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DIGITALIZATION OF THE TOURISM INDUSTRY: WHAT ARE THE IMPACTS OF THE NEW WAVE OF TECHNOLOGIES

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Abstract: The aim of this paper is to examine the impact of the new wave of technologies in the hospitality industry. We use a qualitative method to examine the effects of industry 4.0 technologies on the hospitality sector and how these technologies can help to resolve challenges it faces. While the first wave of technologies was characterized by lower cost, a more integrated value chain and other facilities, the newest technologies go far beyond this. Hospitality industry 4.0 technologies have new facilities and will have more important and deeper impacts. They should lead to reductions in mass tourism, personalized services and sustainability. The hospitality industry was an early adopter of technology. Over the years, digitalization has changed this sector and is expected to have even more profound changes on it in the post-COVID world. The future hospitality will change radically based on increased use of industry 4.0 technologies and different consumer behaviour and preferences.

Key words: hospitality 4.0, personalization, mass tourism, sustainability, virtual travel, COVID-19

JEL classification: L83, Z3, R41, O3

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Introduction

The dynamics of technological transformations is promoting substantially greater computing capacity and consecutive waves of new technologies. The fourth industrial revolution or Industry 4.0 is transforming most industries and posing new challenges. Industry 4.0 technologies can be considered general purpose technologies (GPT) (Bresnahan and Trajtenberg, 1995; Helpman and Trajtenberg, 1998, Basu and Fernald, 2007). Most GPTs linked to information and communication technologies (ICTs) are produced in the industrialized countries and require adaptation to local users especially in developing countries (Bellon et al., 2007; Ben Youssef, 2020).

The tourism industry can be considered one of the world's largest industries, accounting for 10% of global GDP and jobs (WEF, 2020). The hospitality industry was an early adopter of digital technologies and digital platforms to enable computer reservation systems (CRS) in the 1970s, global distribution systems (GDS) in the late 1980s, and the Internet in the late 1990s (Buhalis and Law, 2008). Over time, the technology has improved greatly and is allowing more convenient purchase of tourism services at the lowest possible cost. The biggest advantage provided by ICTs is the access to reliable information, allowing the creating and sharing of knowledge among large numbers of people, and reducing costs while increasing efficiency (Mihajlović, 2012). Hospitality companies have gained from the use of technologies in terms of reduced costs, higher revenues, easier marketing research and database developments, and customer retention (Morrison et al., 1999).

However, the tourism industry is changing from hospitality industry to hospitality industry 4.0. Tourism is one of the most digitally mature sectors (Mc Kinsey France, 2014). The literature explores the links between the existing hospitality industry and the pillars of industry 4.0 such as the Internet of things (IoT) (Car et al., 2019; Kansakar et al., 2019; Nadkarni et al., 2019), virtual reality (VR) (Guttentag, 2010; Ja Kim et al., 2020; Nayyar et al., 2018; Wiltshier and Clarke, 2016), augmented reality (AR) (Kounavis et al., 2012; Nayyar et al., 2018), big data (Li et al., 2018; Nadkarni et al., 2019), artificial intelligence (AI) and robotics (Ivanov et al., 2017; Kuo et al., 2017). This body of work focuses on the transformations to the hospitality industry enabled by the application of industry 4.0 technologies.

The impact of the recent pandemic COVID-19 on the hospitality sector has been dramatic. There is no doubt that it will never return to how it was and the future of hospitality industry will be characterized by deep structural change. The cessation of tourism activities has increased use of digital technologies, and in the post COVID-19 world we can expect changes to tourists' use of tourism services and increased use of virtual reality.

The present study investigates the impacts of the new wave of technologies on the hospitality industry. It makes several contributions. *First*, it describes hospitality industry 4.0 and the technologies that are reshaping tourism; *second*, it examines the challenges the future hospitality industry will face and how hospitality industry 4.0 could reduce mass tourism, and allow personalized services and sustainability; *third*, it discusses what the future hospitality sector will look like in a post COVID-19 world.

The paper is organized as follows: section 1 presents hospitality industry 4.0 and the main technologies; section 2 describes how hospitality industry 4.0 could reduce massification, increase individualized experiences and increase sustainability; section 3 discusses the future hospitality industry and draws some conclusions.

1. Hospitality Industry 4.0: concepts and main technologies

The global tourism industry has benefited from three waves of technological change (Pease and Rowe, 2005; Shanker, 2008) which allowed CRS, GDS and use of the Internet to link business destinations and tourism companies. The evolution of the technology allowing the 4th industrial revolution is known as Industry 4.0 (Ivanović et al., 2017).

Hospitality industry 4.0 aims the creation of more personalized and digitalized services for consumers. It should reduce mass tourism and allow individualized experiences and sustainability (Ben Youssef and Zeqiri, 2020). Smart hospitality involves an interoperable and interconnected system that enables information sharing and provides added value for the entire ecosystem of stakeholders via digital platforms (Buhalis and Amaranggana, 2015; Buhalis and Leung, 2018). Industry 4.0 has changed the consumer behaviour regarding the use of hospitality services. According to Buhalis and Leung (2018), smart hospitality will put customers at the centre of the process by providing personalized and contextualized services and experiences and will allow the exchange of information along the value chain. Further, Ben Youssef and Zeqiri (2020) emphasize that consumers will benefit from a digital environment that will allow them to engage in various activities using digital technologies. Consumers are no longer satisfied by provision of essential facilities and the hospitality sector must change to meet their expectations.

Ben Youssef and Zeqiri (2020) argue that CPS, the IoT, AR, VR, AI and robotics and big data are aspects of industry 4.0 that will affect the hospitality industry. The interconnection of Industry 4.0 technologies can be achieved through the use of horizontal, vertical and end-to-end system integration tools along the value chain (Ben Youssef, 2020). Table 1 provides a description of these technologies and their use in the hospitality sector.

Table 1. Main pillars of hospitality industry 4.0

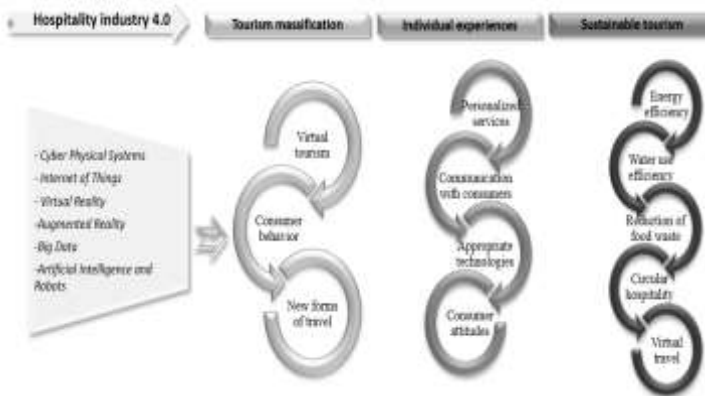
Authors	Pillar	Description of the technology	The technology in hospitality industry
(Lee et al., 2015)	CPS	CPS are defined as integrated and interconnected physical and virtual arrangements based on computation, communication, and control systems.	CPS consists of two aspects: first, interconnection of the physical and cyber worlds which enables access to the real-time data; second, smart data management, analytics and computational capability.
(Munir et al., 2017); (Kansakar et al., 2019)	IoT	IoT involves interconnectivity among physical devices and cyber worlds.	IoT enables interactions with tourists and collection of real time tourist data, thus creating personalized and localized services, and accurate evaluation of tourists' behaviors and preferences.
(van Kreveken and Poelman, 2010); (Kounavis et al., 2012)	AR	AR involves the combination of real and virtual objects in a real environment, synchronization of real and virtual objects, and interaction in 3D and real time.	AR provides tourists with more personalized services and several additional benefits. It enables tourists to share and exchange information and opinions with other tourists in large networks.
(Desai et al., 2014); (Wiltshier and Clarke, 2016).	VR	VR simulates reality. VR is "a computer simulated (3D) environment that gives the user the experience of being present in that environment".	VR provides people with opportunities for virtual travel with a low cost and contributes to sustainable tourism.

(Ben Youssef and Zeqiri, 2020); (Buhalis and Leung, 2018)	Big data	Big data analytics are related to recent technological developments, which cope with the data processing and analysis.	In the hospitality sector, big data include internal and external big data. Data can be classified based on their characteristics and type, and hospitality ecosystem actors can access and use these data to prepare strategic business plans and manage their operations in a dynamic way.
(Tung and Law, 2017); (Horváth and Szabó, 2019); (Ben Youssef and Zeqiri, 2020)	AI and robots	AI and robots are used in workplaces to maintain contact with people in a shared non-industrial environment and can replace humans in R&D activities.	AI and robots are used in the hospitality sector to create more personalized and unique experiences, for instance at traveller information centres in the airport.

2. The main challenges that hospitality industry 4.0 technologies can help to be resolved

The main challenges that hospitality industry is facing are mass tourism, creation of personalized services for consumers and sustainable development (figure 1). The implementation of hospitality industry 4.0 technologies should help to resolve these challenges.

Figure 1. Challenges that hospitality industry 4.0 technologies can help to be resolved



2.1. Tourism massification and hospitality industry 4.0

The extreme concentration of tourists in a country is one of the characteristics of mass tourism which can lead excess tourists in the country which in turns leads to loss of attractiveness as a tourist destination. Mass tourism depends on the sheer number of tourists in the local population (Theng et al., 2015). In many areas, mass tourism has resulted in environmental pollution, changes in rural areas, changes to dwellings in urban areas, migration, etc. These variations are prompting the search for new solution and new ways such as alternative tourism (Akis, 2011) based on the implementation of new technologies.

The opportunity to experience real-time travel via drone, satellite and other technologies could have major effects on the hospitality industry and result in new forms of travel. Virtual travel would help to reduce mass tourism and travel although it will be depending on consumers' perception of the technologies and level of satisfaction with virtual travel as a substitute of real travel and physical presence in a destination. Virtual reality is likely also to affect travel planning allowing visits to museums, castles, galleries and other destinations before making the decision to travel physically. Industry 4.0 has much to offer to the hospitality industry. However, it will not resolve the problem of mass tourism unless consumers and the industry are fully engaged in the process.

2.2. Creation of individual experiences

The focus of some studies is on unusual (Farber and Hall, 2007; Jefferies and Lepp, 2012) and unforgettable experiences (Curtin, 2010; Kim, 2010; Tung and Ritchie, 2011). A memorable experience by nature is unforgettable and tourists put huge value on individual experiences despite their expense. Creating and offering unforgettable experiences for tourists provides tourist companies with a competitive edge. The tourism experience varies but extraordinary customized experiences are "exceptionally vivid and long lasting" (Kim, 2010, p. 781). Curtin (2010) emphasizes that future expectations and behaviors are based on consumers' memories of previous experiences.

Relationships between customers and companies are changing in favor of the consumer who is gaining increasing power and control and the most important trend is the creation of personalized services for consumers which is being facilitated by hospitality industry 4. In the past, tourism companies deleted data because of limited storage capacity; however, the emergence of big data allows collection and transformation of data from numerous sources. These large data sets are used to identify customer behavior patterns and allow creation of individual tourist experiences. Collection and application of data is the key for companies to the ability to target consumers and offer them customized services. Airlines, travel agencies and hotels own huge amounts of data on consumers and their behaviour in interactions with hospitality services. However, to better understand consumers' attitudes and how they share their experiences with others, requires information from other resources. Customer attitudes and beliefs are critical for building relationships with customers and creating personalized services. Communication between customers and companies allow the customer to be heard and to be at the centre of the process.

Alongside these developments, AI, the IoT, VR and AR are facilitating close engagement with consumers which leads to loyalty to the particular company. These technologies allow collection of information on people's daily lives, their TV program preferences, likes on Facebook, etc. Purchases using credit cards and searches on Google, along with activities engaged in using or carrying a mobile phone allow data to be stored (Gelter, 2017). However, their interpretation requires some investment in appropriate technologies. The services enabled by technologies include automatic room temperature adjustment, TV controls, control of lighting, wake up calls, self-hotel check-ins and check-outs, robot assistance at airports and virtual tours. In nearly all cases, the technologies are not stand alone but are implemented as a set to ensure transformation of traditional business into business 4.0 and to provide consumers with the best individual services and experiences.

2.3. Sustainable hospitality

Sustainability is one of the challenges facing the hospitality industry. Sustainable tourism is becoming a priority for many countries around the world. Tourism accounts for 5% of global carbon emissions (Peeters and Dubois, 2010) with transport the main contributor accounting for 75% of carbon emissions in this sector (UNWTO et al., 2008). Of this 75%, air travel accounts for 40% (Gossling, 2009).

Industry 4.0 technologies are considered environmentally-friendly and one of the solutions to achievement of sustainability. Ben Youssef and Zeqiri (2020) propose five ways that hospitality 4.0 can help to achieve sustainability: increased energy efficiency, more efficient use of water, reduced food waste, circular hospitality and use of virtual reality to reduce transport and travel.

Shifting from non-renewable to renewable energies must be a priority for the accommodation sector to achieve greater energy efficiency and implement sustainable practices. Smart hotels are using smart lightning, temperature adjustment devices, smart showers, smart sinks, smart laundries, etc. which are allowing more efficient use of energy and water. Further, implementation of smart meters in hotel kitchen and restaurants and other related tourism businesses would help to reduce food waste. Already, various smartphone applications gather information on consumer preferences to allow offers of appropriate food in the desired quantity (portion size).

In the case of transport, use of VR could help to reduce travel and achieve sustainability. VR (Dewailly, 1999) provides a low cost and environmentally friendly way of "traveling" (Wiltshier and Clarke, 2016). Hospitality 4.0 could enable tourist spaces that do not harm the environment, innovative transportation means, and virtual tours, and contribute to the preservation of cultural heritage.

3. The future of hospitality industry 4.0

COVID-19 is a new infectious disease first identified in December 2019 in Wuhan, capital of China's Hubei province. It spread quickly across Asia and then the world, causing a global public health crisis. As a result, all industries are experiencing huge losses. The hardest hit sectors include hospitality which is suffering from the drastic

fall in the flights, cancellation of trips and events and closure of tourism activities. According to the World Tourism Organization (2020) global international tourist arrivals could decline by between 60% and 80% in 2020.

When the economy starts to recover and tourism activities reopen, the hospitality industry will look different and will include increased use of hospitality industry 4.0 technologies and changes to consumer preferences (Ben Youssef et al., 2020). During lockdowns when people were asked to stay at home to prevent the spread of COVID-19, technology has been a vital tool. Many people are working remotely, using videoconferences, and engaging in virtual tours. Virtual tourism allows for more environmentally-friendly “travel” and it is possible that people might prefer this to avoid long trips and multiple contact in airport hubs.

To remain relevant, many hospitality companies are offering more online services and allowing virtual visits to museums, galleries, exhibitions, castles, zoos, aquaria and other destinations. Digital strategies are filling the gap left by the ban on travel for tourism. In the future, the hospitality industry will depend even more on digitalization and new technologies.

Conclusion

This paper has examined the impact of industry 4.0 in the hospitality industry. Using a qualitative analysis, we examined the effects of industry 4.0 technologies on this sector and how they can help to resolve the challenges faced by the hospitality sector.

The first wave of technologies decreased the costs of travel and flying in particular, reduced hotel, travel agency and tour operators’ costs. They also allowed tourists to search for information and to book online without the need to visit a travel agent. The most recent technologies are providing solutions to problems related to mass tourism, and enabling tailored experiences and sustainability. Therefore, their implementation and use are benefiting both consumers and companies and changing the structure of the hospitality sector.

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