more attractive and facilitating travel. The study shows that System Integration covers 33.9% of implemented innovations in the world in tourism, and using it in tourist products allows to combine different systems into a cohesive and efficiently functioning organism. In the case of tourism enterprises, it owes to the System Integration unlimited data flow and the use of the company's full potential with regard to improving customer service and reducing costs. Two other of the technologies of Industry 4.0, Simulations and the Internet of Things concept, are also

used to improve the offer and communication while creating tourist attractions and travel amenities. Other technologies of Industry 4.0 are not used in implemented innovations so often, because they constitute less than 10%. The tourism sector's innovation only in 1/3 is based on Industry 4.0 technologies.

Literature

1. Automatyka B2B (2017), *Przemysł 4.0 - technologie przyszłości* [*Industry 4.0 - technologies of the future*], https://www.automatykab2b.pl/temat-miesiaca/47534-przemysl-4-0-technologie-przyszlosci [25.05.2019]
2. Bendkowski J. (2017), *Zmiany w pracy produkcyjnej w perspektywie koncepcji „Przemysł 4.0"* [*Changes in production work in the perspective of the "Industry 4.0" concept*], Politechnika Śląska, Wydział Organizacji i Zarządzania, Instytut Zarządzania, Administracji i Logistyki, Śląsk 112, pp. 21-33
3. Evans D. (2011), *The Internet of Things: How the Next Evolution of the Internet is Changing Everything*, Cisco IBSG
4. Gołembski G. (1998). *Przedsiębiorstwo turystyczne w gospodarce wolnorynkowej* [*A tourist enterprise in a free market economy*], Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań
5. Hulicki M., Lustofin P. (2017), *Wykorzystanie koncepcji blockchain w realizacji zobowiązań umownych* [*The use of the Blockchain concept in the implementation of contractual obligations*], Człowiek w Cyberprzestrzeni 1, pp. 28-53
6. Kaczmarek J., Stasiak A., Włodarczyk B. (2005), *Produkt turystyczny* [*Tourist product*], Polskie Wydawnictwo Ekonomiczne, Warszawa
7. Marcinkiewicz C., Kowalski S. (2012), *Marketing turystyczny (elementy norm postępowania i etyki dla zarządzających)* [*Tourist marketing (elements of conduct standards and ethics for managers)*], Oficyna Wydawnicza „Humanitas", Sosnowiec
8. Middleton V.T.C., Fyall A., Morgan M., Ranchhod A. (2009), *Marketing in travel and tourism*, Elsevier, Amsterdam
9. OECD (2016), *Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy*, DASTI, Copenhagen. Retrieved from https://ufm.dk/en/publications/2016/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-context-of-future-research-policy
10. Oleksiuk A. (2007), *Marketing usług turystycznych* [*Marketing of tourist services*], Difin, Warszawa
11. Polarczyk K. (1971), *Wynik pracy podstawą definicji, klasyfikacji oraz sfery usług* [*The result of the work as a basis for the definition and classification of services and the*

sphere of services], Wydział Prawa i Administracji UAM, Ruch Prawniczy, Ekonomiczny i Socjologiczny 33(1), pp. 189-204
12. Szczepanowski A. E. (2012), *Markowe produkty turystyczne* [*Branded tourist products*], Polskie Wydawnictwo Ekonomiczne, Warszawa
13. Szymczyk T. (2013), *Wykorzystanie rozszerzonej rzeczywistości we współczesnych systemach informatycznych* [*The use of augmented reality in modern information systems*], Prace Instytutu Elektrotechniki, Politechnika Lubelska, Lublin
14. Ślusarczyk B. (2018), *Industry 4.0 – are we ready?*, Polish Journal of Management Studies, 17(1), pp. 232-248
15. Vaidya S., Ambad P., Bhosle S. (2018), *Industry 4.0 – A Glimpse*, Procedia Manufacturing 20, pp. 233-238
16. WEF – World Economic Forum (2016), *The Future of Jobs Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution.* World Economic Forum Survey Report, http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf [22.05.2019]
17. Yoon J. (2019), *Tourism and Technology: The Impact of Technology on the Tourism and Hospitality Industry* [Lecture PowerPoint slides], http://www.cf.cdn.unwto.org/sites/all/files/pdf/presentation1_the_impact_or_technology._updated.pdf [27.05.2019]