

ICT Pandemic Time Adoption via Immersive Technologies: A Comprehensive Review

Ali Yuce
Cappadocia University, Turkey

ABSTRACT

The tourism industry is a driving force for the global economy. Immersive technologies create powerful opportunities for the products and services of the tourism industry. The convergence of tourism products with advanced technology has a notable impact on business growth, lowering the operational marketing and training costs, and finally, remarkably influencing the consumers' perception of their choice of destinations. Technology is also an essential instrument for the travel and hospitality industry during hard times, such as the novel COVID-19 pandemics, which caused a sudden and sharp interruption in business and private environments. The business owners and labor force have suffered drastically owing to the pandemics. Immersive technologies have vast potential for sectoral growth and present an alternative digitalized tourism environment for all but especially tourism-dependent destinations. Early adopters of advanced technology have had a greater opportunity to recover from the severe economic damages. Yet, there is an urgent need to discover how immersive technologies helped companies survive the pandemic. Hence, it is essential to understand the immersive technology's epistemological aspect to rip the benefits of the technology-enabled marketing solutions and create alternative tourism approaches when faced with unprecedented challenges.

Keywords: COVID-19, Immersive Technology, Information and Communication Technologies, Virtual Reality, Tourism, Digital Innovation, Digital Tourism

INTRODUCTION

Tourism is a vital economic activity, particularly for emerging economies. Many developed or developing countries depend on tourism revenue to drive their economies. Tourism has grown rapidly and gradually (except the global pandemic COVID-19 period) over the past several decades (Yuce, 2021). Tourism significantly impacts overall economic growth as a major source of foreign exchange earnings that enhances livelihoods and improves citizens' living standards in developing and developed countries (Hidalgo, Martín-Barroso, Nuñez-Serrano, Turrión, & Velázquez, 2022). According to the World Tourism Organization (WTO), tourism is the third-largest industry which accounts for 7% of the global trade while creating a large portion of (one in

ten jobs) employment worldwide (UNWTO, 2020). Yet, despite the increasing visiting number and expectations about overall improvement in the tourism industry by 10% during the post-corona era, tourism businesses feel competitive pressures to increase their productivity and efficiency while reducing operational costs.

On the other hand, besides natural disasters and political crises, pandemics and epidemics also negatively impact businesses, individuals, and societies. Suffice it to say that the novel COVID-19 has proved one more time that tourism is a highly sensitive industry, which is hardest hit one, towards the external harmful events such as political, economic crises, and disaster and pandemic (Gretzel et al., 2020; Hidalgo et al., 2022; Zhong, Sun, Law, & Li, 2021). Although the tourism industry faced challenges with the previous numerous disasters and pandemics, COVID-19 has caused more severe challenges due to the uncertain duration, magnitude, speed, and prevalence of the pandemic, particularly in the tourism industry, which relies on the mobilization of its consumers. UNWTO (2020) reports that tourism originated export revenue (between \$910 billion and \$1.2 Trillion) lost could reduce the global GDP by 1.5% to 2.8% in 2020. The impact of COVID-19 can be assessed by investigating from several dimensions to the tourism industry as a whole and from business, employees, and tourist perspectives. All these aspects are crucial to providing helpful strategies for all the shareholders in the tourism industry.

COVID-19 had a significant negative impact on the tourism industry (Gössling, Scott, & Hall, 2020; Karatepe, Saydam, & Okumus, 2021). One of the first and the most vulnerable effect of the COVID-19 was widespread business closures due to travel restrictions, strict lockdowns, and isolations during the coronavirus pandemics (T. Baum & Hai, 2020; Gössling et al., 2020; Karatepe et al., 2021; Ntounis, Parker, Skinner, Steadman, & Warnaby, 2021; Park, Kim, & Kim, 2020). In particular, as the duration and prevalence of the pandemic last in a longer period, its negative impact also gets more vulnerable to businesses of all sizes. The majority of the current studies report that the tourism industry is also suffering to respond and survive during the COVID-19 pandemics (Mao, He, Morrison, & Andres Coca-Stefaniak, 2020; Sharma, Shin, Santa-María, & Nicolau, 2021). COVID-19 put the businesses, whether small, medium, or large-sized enterprises, viability or sustainability at great risk in terms of mandatory closing the hotels and accommodations restaurants temporarily or permanently. According to recent studies, the consequences of the pandemics have been hurting the tourism-dependent country economies heavily. Hence, one of the most crucial elements that can protect the businesses' long-term survival requires several measures such as solidarity among business owners, tourism employees and their unions, and governmental support. A study suggests that organizations can attract tourists by offering more services with lower fees to ensure that the businesses survive pre and post COVID-19 pandemics (Lai & Wong, 2020; Neuburger & Egger, 2021; Ritchie & Jiang, 2019). Another approach that can help organizations confront economic-related concerns and hardship is transforming the classical business operation into a digital platform where businesses can serve year-round (Dantas et al., 2021).

From the labor perspective, millions of employees and their families have already relied on low and irregular wages have already been suffering from extremely long working hours, living in poor conditions, and lacking labor and social rights. Jiang and Wen (2020) and Hang, Aroean, and Chen (2020) stated that COVID-19 did not only damage traveling at the local, national and international levels, but it also had significant emotional outcomes on an individual level. Some of these detrimental consequences are such as disappointment and anxiety employees owing to the fear of losing being transmitted of virus and losing the loved ones, and other traveling restrictions (Jungmann & Witthöft, 2020; Karatepe et al., 2021; Landi, Pakenham, Boccolini, Grandi, & Tossani, 2020). UNWTO (2020) also asserted that COVID-19 had placed 100 to 120 million direct tourism jobs at risk. This severe impact threads the employees' livelihoods and their psychological well-being in the long term. The Covid-19 pandemic-based stress and uncertainty of the future are closely associated because those mentioned above the escalated high risk of virus transmission threatens the economic affairs in the tourism industry and causes mental health issues of the tourism employees. COVID-19 stress has caused various challenges and dramatic afflictions among individuals and organizations because of the growing fear of uncertainty and lack of efficient diagnosis and treatment procedures in current epidemiology despite available numerous vaccination and other preventive measures (Gretzel et al., 2020; Karatepe et al., 2021; Neuburger & Egger, 2021).

On the other hand, from the consumer perspective, tourism has a significant correlation with the employment rate across the world. In addition to a massive negative impact on organizations' millions of employees, travelers have also suffered and experienced severe traumatic grounded mental health issues due to the socio-economic hardship and uncertain future due to direct or indirect exposure to the most recent pandemic called SARS-2 or COVID-19. According to the Forum (2021), Devastating COVID-19, as one of the most recent disasters, has been jeopardizing the existence and well-being of people while it places all sizes of organizations' survival at a particular risk around the world (Karatepe et al., 2021; Sara A. Cloonan, 2021). People have not traveled since the beginning of these pandemics due to flight cancellations. Besides the negative impacts of coronavirus on various industries, it also undermines people's psychological resources worldwide. COVID-19 has altered tourists' visiting approach and behavior significantly. Unlike previous disasters and crises, the pandemics' duration and vagueness have forced individuals to use alternative strategies such as information communication technologies (Yeh, 2021).

BACKGROUND

COVID-19 and ICT Impact of Digitalization on the Tourism Industry

As noted above, the COVID-19 pandemic halted many businesses, resulting in devastating financial costs around the globe (Dantas et al., 2021). The tourism sector has direct, indirect, and induced benefits on many economies. Besides the business owners of all sizes of the companies, employees also try to cope with the disrupted income sources and livelihood while discovering alternative strategies to recover from the traumatic emotional disorder (Dube, Nhamo, & Chikodzi,

2021; Kapoor, Yadav, Bajpai, & Srivastava, 2021). Moreover, the tourism industry has been experiencing a dramatic down (87%) in 'tourist arrivals numbers in January 2021 compared to 2020 January (UNWTO, 2021). At this point, transforming the tourism services into a digital platform using the right, effective, and adaptable digital mediums can overcome most of these challenges. Within the context of tourism, the expansion of technology plays a key role in creating enormous opportunities for the supply and demand sides of the tourism industry.

The role of information and communication technologies in the tourism area has been significantly changed even quickly during the past several decades, particularly with the emergence of the 4th Industrial Revolution (Gonzalez, Gasco, & Llopis, 2020; Law, Buhalis, & Cobanoglu, 2014). Digitalization has been recognized as one of the greatest opportunities to achieve organizational goals and improve customer satisfaction in the tourism industry landscape (J. Lee, Cameron, & Hassall, 2019). In the rapidly changing travel and hospitality industry, the growth of transportation, logistic, distribution, and promotion of goods and services have been paralleled by the digital transformation. In response to the pandemic-related disruption, businesses have undergone radical changes in the transformation of their infrastructure.

Businesses in almost all industries, especially the service sector, whether they are technology adopted or not, grapple with the delirious effects of COVID-19. However, technology is an effective alternative approach to curb the damaging effects of the pandemics and helps them for economic recovery in the eye of pandemics (Yuce, 2021). As noted earlier, unprecedented COVID-19 negatively and dramatically impacts socio-economic, psychological, and physical well-being and the high risk of business' sustainability (Dube et al., 2021; Karatepe et al., 2021). Although vaccination efforts helped control the speed of COVID-19 among individuals, it continues threading the organizations' viability at great risk due to sole dependency on tourism affairs. ICT has unmeasurable benefits for the business to respond, maintain and revive from the economic failures of this vicious pandemic (Gretzel et al., 2020). Technology helps them by providing adaptable and adaptable approaches, knowledge, and ability to improve the organizations' and employees' productivity and instant and enhanced communication accessibility and creating effective marketing styles to all contemporary workplaces. Technology does not only help organizations to be reborn from unprecedented disasters of any kind, such as pandemics, but it also supports them in maintaining and strengthening their economic existence in the highly competitive tourism industry in a post-COVID-19 era (Abbas, Mubeen, Iorember, Raza, & Mamirkulova, 2021; Islam, 2021; Sharma et al., 2021).

Digital transformation and innovation

Digital transformation has begun during Industry 3.0, which refers to the third industrial revolution, and since then, it has been the primary parameter of economic growth and catalyzer for globalization (Adeyeri, 2018). With the development of sophisticated **information and communication technologies (ICT)**, digitalization has accelerated postindustrial society's

transformation and led to the emergence of digital-age society (Martins et al., 2017). Digitalization's vitality has been recognized and considered as the most important dimension of Industry 4.0 (Ghobakhloo, 2020; Silvestri, Forcina, Introna, Santolamazza, & Cesarotti, 2020), which refers to the fourth industrial revolution and Society 5.0 (Fukuyama, 2018), a human-centered society in which virtual and physical spaces are proximate. Industry 3.0 heavily consisted of an automated process by implementing smart ICT.

In industry 3.0, there has been little room for human involvement in producing services and goods. Apart from Industry 3.0, Industry 4.0 aims to eliminate human intervention due to the comprehensive autonomous integration of Cyber-Physical Systems (CPS) (Pivoto et al., 2021; Zanero, 2017) and highly sophisticated technologies such as Artificial Intelligence (AI) (Lv, Chen, Lou, & Alazab, 2021), machine and deep learning technologies (Neshat, Moayedfar, Rezaee, & Amrollahi Biuki, 2021). The historical and technical aspects of the Society 5.0 and Industry 4.0 are beyond the concept of this study. Therefore, we will focus on the features and role of immersive technologies in the tourism and hospitality landscape in the following sections.

There has been confusion on the definition of digital transformation, digitalization, and digitization terminologies in the extant literature. *Digitization* (Ghobakhloo, 2020) refers to converting analog data or physical objects into digital data sets or digital representation. *Digitalization* (Filipiak, Dylewski, & Kalinowski, 2020) is a process of integrating various and existing technologies in social, private, and workplace platforms. Digitalization presents numerous benefits for companies that adopt and keep up with it to unleash business and employee potential, lowering operational costs while improving customer satisfaction (Filipiak et al., 2020; Sharma et al., 2021). On the other hand, *digital transformation* differs from the antic approaches and systems regarding the solutions they used to produce for business operations and marketing (Yuce, 2021). Digital transformation is a phenomenon that integrates sophisticated digital technologies that present instant and faster information/knowledge to the users/consumers compared to the old-fashioned methods, applications, and tools such as radio, brochures, and newspapers (J. Lee et al., 2019; Parviainen, Tihinen, Kääriäinen, & Teppola, 2017; Schweer & Sahl, 2017). There is no doubt that with the future digitalization-driven innovations, digital representation of tangible and intangible non-digital information and objects will be converted and presented to individuals with more sophisticated technologies at a light speed.

Main FOCUS OF the CHAPTER

Issues, Controversies, Problems

Many industries have experienced a significant loss; however, as noted above, the tourism industry has been one of the most suffering service sectors during the most recent catastrophic events of COVID-19 epidemics (Hidalgo et al., 2022; Karatepe et al., 2021; Neshat et al., 2021). Despite the

devastating toxic effects of COVID-19, some companies that have completed and embraced the digital innovation process using the most recent digital innovative technologies and the knowledgeable employees have provided a safe, healthy, and flexible virtual environment during the increased complexity and uncertainty of the tourism sector (Abbas et al., 2021). While businesses engage with inclusiveness, they strive to embrace technology's unprecedented newer transformational power (Gretzel et al., 2020). Transformational power is one of the most notable features of digitalization since digital transformation allows organizations and societies to form a new model of business and life.

From the traveling perspective, advanced digitalization has been a driving force for business efficiency and sectorial transformation in the landscape of tourism. Digital transformation allowed some tourism organizations such as museums and historical areas to transform their walk-in-based classical business approach to the digitalized business-driven virtual platforms (Errichiello, Micera, Atzeni, & Del Chiappa, 2019; H. Lee, Jung, tom Dieck, & Chung, 2020). Digitalization in a business environment refers to the ability and capability of bringing digital technology into the workplace. Moreover, digitalization creates and offers considerable benefits and helps tourism-dependent organizations ensure business stability, sustainability, and growth in a very fragile and highly compatible tourism marketplace (Sharma et al., 2021).

Innovation is another crucial concept that requires public or private organizations, companies, and businesses of all sizes to succeed in their organizational goals and remains compatible in their socioeconomic spheres (Sharma et al., 2021). On the one hand, innovation aims to introduce fundamentally new and visional ideas, methods, and approaches that provide novel guidance and solutions to make revolutionary changes and help create or add remarkable value in a private, public, or business environment. In this context, although there is no common agreement on the definition of innovation, it can be defined as 'innovation is an idea that goes beyond renovation process which produces notable and, valuable outcomes for individuals, business and society. On the other hand, technological innovation is a process of implementing either the newest technologies or significantly newer and much superior versions of the current technologies, but displacing the previous ones and making revolutionary changes in the workplace (J. A. C. Baum, 2001). Technology-driven innovation serves as a locomotive for the tourism organization to leverage its business capacity and performance while helping to establish a sustainable development position in the very competitive and fragile travel industry. Technological innovations have enormous potential to help organizations to survive during hard times.

Immersive technologies: Virtual reality and augmented reality

Immersive technologies have elicited remarkable digital transformations that create novel business operations improvements, lower operational costs, sectoral growth, and consumer satisfaction (Loureiro, Guerreiro, & Ali, 2020; Marasco, Buonincontri, van Niekerk, Orlowski, & Okumus, 2018; Yuce, Arasli, Ozturen, & Daskin, 2020). With the most recent technological innovations,

immersive technologies have become integrated with our personal lives and workplaces (Atzeni, Del Chiappa, & Mei Pung, 2021; Beck, Rainoldi, & Egger, 2019). Individuals enjoyed experiencing virtual, real, or mixed environments through immersive technologies. Moreover, businesses have taken significant advantages and benefits by implementing these new innovative technologies to improve business outputs and increase visitor satisfaction with the newest business insights, ideas, and concepts in the tourism industry (van Nuenen & Scarles, 2021; Wortley, 2013). Due to the remarkable similarities and the lack of clarity and familiarity of the immersive technologies, people often confuse the functionality and definition of the VR and AR technologies (Beck et al., 2019). However, there are differences between these two immersive technologies, which integrate the real-world physical environment with the stimulated location using virtual devices and platforms (Beck et al., 2019; Weber-Sabil & Han, 2021).

Virtual reality and virtual tourism and virtual workplace

Although modern Virtual Reality (VR), with its mobilized head-mounted displays (HDM) using smartphones, is in its early stage of development, it has become a fundamentally effective marketing tool of the tourism industry for the past several years (Guttentag, 2010; Lu et al., 2021; Yuce, 2021). Virtual Reality has been one of the leading emerging technologies convincing and inspiring potential travelers towards the destinations with its unique features (Flavián, Ibáñez-Sánchez, & Orús, 2021). Virtual Reality has wholly revamped tourism products delivery and turned into a mobilized environment where potential consumers could visit the destinations while sitting on their couches due to the advanced telepresence functionality of the latest VR technology (Lu et al., 2021). As noted above, telepresence or sense of presence is the backbone characteristic of virtual reality technologies. Furthermore, as its implementation has been flourishing, VR's notable impact in developing sustainable tourism has also been discovered over the past few years.

Virtual Reality has been an innovative resource to the tourism industry to transition from a classical marketing approach to the most effective technological solutions. VR enables high-quality 2D or 3D authentic images or real videos to present instant access to a broader population and at speed light. Virtual Reality also provides more significant customer satisfaction than other technologies because of its 'try before you buy option, convenience for accessibility, and interactive engagement with the immersive content (Guttentag, 2010; Yuce et al., 2020). Furthermore, VR changes how tourism works; in a traditional tourism business, consumers must be mobilized from their homes to a destination to experience a tourism product. However, virtual reality technology converts the tourism services and products into a virtual environment which expands the accessibility of these resources to a broader layer of the society by taking the tourism products to the people's homes.

Business owners, authorities, and consumers have been interested in how to experience a depicted environment in which as if they are present virtually during the simulation. Virtual reality is among one of the most used innovative technologies in the past few decades, even though the root of the VR idea goes back to the 1930s. VR technology depends on computer-generated 360-degree simulations through images or videos, creating highly immersive direct and intuitive user

interaction (Bricken & Byrne, 1993). With the advent of the invention of VR headsets, the feeling immersed has been increased at a greater level, which led more realistic and exciting experience for the users (Beck et al., 2019; Yuce et al., 2020). Besides VR headsets, developers have also been working on even more cutting-edge innovative technologies and interactive devices such as gloves and bodysuits that stimulate and capture the user at a level that allows the user to feel as if they are in a realistic environment. If we need to give an example, someone can feel like they are in a hot balloon over the antic Cappadocia area while having dinner in another part of the world. This example or type of experience might have sounded futuristic or an unbelievable science fiction before the digital era began. However, immersive technologies create such a sense of presence in a simulated location as real as possible (H. Lee et al., 2020). Hence, the increased telepresence or sense of presence-based experience via immersive technologies makes this technology a unique and more promising digitalized tool for businesses of all sizes in all sectors (Wortley, 2013; Yuce et al., 2020).

Digital tourism using VR and AR

VR is one of the most effective and promising marketing tools that present numerous benefits, such as entertainment activity for destinations and businesses in boosting their performance, creating more favorable and substitutable destinations, and improving their competitiveness in global tourism commerce (Guttentag, 2010; Lu et al., 2021). As already mentioned, VR is an inclusive technology that removes the accessibility barriers and excludes tourism resources due to the physical, financial, or other challenges individuals encounter. Furthermore, VR offers opportunities to maximize tourism business potential while reducing the cost of supply and demand sides and enabling the accessibility of the tourism contents affordably and conveniently (Flavián et al., 2021; Yuce, 2021). The majority of the studies report a significant positive correlation between VR technology and consumers' perceptions of destinations.

The majority of the current studies also posit the importance of digital transformation in immersive technologies. According to these studies, advanced immersive technology has been a transition phenomenon from a traditional marketing strategy to a postmodern approach that encourages, motivates, and satisfies the potential consumers towards a particular tourism product or service. From the postmodern marketing perspective, digital transformation in tourism changes the production technique, system and delivers value to customers quickly and effectively regardless of the accessibility issues. In this context, with the advent and implementation of VR technology into the tourism industry, many destinations have used VR as a sophisticated marketing substitution device to appeal to the potential visitors' destination preferences and influence their choice attitude. In particular, due to constant advancements in immersive technologies, innovative hardware and software development have played a game changer role in the service and marketing landscape.

Moreover, as innovation in technology advances, most devices, including phones and computers, got smaller and their overall efficiency in speed, performance and usability increased even at a

greater level. For example, the integration of mobilized wearable virtual glasses and cellphones using the VR applications through the various online stores helped a significant achievement in the tourism field. Unlike the applicability of VR technology in the context of the tourism industry, characteristics of AR technology does not allow the users to experience the virtual tourism options while people have been lockdown in their houses during the COVID-19 (Gössling et al., 2020; Lu et al., 2021; Sigala, 2020). Nevertheless, AR technology's impact on users' perception and intention to visit a destination and marketing purposes should not be underestimated.

SOLUTIONS AND RECOMMENDATIONS

As a result, immersive technologies have enormous potential and can help organizations revive from the coronavirus pandemic's ashes (Lu et al., 2021). While the socio-economic cost rises due to the coronavirus pandemic, organizations strive to minimize the loss of their human and fiscal resources with a greater investment in technology. However, the most appropriate and cost-effective information community technologies (ICT) can be a key element in recovering from the pandemics' short-term, medium, and long-term harmful effects.

CONCLUSIONS AND FUTURE WORK

ICT has been the major factor that helped world trade, in terms of large firms, remain on track during the COVID-19. Yet, small and medium-sized businesses (SMBs) have not proportionally benefited from the technology-oriented developments in the face of unprecedented COVID-19 (Forum, 2021). Hence, as stated earlier, small businesses need to adopt technologically oriented strategies to overcome the long-term negative effects of pandemics and crises before jeopardizing their business sustainability or survival.

In particular, immersive technologies have vast potential for sectoral growth and present an alternative digitalized tourism environment for all but especially tourism-dependent destinations. Hence, it is essential to understand the immersive technology's epistemological aspect to rip the benefits of the technology-enabled marketing solutions and create alternative tourism approaches. In this context, by implementing advanced immersive technology with cutting-edge and adaptable applications, the tourism sector will effectively confront the crisis, overcome the hardships, and endure the challenges during hard times, such as the unprecedented COVID-19 outbreak. Organizations and entrepreneurs should understand and meet the dynamics and nature of society's constant changes and tourist behavior. They must adapt to the most innovative technologies to enrich their potential and deepen an engaging customer experience. Implementation of VR or AR technology also helps organizations continually transform their business operations according to the consumers' changing behaviors, expectations, attitudes, and motives regardless of how technological transformation can be disruptive and entails unprecedented adaptation challenges. Therefore, this study suggests that investors consider VR and AR technologies that enable postmodern alternative approaches away from classical marketing strategies.

To shed further light on the impact of immersive, innovative technologies developments in the tourism sector, this research reveals that VR-driven innovative technology plays a remarkable transition in transforming and reshaping the entire tourism industry for sustainable, responsible, affordable, accessible, and inclusive tourism development around the globe. Furthermore, unlike the current popular outlook for the benefits of VR technology, this study also put forward some critical aspects of immersive technologies to spur the organizations' short and long-term productivity growth and coping strategies with the growing global challenges the industry faced during the last few years. Finally, in addition to the abovementioned significant benefits, the technology-driven global economy also presents significant opportunities such as conserving the environment, including the historical resources, and the overall business growth for responsible and sustainable tourism development in developed and developing countries worldwide.

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