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Original Article

Future Service Robots: A Review of the Psychological Processes Involved in the Tourism and Hospitality Industries

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Abstract *- In recent years, studies on the interaction between automated services and tourism have significantly expanded. This has resulted in a new service environment in which automation receives both constructive attention and researchers' interest. This conceptual piece expands on existing criticism and does a detailed literature review to evaluate the advantages and disadvantages of employing service robots in hospitality and tourism. The observation follows the identification of management and ethical problems, and moral and economic issues continue to get insufficient attention. Moving ahead, there is an immediate need for new avenues to be taken to influence future research and practice. There is a pressing need for proactive legal and ethical problem-solving and the development of new research paradigms to investigate the upcoming posthumanist and transhumanist shifts. In addition, more significant consideration must be given to the prospect of broader use of innovations in improved customer service experiences in the hotel and tourist industries. Principles such as accountability, inclusion, and collaborative design and execution of human-robot systems emerge as critical guiding principles for future research and practice in this domain, among others.*

Keywords *- Service robots, Robotics, Travel technology, IoT.*

1. Introduction

While using artificial intelligence (AI) technologies in place of people is commonplace in the production sector (Li et al., 2017), this is not the case in the service sector. Service businesses like tourism, travel, hospitality and event-related companies often need direct provider-to-customer interaction. The connection between supply and demand, as well as the engagement of tourists in the process of co-creating their experiences, is central to the tourism industry (Stienmetz et al., 2021; Soares et al., 2021; McLeay et al., 2019; Assiouras et al., 2019). In hospitality and tourism exploration, using new technology (including AI devices) to enhance the customer experience is not novel since AI devices are more reliable and predictive than humans (Bock et al., 2020; Pillai & Sivathanu, 2020). Nevertheless, the application of AI gadgets is still debatable since consumers are hesitant to engage with AI devices and prefer human interaction (Castillo et al., 2020; Lu et al., 2019; Tussyadiah et al., 2020). Conversely, personal security and apparent health risk significantly impact consumers' decisions (Huang et al., 2020; Perić et al., 2018). Therefore, tourism-travel and event-related businesses are disproportionately affected by COVID-19 (Gossling et al., 2020; Cooper & Alderman, 2020; Karabulut et al., 2020; Lew et al., 2020; Perić et al., 2021). Corresponding to UNWTO (2022), international tourism would experience a 67 percent decline in international tourist arrivals (January 2022 change from 2019 percent), a drop of US$ 0.9 trillion to US$ 1.0 trillion worth of export revenues from international tourism in 2021, and the endangerment of COVID-19 causes greater than 100 million direct tourism jobs. The global travel sector is not anticipated to recover for years (Matiza 2020).

Nevertheless, in today's technologically advanced society, it is almost impossible to ignore the impact on human life. Culture and the economy are being transformed by various technological advancements, including artificial intelligence, cloud computing, and blockchain (Meidute-Kavaliauskiene et al. 2021a). It was a consequence of the shift in the market that pushed corporations to look for new and better ways to deal with the strain. Companies are not uncommon to experiment with novel methods of encouraging their workers' creativity. Businesses have made innovation a discipline, leading to the development of several ideas. Each invention provides a means to replace existing methods of doing things (Christensen, 2016); therefore, innovation may play havoc with the status quo (Schumpeter & Swedberg, 2013). In any case, the research emphasizes that creativity gives businesses a strategic advantage by aiding in developing novel goods/services and processes (Meidute-Kavaliauskiene et al. 2021b).

According to studies examining the relationship between technology and tourism, "information is the lifeblood of tourism" (Sigala, 2018). The notion of everything innovative, including smart tourism, is supported by a central pillar called information and communication technology (ICT). In line with Lopez de

Avila (2015), applying innovative concepts within any business or tourism location fosters sustainable growth by enhancing resource availability and facilitating mobility, simplifying resource allocation, and improving the quality of life for residents as well as visitors to the area. Likewise, Höjer and Wangel (2015) reaffirm the term "smart" refers to the technologies utilized to advance technological, social, and economic growth. These technologies are built on sensors, vast and accessible data, information sharing, and unprecedented levels of connectivity.

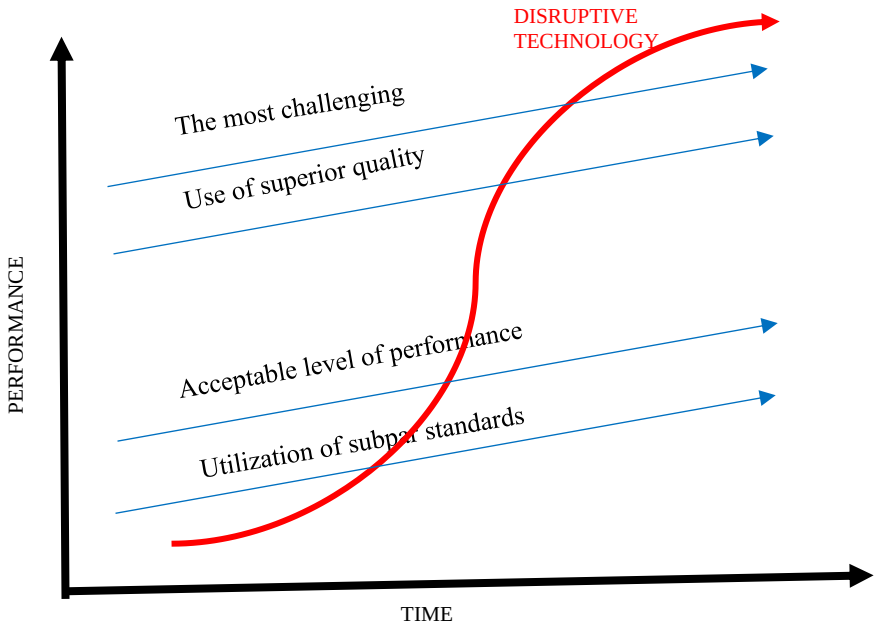
The hotel industry has begun implementing environmentally friendly practices to meet its guests' expectations and demonstrate its responsibility toward the environment, resulting in a competitive advantage (Gössling, 2018; Noor et al., 2018). This is in response to the fact that travelers are becoming increasingly aware of our environmental issues. Some people use the terms "millennials," "generation Y," and "digital natives" to refer to people who were born between the years 1982 and 1994, while others use the years 1980 to 2000 (Evangelu, 2014; Sziva and Zoltay, 2016) leading to a cross between the earlier Generation Y and the latter Generation Z (Skinner et al., 2018). These individuals are known as "digital natives" because they have integrated technology into their lives to such an extent that everything is mediated through a screen. Additionally, this generation is characterized as having an excellent opportunity to explore the local community more genuinely, and as expected, the hotel business gives ever-increasingly individualized services.

Interconnectivity between the hotel and its visitors may be significantly facilitated by technology, leading to hotels providing better services to their customers. As millennials become more influential in the travel industry, hoteliers must adapt their offerings to meet their expectations better. Visitors' health and safety may be safeguarded by using it for advertising and marketing purposes. New digital technologies like AI and the Internet of Things (IoT) and increased customer loyalty may help boost travelers' confidence in hotels' safety, health, and overall satisfaction.

2. Innovations in the Hospitality Industry

Entrepreneurs and new entrants to the market have been the ones to generate innovative and potentially disruptive technology rather than today's market leaders. It is challenging for businesses to pursue disruptive innovation since these innovations do not generate sufficient profits initially. Instead, their development might divert scarce resources away from existing and thriving inventions. The disruptive process is complex to complete, but once it is created, there is rapid market penetration, the impacts of which disrupt the existing markets. As a result, the process itself undermines the current needs.

As it stands, recognition technology (RT) is one of the many emerging travel and tourism trends beginning to permeate many applications. Automated border crossing gates are one of the most common implementations of RT for regular flyers. The gateways could scan a traveler's passport or identity card and compare it with the individual face by using a digital camera and image identification technology. The use of speech recognition in smart hotel rooms is becoming more common as a control mechanism. RT is also a significant tourist trend in the hospitality sector.



Source: Author's adaption of Clayton et al. (2015), What is disruptive innovation

Fig. 1

It is also said that robotics and artificial intelligence give travel, tourism, and hospitality organizations tremendous potential to improve their business processes and continue to offer superior products and services to their customers (Choi et al., 2021). As a result, they are reshaping the tourist industry (Samala et al., 2020). Due to these advantages, robotics in the tourist and hospitality sector has become prominent. Following the COVID-19 outbreak, it became clear that robots may be utilized in several different activities, notably distribution, entertainment, cleaning, guidance, and security (Çakar & Aykol 2020), which shows that robots can be used in a variety of different disciplines. For example, robots may be used to prepare meals, create "safe" distant places (Fusté-Forné & Jamal 2021), disinfect, monitor, and distribute in the post-epidemic hotel business (Wang & Wang 2021).

Besides, service and process automation is aided by artificial intelligence-based solutions and client engagement in various pre-service scenarios (Pillai & Sivathanu 2020). Artificial Intelligence (AI) and robots are increasingly being used in tourism and hospitality services to understand better the linkages between trust and its premises and consequences (Tussyadiah et al., 2020). AI, in addition to chatbots, will play an expanding role for tourists. Machine learning is now well established in the tourist sector's marketing, with AI aiding in personalizing the search for and booking of tours and excursions. AI is becoming more valuable when it comes to detecting visitors' wants and preferences while staying in a hotel room. From customer service to security, artificial intelligence is gaining a foothold. Self-driving cars and virtual tour guides are two AI tourism technologies to keep an eye on in the future. In the service industry, robots may help companies stand out, gain and maintain a competitive edge, and enhance product quality. Food preparation and service, customer welcome, and product delivery are just a few of the services robots provide in the hospitality business (Seyitoglu & Ivanov 2020a). The most common applications for these robots are in the hospitality and tourism industries. They help guests and visitors navigate hotels, lock and unlock their hotel rooms, serve food and drink, and do various other cleaning and security jobs (Zeng et al., 2020).

In light of the factors mentioned earlier, robots are increasingly being considered a potential cost-saving measure in the hotel sector, independent of the spread of the pandemic (Seyitoglu & Ivanov 2020a). Currently, hotel operations seek to maximize the integration of people and technology. Hotel companies aim to integrate their operations with intelligent technologies to promote human-technology interaction and consequently boost process efficiency. The hotel industry will not return to its "pre-epidemic" form after the pandemic. Better hygiene and safety will be required, and customers will keep their social distance.

As a consequence of the World Health Organization's (WHO) suggestion to employ contactless services to prevent COVID-19, adoption of technological improvements throughout the pandemic will ultimately become the norm (Pillai et al., 2021). The hotel sector must quickly embrace autonomous technology to assuage their concerns about COVID-19 and other difficulties. Recent developments, however, have inflicted disproportionately severe damage to the tourist industry. Hotels and their ecology suffer financial losses due to the impact of the tourist industry. The tourist industry stands to lose $2.1 trillion and 75 million jobs due to the current situation (Zenker & Kock 2020). Given the fact that COVID-19 (Hakovirta, M., Denuwara) has affected millions of people, borders have been closed, international travel has been halted (Aloi et al., 2020), and work environments are changing, business demands (Ramaci et al. 2020) and customer behavior (Van Droogenbroeck & van Hove 2021) are changing. In the face of such challenges, the tourist business cannot proceed as usual.

Consequently, tourism-related technology development should be encouraged by governments via funding and incentive schemes. Emerging technologies and new business models are anticipated to serve a crucial role in the hotel industry's anticipated comeback from recent crises (Shin & Kang 2020). In the history of modern technology, robots represent a game-changing development (Tuomi et al., 2021). These advanced robots with artificial intelligence are now being used in hotels, airports, and restaurants because of their advanced object recognition and processing techniques and enhanced text processing capabilities (Murphy et al., 2019, Go et al., 2020). The COVID-19 situation presents a unique circumstance to hospitality firms, forcing them to focus on client and staff wellness and the physical segregation that robotics may effectively offer (Seyitoglu & Ivanov 2020a). As a result, the pandemic has rendered such technology vital to the global hotel industry. At the same time, we move forward with a hypothetical destiny featuring greater robot solutions to limit people contact (Lu et al., 2021). Robots and automation have also become increasingly crucial to lodging firms to reduce human contact (Seyitoglu & Ivanov 2020b).

Due to the general factors highlighted earlier, implementing service robots in the hospitality industry has become extremely urgent. Hotel owners and managers are now confronted with the challenge of determining whether or not the initial financial expenditure required to hire service robots is worthwhile from a financial perspective. It is crucial to understand various issues to produce a suitable answer to this query since many different things may go wrong.

- First, it is necessary to consider the link between robots with their customers and the acceptability of these robots among customers.

- The second question is whether or not maximizing the usage of service robots will play a critical role in guaranteeing consistent productivity and GDP growth.
- Third, it is critical to assess whether or not the organization that plans to engage with service bots can incorporate this innovation into its management strategy and economic model.

Unquestionably these topics are still being investigated separately in the corpus of academic work, and attempts are being undertaken to narrow the scientific knowledge gap about the subject. In essence, these themes are the primary emphasis of this paper and ultimately lead to the understanding of why the opening of the black box of psychological processes is essential for tourism and hospitality development.

3. Robotics in the Tourism and Hospitality Industries are Becoming More Commonplace

Bowen and Morosan (2018) define robots as autonomous devices with humanoid, animaloid, objectoid, and utilitarian shapes. According to Murphy, Hofacker, and Gretzel (2017), industrial robots first debuted over a half-century before autonomous robots that assisted in simple jobs needing repetitive actions, such as fast-food production. They ushered in a new age of automation in the hotel and leisure arena. By the mid-1990s, personal and professional service robots had entered the scene several decades later. Commercial services robotics are frequently utilized for tasks like housekeeping and distribution, but personalized services robotics are frequently observed engaged in social pursuit.

"Travel technology" encompasses information technology (IT), e-commerce, and other comparable technical solutions in the hospitality and tourism sectors. In addition, the technology utilized in the hospitality and tourism business may benefit firms and their employees, improve the customer travel experience, or both. The ultimate goals or motivations for adopting traveling automation include: (1) optimizing traveling and associated procedures, (2) conserving effort and money, and (3) offering a better streamlined traveling encounter for clients. In addition, travel technology may help firms streamline their procedures or even automate formerly manual tasks. It can help a corporation reduce personnel requirements, decrease expenses, and boost revenue, resulting in improved financial outcomes.

Furthermore, technology can help businesses by increasing reliability and simplicity while lowering or eliminating human error. However, it is vital to stay current on the most recent tourism technological advances to implement ideal solutions and keep ahead of competing enterprises in terms of gaining a competitive edge. Businesses must continually keep up to date on the latest travel technology developments since their key competitors will also. It means that if you enable people to adopt new technologies, they will. Simultaneously, if you preserve the status quo, you risk handing them a considerable edge, primarily if the technology is targeted toward benefiting customers. As a result, as trends emerge and new technology becomes established, customers expect a certain degree of experience and comfort. As a result, if your organization fails to meet these expectations, clients will be unsatisfied. It can cause unfavorable reviews and harm your reputation. On the other hand, finding and hiring new employees may be easier if travel and tourism businesses stay abreast of technological advances since many people would like to work with cutting-edge tools, especially those that reduce stress.

In the hotel sphere, various elements influence customer behavior and, therefore, the most current travel technology trends. Virtual reality (VR) and augmented reality (AR), face recognition, and the IoT have led to the introduction of smart speakers in hotels and augmented reality tours from travel businesses, as well as innovative and seamless methods to check in without having to wait and communicate with receptionists.' Contactless payments, voice search, and smartphone solutions are becoming more common in our daily lives; therefore, it seems reasonable that tourist technology trends follow suit. These behaviors have been accelerated by the COVID-19 epidemic while boosting demand for solutions like cleaning robots.

Many current tourist trends may benefit from the IoT. For example, a microprocessor and some digital connections are required for IoT devices to connect to and operate the internet. Hotel rooms are becoming more "smart" because of the proliferation of the IoT technologies like heating and cooling systems, entertainment systems, and other amenities. Additionally, the Internet of Items is being used by hotels to integrate various services for guests, such as enabling them to schedule activities (a session in the hotel's spa or a workout at a gymnasium, for example) or requesting things like housekeeping or additional bedding through a portal or an app.

In contrast to VR, which recreates whole worlds and experiences, AR blends real-world and virtual aspects. Pokémon Go is a well-known example of a mobile game that uses real-time video of the player's surroundings to superimpose fictitious animals. This is a massive benefit to the tourism industry: instead of fantastical creatures. It is possible to use AR smartphone applications to provide travelers with information about the places they are seeing. For example, you could find historical data on a specific structure or landmark and directories, brochures for nearby restaurants, and entertainment places. Artifacts may now be seen in their original form thanks to the rising usage of AR in museums. Internet-enabled virtual maps might also be used in augmented reality apps.

4. Robotics Service Optimization will Boost Productivity and GDP growth

Service robots are one of the most innovative technological innovations thus far in terms of hospitality service interactions (Ivanov & Webster, 2019a). Due to developments in mechanical and electrical engineering and computer science (e.g., upsurges in raw computing power, aggregation of an unfathomable volume of data, innovative techniques, and processes, for instance, machine learning and deep neural networks). Interestingly, robotics has migrated from processing plants to human-populated environments (Ivanov et al., 2019; Wirtz et al., 2018). In recent years, the hotel industry has seen an increase in the creation of service robots (Bowen & Whalen, 2017; Murphy et al., 2017). These developments include robots that cook and serve consumers extravagant meals (Bowen & Morosan, 2018). In the United States, a developer from California has created a burger robot that can finish up to 120 orders per hour (Troitino, 2018), while Café X has created robot baristas that dispense three cups of coffee in 40 seconds (Canales, 2018). Several Japanese hotels have replaced front-desk personnel with interactive robots (Osawa et al., 2017). Interest and investment in food technology, particularly restaurant robots, are gaining traction in the United Kingdom (Dobberstein, 2019).

Hospitality service robotics has recently grown due to the following factors, according to the studies by Ivanov, Webster, & Berezina (2017) and Ivanov & Webster (2019a, 2019b): improved cost efficiency, improved resource allocation, better demand forecast, elevated quality assurance, better enterprise management, and the elimination of admin/operation lapses. On the other hand, Bowen and Morosan (2018) contend that the scarcity of workers is the fundamental reason for this rise in many industries. Emerging technologies have been pushed on hospitality companies in Japan due to a growing population of senior individuals, declining birth rates, stringent immigration rules, and a forecast rise in service demand (Schneider et al., 2018). Frey et al. (2016) found that most industrialized countries see the same trend.

It is fascinating to note that, typically, societal persuasion is how others influence a person's beliefs or actions. It can sometimes be regarded as the extent to which a consumer takes into account the significant beliefs of others on the introduction of new technologies (Venkatesh et al., 2003) or the degree to which a majority believes that innovative technology devices (e.g., robots) are already following existing social norms (Gursoy et al., 2019), which can be crucial for the individual's social behaviors (Rather, 2018), primarily when involvement originates from friends and family (Gursoy et al., 2018). As the deployment of robotic devices is still unfamiliar to tourism and hospitality industry players, society is likely to impact their decisions over whether and to what extent to implement this technology. This is particularly prone to occur if the decision makers are female, as women place a more significant premium on social influence in deploying new technology than males (Venkatesh et al., 2000).

5. Using Service Robots to Innovate Management and Business Model

Servicing robots are demarcated by Wirtz et al. (2018) as "system-based autonomous and adaptive interfaces that interact, communicate, and give service to an organization" (p. 909). Robots have a distinct advantage over other technology when it comes to manufacturing and delivering hospitality services. Self-service kiosks and pre-programmed tablets cannot match the responsiveness and adaptability of service robots (Ivanov & Webster, 2019b). In many cases, they may collect input data through sensors, evaluate it quickly, establish a plan, and promptly implement choices utilizing physical actuators (Ivanov & Webster, 2019a). More advanced systems may also use past encounters to improve performance at some point (Belanche et al., 2020). Continuously analyzing and reacting to its surroundings is essential for service robots offering food and drink. While doing so, it is necessary to consider other pertinent social aspects (such as consumers and staff). Consequently, human-technology interplay in hospitality service situations is possible for the first time (De Keyser et al., 2019).

According to Larivière et al. (2017), technology has presented two critical functions in physical service encounters. Primarily, it has assisted service personnel by improving their data handling and analytical abilities. It allows them to understand consumer needs better, resulting in higher work and service quality (Marinova et al., 2017). These innovations have reduced staff burdens by completing repetitive and boring duties, such as processing orders and transactions. This allows workers to concentrate on more strenuous activities requiring genuine concern or social competence (Huang & Rust, 2018). Secondly, automation has streamlined customer service interactions and surrogated workers in a series of activities or entirely (Mathath & Fernando, 2015). Furthermore, Rosenbaum and Wong recapitulate (2015) that this includes self-serve technologies, for example, hotel and airport check-in kiosks. Wirtz et al. (2018) indicate that contemporary academic study on using robots in service interactions is still in its inception, even though prior research has examined technology in services at length.

Robotization of formerly impossible-to-automate processes is now possible because of recent developments in equipment and programming. However, this has significant ramifications for hotel operations, management, and marketing (Ivanov & Webster, 2019a; Murphy et al., 2019). Moreover, leading intellectuals and innovators expect this trend to accelerate (Bughin et al., 2019). Therefore, a more scholarly focus should be placed on how service robots will transform the creation and delivery of services in service interactions.

Concerning automated systems, such as robots and chatbots, this specific tourist trend is best shown by Hilton Hotel's robot concierge, Connie. It is very uncommon for hotels worldwide to use robot workers in various capacities, including serving meals and drinks to guests.

Fig. 2 Photo credit: Korea IT Times 2020

http://www.koreaittimes.com/news/articleView.html?idxno=97242

However, this is not the only type of novelty application available on the market. As a result, many consumers increasingly utilize online chatbots without human agents to make travel and lodging arrangements. Consequently, these AI-powered agents can answer questions and provide helpful information to clients when human agents are not accessible. According to the firm's website, Asksuite, a global leader in an omnichannel service platform for hotels and resorts based in New York, claimed that more than 2,000 hotels have already revolutionized their service (https://asksuite.com/). The goal of any hotelier is to make a lasting impression on their guests. It is even great if that person returns or spreads the word about their stay. In addressing this issue, what role do robots play? In a nutshell, hotel robots provide a distinct advantage over their competitors. Automation may save staff time and allow guests to have a more personalized experience. The only limitations on their use are those imposed by the user's imagination and the available budget.

As we return to the real-world context, it is comprehensible that if tourism and hospitality players implement disruptive innovation for any service or product, the following essential issues will become apparent:

(1) Are the newbies going after a market segment that is not profitable for the current players? Suppose you connect this question to disruptive innovation in human hospitality capital. In that case, the question becomes: Are the newbies going after the organization's human resources, which the old management thought was not constructive or essential?

(2) Can the newbies serve this market segment profitably because they have a dissimilar business concept? Regarding this subject of human capital in the hotel industry, are the newcomers capable of serving this segment or motivating experienced employees with various techniques?

(3) If the response to (2) is "yes," then we must determine if business owners have "enabling technology" that enables them to leverage their new business model to undertake bigger, more complicated projects without sacrificing the cost savings and quality features that allow them to prosper with smaller projects.

If the actors affirm "yes" to each of the three issues, the situation we are judging involves disruptive innovation; nevertheless, if we cannot, the situation does not involve disruptive innovation.

In hospitality and tourism service contexts, employee-customer interactions are unavoidable. These encounters are crucial for fulfilling the service delivery procedure (Chakrabarty et al., 2012). Service outcomes are more likely to be positive when employees demonstrate empathy, defined as "the perception and understanding of customer emotions during service delivery" (Hwang, 2018; Wieseke et al., 2012). In addition, a user's level of empathy determines how they rate the service they received. As a result, robots need to render services that are popular with humans (De Kervenoael et al., 2020).

As in many service sectors, customer experience has always been a significant focus in the tourism industry's next-generation customer service. Improving the customer experience never has been so necessary as new technology and alternatives for travelers continue to expand. In the

end, the customer's experience determines the success or failure of tourism and hospitality actors. To create a return client who will help grow the company's profitability by spreading word of mouth, you need to fine-tune the experience. The entire ecosystem should be as delightful as possible for customers, from the booking process to the last vacation day.

ICTs like robotics, augmented reality, virtual reality, and the IoT have made many changes and given tourism and hospitality companies and organizations a fresh set of dangers and possibilities. ICTs facilitate the discovery, customization, and purchase of tourism products. In addition, they can contribute to the globalization of the tourism business by providing the means to generate, manage, and sell tourism services internationally. With the help of ICTs, tourism companies and organizations can use intranets to reorganize their internal processes, extranets to do business with trusted partners, and the internet to talk to all stakeholders easily. ICTs make it possible to combine relationships with customers and logistics into a single source that helps with many tasks, such as choosing products, ordering them, getting them delivered, tracking them, paying for them, and giving reports. All of these tasks can be done with a single, easy-to-use tool.

The psychological considerations, particularly the fear of losing (whether financial or non-financial), influence the actors within tourism and hospitality to delay adopting robotics, AI, IoT, etc.; furthermore, the tourists' inclination to travel and their choices for holiday places. People will refrain from traveling in large groups in congested locations in the future. For instance, sanitation and health conditions at the host location may be decisive in selecting whether to visit. Tourism enterprises (such as transportation, lodging, and food service) should improve their hygienic conditions to regain customers' trust. Additionally, communication is vital in these difficult times for addressing the fears and anxieties of tourists. Due to economic conditions connected with a drop in family income, there is a greater inclination to save or unclear economic prospects.

So, the issue for the actors in the tourism and hospitality space is not "if" but rather "when" the current status quo will swiftly be replaced by robotics, AI, and associated travel technology. In introducing them to tourism and hospitality will be more complex as more players join the supply chain. However, the issue will become more daunting if they do not start immediately.

6. Conclusion

This paper explored posthumanist and transhumanist shifts and the reality of resolving legal and ethical issues and finding new solutions for integrating robotics, AI, and travel technology in a post-pandemic society. This paper examines several contemporary approaches, including disruptive technologies in the hospitality and leisure business, including deploying robotics in real-world settings, enhancing robotics' productivity, and the employment of service robots to reimagine management and business models. In addition, robotic, human-based, and hybrid service delivery systems are discussed in this work. As a result, the outcomes of the article provide more evidence that the tourism and hospitality industries may benefit significantly from using automation technologies.

From a theoretical viewpoint, the question of legal control of a geographically dispersed hospitality service delivery system during a viral pandemic goes beyond the use of masks, protective clothing, and extensive cleaning. Implementing permanent criteria (such as sterilization measures) may be necessary to prevent future virus outbreaks. Robot damages would also require regulation from the government. For example, a service robot, for instance, may be considered an asset to a hospitality company, and any harm done to it may be regarded as property damage, but any damage done to a human will be considered negligent.

Nevertheless, from a managerial perspective, merging human employees with service robots allows a hospitality firm to leverage its advantages and avoid shortcomings. The hybrid approach delivers a geographically remote service without losing social contact between visitors and human staff. Managers in the hospitality industry must analyze their resources, operations, and stakeholder relationships with realism. It includes their current resources, activities, and relationships, in addition to the possible implications of the service delivery system. Managers must examine their organizations' capabilities, the likelihood that current resources will become obsolete, the reorganization of the service process, the new skills required of employees, etc. Suppose they overstate their existing resources, underestimate the resources they need or fail to account for the service process alterations necessitated by the (re)modeling of the continuum of care. In that case, the adoption may be difficult or fail.

Theoretically, a geographically remote service delivery system might meet visitors' assumption of being free from health risks in the post-pandemic era. However, the hotel's architecture of the service delivery system must consider the company's resources, its business model, stakeholders' interests, and the external macroenvironment in which the business operates since these factors restrict the practicality of the adoption of robotics, AI, or travel technology. For instance, if a hotel lacks sufficient financial resources, its amenities are unlikely to be robot-friendly (e.g., small floor areas, the doorway that impedes robot manoeuvring) as it requires substantial financing to upgrade. On the other hand, if customers have negative perceptions of robots, an automated service means of delivery design may not be acceptable or economically viable.

The paper has several drawbacks. First, this is a conceptual exploration rather than an actual investigation. Secondly, the current study's basic tenets encompass

disruptive technologies within the tourism and hospitality industries, robotics deployment in real-world settings, robotics productivity increase, and the use of service robots to reinvent management and business models. Consequently, the constraints of these theoretical frameworks demonstrate the constraints of the cognitive model in this study. Thirdly, the conceptual structure for designing service delivery systems focuses heavily on service robots. Finally, other technology advancements (such as chatbots and self-service kiosks) must be more adequately described. Future research could examine the strategic function of robots in the service delivery systems of individual firms to validate the suggested model. Given the complexity of hospitality services and the variety of services and robot uses in the industry, future studies might aim to provide empirical evidence for the proposed framework regarding diverse hospitality service interactions and situations of robot use.

Moreover, future research might expand the model to incorporate other types of technology and elaborate on their particular roles in a geographically remote service delivery strategy. In addition, an analysis may reveal guests' valid preferences regarding the proportion of "human-to-employee" robots in the front-of-house operations of the hospitality firms they visit. Future research may also examine the willingness of tourists to spend money on services provided by robots.

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