

Chapter 11

The Future of Hotels Robotics, AI, and Service Automation in Practice

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ABSTRACT

The chapter examines the implementation of Robotics, Artificial Intelligence, and Service Automation (RAISA) in the hotel industry, focusing on their role in improving operational efficiency and customer experience. It highlights the advantages of RAISA, such as reduced costs, enhanced accuracy, and service consistency, while addressing challenges like limited emotional engagement and technical shortcomings in human-robot interaction. The COVID-19 pandemic accelerated RAISA adoption, prompting hotels to incorporate contactless technologies to meet evolving customer expectations. However, concerns over a lack of empathy and adaptability remain, as robots struggle to replicate human social skills. The chapter offers solutions for optimizing RAISA use, including differentiating between tasks for robots and human staff and promoting collaboration. It concludes with recommendations for future research on human-robot collaboration, privacy, ethics, and RAISA's role in

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achieving sustainable development goals in the hotel sector.

INTRODUCTION

With the improvements in technology and particularly robots, artificial intelligence (AI) is relentlessly permeating our lives (Pizam et al., 2022). From the robots used in the automotive industry's assembly lines to the clinical decision support systems used in hospitals, AI technology has become an integral part of conducting business in a variety of industries (Gursoy et al., 2019). Human-exclusive tasks, including as driving vehicles, understanding human language, and conducting web searches, are now easily completed by AI gadgets.

The rapid development of robotics, artificial intelligence, and service automation (RAISA) is anticipated to influence and revolutionize several segments of the hospitality and service industries (Tung and Au, 2018), with a particular focus on the hotel business (Osawa et al., 2017). RAISA is becoming more and more favoured in hotel industry owing to their competitive advantages such as low cost and accuracy (Ivanov et al., 2022; Ozdemir et al., 2023). Besides, the Covid-19 pandemic has further accelerated the adoption of RAISA due to the need for social distancing measures (Chi et al., 2020) and quiet quitting trends among hotel employees (Della Corte et al., 2023). Thus, the acceptance of technological advances will become the norm in the future (Pillai et al., 2021).

Even though the utilization of RAISA in hospitality industry is rising at an exceptional pace (Borghi and Mariani, 2024), the adoption is still under global debate. Since some scholars argue that the adoption of RAISA may allow hospitality and tourism to transform their operations and improve service efficiency and reliability (Ivanov, 2019; Chiang and Trimi, 2020). While others questioned the purported advantages of RAISA (Chi et al., 2020; van Esch et al., 2022). Thus, several questions remained for academics and practitioners: what might be a world look like after combination of human and RAISA? What is the win and lose from the rapidly shifting technoscapes? What shifts in thinking and approach are needed in hotel industry? While this chapter is unable to explore these questions in depth, however, drawing on an extensive literature review, the chapter is aimed to review the current state of RAISA adoption in hotel industry, the role of RAISA performance and further discuss the benefits and challenges arising in the research literature. Moreover, some suggestions and solutions are provided to guide future research and practice.

The chapter is structured as follows. A preliminary review of the literature presented in the next section together with an overview of the current implementation of RAISA in hotel sector. Following this is a summary and discussion regarding role of RAISA performance as well as benefits and challenges caused by RAISA adop-

tion. Further, some solutions of current issues offered afterwards which may draw on deeper considerations for future research and practitioners. The chapter closes with a brief summary and recommendations for the future directions in the field.

Background

Robotics, artificial intelligence, and automation are no longer viewed as futuristic technologies. They are already part of our daily lives and will become increasingly prevalent in the near future (Yarlagadda, 2015). Academics and corporate executives anticipate that the implementation of RAISA will accelerate in the near future by technological advancements and the falling costs of these technologies, which are applicable to numerous industries and individuals (Ivanov & Webster, 2017).

Service Robot

Derived from the Czech word *robota*, a robot is a “actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment to carry out predetermined tasks” (International Organization for Standardization, 2012). In other words, robots are “intelligent physical devices” programmed to perform specific physical tasks (Chen and Hu, 2013). Based on their intended uses, all robots can be categorized into two broad categories: industrial robots and service robots (International Organization for Standardization, 2012). Industrial robots are used for industrial tasks such as welding, palletizing, and other similar duties in manufacturing and production, as their name suggests (Murphy et al., 2017). Service robots, on the other hand, are created to assist and serve humans through social and physical engagements (Ivanov et al., 2017). In a service context, what we call “service robots” are autonomous decision-making systems that facilitate interaction and communication with customers (Wirtz et al., 2018).

Artificial Intelligence

In today’s technologically advanced world, among the most innovative inventions ever, AI technology has transformed numerous industries around the world (Russell and Norvig, 2016). Moreover, it is one of the driving forces behind the evolution of service robots (Rust, 2020). The core technologies of AI contain a variety of disciplines, including machine learning, deep learning, natural language processing, and image processing (Davenport and Ronanki, 2018). Basically, AI is essentially a computer - controlled system with multiple functions, such as problem-solving, memory storage, and language comprehension (Wang, 2004). It is defined as the use of computerized machinery to simulate human capabilities (Rust, 2020).

Organizational use of AI is seen as an important source of innovation (Huang and Rust, 2018) and is expected to boost profits and cut costs (Davenport et al., 2020).

Service Automation

The term “automation” is used to describe the substitution of computer-controlled, fully or partially automated machinery for human labour in industrial settings (Raj and Seamans, 2019). Specifically, service automation refers to technological interfaces that allow customers to produce a service without direct employee involvement (Meuter et al., 2000). Service automation are significantly cost-effective and worldly-wise than robots; consequently, they are frequently utilized worldwide to provide customers with quick and simple services (Ivanov and Webster, 2019).

Development of RAISA in hotel industry

Technology developments entered the service industry after the industrial revolution, opening doors for service automation (Collier, 1983). Automated teller machines (ATMs), self-service checkout, conveyors, and vending machines were among the earliest examples of service automation (Law et al., 2014). Service automation has entered the lodging sector of the hospitality industry, influencing various aspects of hotel operations (Lopez et al., 2013). Initially, hotels installed self-service kiosks so that customers could check in and out on their own without requiring front office staff (Kim and Qu, 2014). Later, in order to further improve customer convenience and service speed, check-in and check-out services were made available on mobile devices. In addition, developments in mobile technology are making it easier to include mobile service ordering into the overall guest experience for hotels, giving guests a more convenient way to stay in touch with staff and make requests in real time (Trejos, 2015).

The incorporation of robotics into the travel, tourism, and hospitality industries occurred relatively late, probably because a large number of the services offered demand complex solutions to the needs of the customers (Ivanov et al., 2019). By the middle of the 1990s, robots had replaced many human workers in several mechanized factories, a hotel staffed predominantly by robots did not open until 2015 (Ivanov et al., 2019). Currently, robots are utilized in hotels to perform menial jobs including guest check-ins, floor cleaning, item deliveries, concierge services, and other errands. In the Hilton Hotels’ concierge department, a robotic concierge agent named Connie was debuted, which is partnered with IBM (Choi et al., 2020). In the housekeeping department, the maid robot is designed to provide more effective hotel room cleaning solutions (Dogan and Vatan, 2019). A few hotels also use the

automated bellboy, a robot that brings towels and bottled water to guests as needed (Markoff, 2014).

Although artificial intelligence is frequently viewed as a new technology, its theoretical foundation was established over seventy years ago (Bainbridge et al., 1994). Except for self-service technologies and service robots, the most prevalent AI technologies in the hotel industry are smart devices (Choi et al., 2020). Smart technology is “capable of sensing changes in their environments and implementing measures to improve their functionality in the new environment” (Worden et al., 2003, p.1). A smart thermostat, for instance, may recognize changes in the environment’s temperature and a user’s preferences to enable automatic, personalized temperature control (Choi et al., 2020).

As a result of the COVID-19 pandemic, the hospitality industry has opted for technology-based and contactless solutions (Binesh and Baloglu, 2023). Even though the pandemic has already eased, the hospitality industry will not return to its pre-pandemic condition. Customers will demand higher cleanliness and safety standards and maintain their social distance (Meidute-Kavaliauskiene et al., 2021). According to Starkov (2022), the pandemic hastened digital change by ten years, and today’s travelers are more digitally and technologically sophisticated than ever before. Besides, adoption of RAISA devices to enhance customer experiences is also gaining traction since they can offer a range of services such as increased efficiency to tailored recommendations (Della Corte et al., 2023). Therefore, it is inevitable that the hospitality industry will experience remarkable changes in accordance with the influx of RAISA technologies within the foreseeable future (Chen et al., 2023).

Current Usage of RAISA in the Hotel Sector

The usage of RAISA in hotel industry is becoming more prevalent, with AI chatbot meant to enhance guests service procedures, as well as robot assistants used for smart concierge services, with the goal of improving overall hotel experience for customers (Lei et al., 2023). Pre-arrival (virtual reality, chatbots), arrival (smart room key, self-check-in machine), stay (in-room smart technologies, AI assistant and delivery robots), and departure (porter robots, express checkout) are all examples of how RAISA are being used in the hotel industry (Lei et al., 2023).

In the pre-arrival phase, the prospective guest performs two primary tasks: information gathering and booking (Lukanova, 2017). Modern hospitality technologies now in use include chatbots, virtual reality, and mobile technologies (Konar et al., 2024). Put another way, mobile technologies are making previously intangible hotel services real, enabling potential consumers to choose the ideal hotel in a location from a wide range of possibilities (Lukanova and Ilieva, 2019). Virtual reality (VR) is regarded as a cutting-edge technology for hospitality industry owing to its ability

to deceive the senses into believing they are in a virtual world by providing interactive 3D environments generated by a computer (Balasubramanian et al., 2022; Balasubramanian & Konar, 2022). VR improves the customer experience by allowing guests to not only “look before they book”, but also thoroughly explore a hotel, room, suite, or location before making a reservation (Lukanova and Ilieva, 2019). AI-powered chatbots are utilized in the hospitality sectors to make bookings, offer recommendations, and provide other services (Nica et al., 2018; Ukpabi et al., 2019).

The second stage of the customer journey comprises the arrival and stay experience procedures. At this stage, self-check-in machine, smart room keys, in-room smart technologies, AI assistant and delivery robots are typical examples. Self-check-in machine is a successful addition for delivering efficient service, which allows customers to check in independently, removing the need to stand in line at the front desk (Lukanova and Ilieva, 2019). Modern travelers expect technology applications and amenities prior to, during, and following their hotel stay. Hotel guests desire and anticipate hotels to provide the same technologies they use at home. Current in-room smart technologies include voice-controlled AI assistant and tablet, customers can easily adjust room temperature, lighting, curtains, TV and request room service (Figure 1). Besides, AI assistant is also responsible for answering guest phone call, taking notes upon guests’ requirement and uploading into the HDOS AI system for the service center staff to manage and follow up (Figure 2).

One of the most groundbreaking technical advancements to date in the realm of customer service interactions in the hotel industry is service robotics (Ivanov and Webster, 2019). Robot usage in the hotel sector has increased recently, particularly for front desk, concierges, porters, room services, in-room cleaning and entertainment (Lukanova and Ilieva, 2019). Beijing Yunji Technology Company, is specialized in indoor hotel robot. By late 2019, the company launched a delivery robot targeting hotel industry called Run, which was designed to help concierge as it is able to conducting delivery and guiding service (Zuo, 2023) (Figure 3). Those tasks regarding water delivery will directly send to the delivery robot by HDOS AI system without human intervention. By the end of 2022, Run has been implemented in more than 1,000 hotels across countries in Asia, Europe, and America continents (Zuo, 2023).

Departure is the last phase of the hotel journey and the time when the hotel is able to learn about the preferences and viewpoints of its customers, make use of the data obtained, and turn these guests into repeat customers. AI provides fantastic chances for data analysis by monitoring a large number of guest reviews across numerous channels (Lukanova and Ilieva, 2019). The porter robot moves inside the whole hotel and its function is to carry the guests’ bags to their rooms (Reis et al., 2020). Additionally, similar with self-check-in machine, express checkout enables hotel operations to be efficient and smooth which would generate more delightful and higher quality experiences (Hao et al., 2023).

Role of RAISA Performance

RAISA technology advancements (Miller and Miller, 2017) allow companies across a range of industries to use RAISA to cut costs, reorganize workflows, eliminate waste, and boost production and effectiveness, leading to significant changes in how businesses (will) operate (Davenport, 2018; Markridakis, 2017; Talwar et al., 2017). The implementation of RAISA does not exempt the hospitality, travel, or tourism sectors (Collins et al., 2017; Kuo et al., 2017; Ivanov, 2019). For decades, airports, hotels, and travel agencies have embraced service automation and self-service technologies to give information (Kucukusta et al., 2014). These innovations save operational expenses, shorten wait times (Kattara and El-Said, 2013), and improve overall client experiences (Bogicevic et al., 2017). With AI's advanced data storage capacities, lightning-fast processing, and pinpoint personalization, AI devices can deliver not only more reliable and timely service than human personnel, but also a greater quality of service (West and Allen, 2018). Ivanov et al (2019)'s research shows that the introduction of robots to the hospitality and tourism sectors was somewhat later than in other sectors. Notwithstanding, a growing number of hospitality and tourism firms are implementing robots because they offer a practical answer to a variety of challenging issues while also improving the customer experience (Kuo et al., 2017).

However, despite the fact that some of the advantages of RAISA applications in travel and tourism are obvious, there are still ongoing academic and industry disputes as well as worries about the changes it would make to people and society (Gurkaynak et al., 2016; Tussyadiah, 2020). An essential insight brought about by the automation of tourism services is the (possible) lack of human interaction throughout the travel experience (Tussyadiah, 2020). Moreover, in order to achieve the goal of streamlined efficiency and resolving labour shortages, it was noted that management had to alter their own tactics (Hertzfeld, 2019). Furthermore, according to Reis et al. (2020), there is currently no academic agreement on the employment of robots in the hospitality sector and there are major barriers to machines providing "empathetic intelligence" in frontline service tasks (Zhong et al., 2022).

One of the earliest works on RAISA adoption, by Neuhofer et al., (2014), demonstrated that the technology can improve relationships between guests and staff by integrating single encounters with personalized experiences and customer participation. Later, Zhong and Verma (2019) conducted a study about robot rooms in China among hotel guests, and the results showed that robot rooms have been warmly accepted and have given several properties a positive return on their investment. In addition, Cakar and Aykol (2021) found that robotics service has significantly enhanced the quality of service provided to travelers. According to the respondents of Luo et al., (2021), the level of technology is sufficient to implement robotic services

in the hotel industry. In accordance with Meyer-Waarden et al., (2020)'s findings, customers tend to find chatbots useful due to the functionality and dependability of the technology. Taking into account the effects of the COVID-19 pandemic, Kim et al., (2021) conducted a study on customers' preferences for hotels staffed by robots. The results suggest that during the COVID-19 pandemic, guests favor hotels with robot staff over those with human staff. Research by Romero and Lado (2021) and Ivanov et al. (2018) on young people revealed that they are generally in favor of the adoption of service robots in the hotel sector.

Recent research on the role of RAISA performance not only covered customers, but also included service providers. Touni (2020) conducted qualitative research on hotel managers regarding the application of RAISA technologies, and some hotel managers stated that there are always pros and cons when a new technology is introduced, but they must accept the new trend and work with it to achieve a better outcome. The hotel managers in the study by Tuomi et al., (2021) were also quite positive about new technology. The results imply that service robots either complement or replace employees in customer interactions and also offer a fresh point of differentiation for hospitality companies. The main conclusions of this study, which are similar to those of Kozmal's (2020) study, showed that the effectiveness of service automation and robotics technology in making judgments raises customer satisfaction in Egyptian hotels.

Different perspectives from customers and hoteliers are also not uncommon. The results of a study conducted by Chiang and Trimi (2020) on the service quality of robots indicate that the level of service provided by robots does not meet customer expectations in terms of reliability, assurance, and responsiveness. In addition, Lv et al. (2021) conducted a series of studies on the service failure and recovery of service robots. One of these studies revealed that, compared to human service, unmanned service will decrease the service warmth and brand trust. Furthermore, the study of Yu (2020) has shown the current usage and design of robots in hotels are still disliked by the majority of people. Besides, Xu et al., (2020)'s research on HR professionals in the hotel industry found that while service robots are anticipated to increase the productivity and efficiency of hotel activities, they may also present difficulties like high costs, skill gaps, and significant organizational and cultural shifts in hotels. Ivanov et al. (2020) conducted a study on hotel managers' opinions of using robots. The respondents believed that robots would be better suited for the monotonous, filthy, boring, and dangerous duties found in hotels, while hotel management preferred to use human for jobs that called for social skills and human touch. In terms of service quality, the results of a study conducted by Choi et al. (2020) for the service quality perceptions of human-robot interaction showing that while there are no discernible differences in the quality of the outcomes, human

staff services are perceived to be superior to those of service robots when it comes to interaction quality and physical service environment.

Benefits of Using RAISA in Hotel Industry

Although there is continuing global debate on RAISA performance, the rising importance and benefits of involving RAISA technologies cannot be ignored. For hotels, efficiency of activities performed by staff is measured by the time needed to execute them; the less time, the less expensive labour cost would be (Osawa et al., 2017). Hence, investment in robot labour is often less expensive than paying human employees (Osawa et al., 2017) since service robot, hotel AI devices and self-service machine can operate 24/7, much more than human employee (Ivanov and Webster, 2017). Furthermore, chatbots can serve numerous customers simultaneously, which is not the norm with human employees (Ivanov and Webster, 2017). Therefore, rather than finding human employees, hospitality organizations reorganize their operations using RAISA technologies such that they require less staff (Ivanov and Webster, 2019). Especially those low-skill positions, infusion of hotel RAISA devices is an ideal solution for reducing labor cost (Leung et al., 2023).

Robotics, AI and automation services have the potential to not only reduce human errors and blunders but also to enhance the working efficiency (Limna, 2023). Besides, the goal of hotel RAISA devices is to relieve the workload associated with hospitality professionals in the long term (Palrao et al., 2023). The findings of Blocher and Alt (2021) reported that tasks that are more repetitive, routinized, and structured and that do not require any kind of training and expertise can be performed more effectively while using hotel RAISA applications. Furthermore, Della Corte et al., (2023) also stated that by automating functional and repetitive tasks and processes, service robots can streamline operations, reduce friction points, and ensure consistent service quality. This not only increases efficiency, but also contributes to a more seamless and standardized service encounter (Corte et al., 2023). Furthermore, the study of Reis (2024) also underlined the efficiency of robots in executing standardized tasks, emphasizing their role in enhancing operational efficiency.

Despite the functional aspect, the sensual and emotional aspects referred as hedonically motivated stimulation which engendered the interactivity between customers and hotel RAISA applications (Gursoy et al., 2019). Lee et al., (2021) stated hotel service robot will eventually guide customers to have more enjoyable experiences, hence formulating a more favorable attitude towards RAISA hotel (Phang et al., 2023). The findings of their study also indicate the importance of utilizing the service robot as a unique selling proposition to increase customers' intention to stay (Phang et al., 2023). Besides, robots are a novelty for guests, which generates enthusiasm and publicity for hotels seeking to build an innovative brand image (Kim et al.,

2022). Similarly, the research of Fuentes-Moraleda et al., (2020) also presented that robots are a marketing gimmick, particularly for families travelling with children, and robots are often the reason why families choose to go to one hotel or another.

Labour shortage is a growing concern for the hotel industry. Since 1960s, fertility rates in Europe, China, Japan, South Korea, and other regions have decreased considerably (Ivanov and Webster, 2019). This demographic position indicates that Europe, China, Japan, South Korea, and other nations with declining birthrates might anticipate significant labour market upheavals (Ivanov and Webster, 2019). Meanwhile, high turnover rate also leads to labour shortage issue, and strong seasonality pattern results in an unstable labour condition (Zuo, 2023). Over the past few years, hoteliers have unsuccessfully attempted to address the severe labour shortage by offering sign-on incentives, better compensation, and even cash payments to candidates for attending an interview (Starkov, 2022). Therefore, adopting RAISA devices and service robots may also be a good choice for hotel short of manpower (Han et al., 2024).

Robotics technologies are also revolutionizing customer experiences with increasing human-robot interactions (Fusté-Forné and Jamal, 2021). Kuo et al., (2017) found that service robots are an important resource able to sustain hotel competitiveness. The study of Borghi and Mariani (2024) provided clear evidence of the positive influence of service robots in the evaluation of the overall hotel customer experience. Negative performances related to service robots' interactions do exist, but they do not significantly influence the overall customers' judgements (Borghi and Mariani, 2024). In addition, Binesh and Baloglu (2023) also presented by initiating the shift to robot staff in parts of hotel operation could receive more positive customer responses.

Challenges Caused by RAISA Adoption

As the world progresses with constant technology advancements, incorporating these innovations into enterprises can be challenging and inconvenient at all times. The use of AI and robotics in hotel industry is a complex issue since robots must integrate functions associated with cartography, navigation, collision avoidance, obstacle avoidance, image recognition, object manipulation, and social interaction capabilities that customers' needs and make their experiences more unique (Ivanov and Webster, 2019). Henn-na Hotel, the first robotic hotel, opened in 2015 and invested in a number of service robots like a robot check-in clerk, a robot porter, a robot cloakroom attendant, facial recognition software, and a robot in-room helper (The Guardian, 2015). The introduction of robots was fraught with difficulties, as is the case with any new technology (Ivanov et al., 2020). After receiving complaints from customers and hotel staff, Henn-na Hotel reportedly disabled a majority of its

robots in January 2019 (Bhimasta and Kuo, 2019). For example, the dinosaur robot at the check-in desk has regularly failed at tasks such as photocopying customers' passports. And their robot room service attendants are annoying since they take guests' snores for requests of service rather than providing useful attention (Bhimasta and Kuo, 2019). In the same vein, FlyZoo Hotel, the first unmanned hotel in China which launched at the end of 2018 also had similar situation. This hotel has been lauded as the "hotel of the future" by numerous sources. Meanwhile, it has attracted considerable media excitement due to its cutting-edge technological capabilities, which include face recognition functions, in-room robot attendants, and an advanced version of mobile app (Zhao, 2020). However, this hotel also encountered many problems during operation (Zhao, 2020), such as concierge robot's inability to answer customers' inquiries, and delivery robot's tendency to mistake items and lose directions (Hou, 2021). Besides, an empirical study conducted by Tuomi et al., (2021) on the service robot Pepper TM showed that in the current state, Pepper TM cannot cope well with complexity or sensory overload. And it often slows down or crashes when trying to fuse data from multiple sensors (Tuomi et al., 2021).

Technologies have revolutionized how service providers interact with customers, and service robots play a vital part in this quick transformation, resulting in an emerging reality of embedding robots into the service delivery process (Kao and Huang, 2023). Adopting robotic services may be advantageous for companies since service robots are able to undertake several jobs now done by human employees in a more efficient and effective way (Huang and Rust, 2018). However, one critical issue related to the role of functions performed by service robots is communication skills (Saunderson and Nejat, 2019). Due to the limited intelligence, service robots cannot be responsive but could conduct several straight-forward tasks (e.g., delivering food or items) (Fang et al., 2024). More importantly, the effectiveness of service robot adoption depends on the quality of their interaction with guests (Choi et al., 2020). Thus, most robots applied in hotel industry are used to provide information or to deliver items, as they cannot yet mimic humans in affective and emotional terms (Rosete and Soares, 2020). Hospitality largely depends on the direct interaction that occurs between customers and staff, instead, robots lacking social skills which allow them to communicate with customers in an effective way (Martins and Costa, 2021). Further, a study of Manthiou et al., (2020) concluded that social interactivity, social presence, and rapport skills of robots in hospitality industry needs to be developed to match customers' expectations.

Many hotels currently replace human employees with service robots to deliver food or items (Han et al., 2024), however, there are significant differences between service robots and human employees, such as empathy (Wirtz et al., 2018). Empathy is a complex phenomenon in which basic human abilities (e.g., affect, social perspective-taking) and assumptions (e.g., understanding of other's motivations and goals) are

needed (Belanche et al., 2020). A key barrier to the adoption of service robots in the hospitality industry has been the lack of ‘human-like’ characteristics (Blut et al., 2021). Service robots can neither express emotions nor understand tourists’ needs (Han et al., 2024). Similarly, drawing on the service task intelligence framework by Huang and Rust (2021), hotel robots are able to carry out tasks requiring mechanical or analytical intelligence, but they cannot display intuitive or empathetic intelligence (Tuomi et al., 2021). Therefore, it would be challenging for service robots to provide customer service equivalent to human employees with empathy in the predictable future (Wirtz et al., 2018). Due to the lacking of human-touch, service robots may be inferior to human employees when performing emotion-related tasks (Han et al., 2024). Besides, service robots are less adaptive than human employees (Manthiou et al., 2020). As a result, service robots are unable to carry out complex tasks or offer personalized services (Fang et al., 2024).

Solutions and Suggestions of RAISA Implementation

Based on the summary of benefits and challenges stated, some solutions and suggestions are hereby provided. The first is differentiation on hotel category of RAISA adoption. Hotel classification is a key factor in determining the ways in whether and which the service robots are implemented (Paraman et al., 2023). Choi et al., (2020) stated that human staffs are good at dealing with emotions, and service robots are good at mechanical and analytical work. Luxury is about emotional connections, it is vital to deliver to feelings through a verbal context which is something robots cannot be programmed (Zuo, 2023). Besides, social value, conspicuousness and uniqueness are the drivers of luxury experiences with the aim of social emulation, self-esteem and public display in some way (Correia et al., 2020). Moreover, luxury hotel tends to offer meticulous service that would go beyond guests’ expectations, by offering unique personalized service (Shin and Jeong, 2020). Thus, customers in luxury hotel expect something unique and special, due to the lack interpersonal skills and emotional sensing, equipped RAISA in luxury or even upscale hotel are quite challenging (Zuo, 2023). However, budget and midscale hotel guests are more affected by RAISA than luxury hotels (Chi et al., 2020) and they often strive to meet the needs of guests through limited service (Paraman et al., 2023). According to Chan and Tung (2019), robotic service influences a higher rating for budget and midscale hotels, but not for luxury hotels. In this case, budget and midscale hotels are the ideal hotel categories for implementing RAISA applications.

Second, selecting the appropriate RAISA type. The research of Leung et al., (2023) confirmed that frontline employees respond more favorable to room service robots (physical affordance) than concierge robots (cognitive affordance). The findings showed most hotel staff perceive physical robots (e.g., room service robots) to

possess a higher relative advantage in delivering hotel services, thus, service robots that offer sufficient physical affordance should be prioritized in hotels' investment and purchase lists (Leung et al., 2023). The results of the study conducted by Luo et al., (2021) also had similar conclusion. Comparing with cognitive robots, the physical robots demonstrated a higher level of customer satisfaction in the operation areas.

Third, differentiation on job positions between human staff and RAISA devices. In the hospitality industry, services are frequently characterized by their intangible nature (Wang, 2024). In operation terms, AI-driven analytics could optimize resource management, leading to cost savings and increased efficiency (Xiang et al., 2017). Besides, the automation of routine tasks through AI, such as inventory control or predictive maintenance, could free up staff to focus on providing a more personalized service (Wang, 2024). The findings of Della Corte et al., (2023) also suggested robots can handle routine job positions, such as item delivery or information providing, meanwhile, a service employee can focus on more complex positions that require intuitive or empathetic intelligence, such as handling customer complaints. In the same vein, the result of Phang et al., (2023) showed that providing fast and convenience services through the adoption of robots in operational positions such as check-in/check-out or meal/luggage delivery are more prevalent. Thus, differentiate job allocations will eventually provide solutions for human staff and robot collaboration.

Lastly, collaboration with RAISA technologies instead of resistance. As service robot continue to grow in the hotel industry, working with human employee and service robot has inevitably become an integral part of the workplace (Paluch et al., 2022). The findings of Le et al., (2023) demonstrated if frontline employees accept the service robot as coworkers rather than tools, attitudes toward the service robot will improve. Therefore, for the collaboration to be successful, it will be essential for the human employee to accept the robots as collaborative coworkers (Kim, 2023). However, since the frontline employee are not used to working with robots, they may be afraid of or may resist the collaboration (Vatan and Dogan, 2021; Fu et al., 2022). Thus, based on above conclusion, hotel managers should find more appropriate and suitable service robots to work with frontline employees and improve their intentions to collaborate with service robots (Leung et al., 2023). Concurrently, the study of Reis (2024) demonstrated the irreplaceable contributions of human supervisors in customer engagement, personalized tasks, and ensuring the seamless operation of robotic system. More important, his case study of Henna na Café highlighted significance of maintaining a balance between RAISA and the human touch in service delivery (Reis, 2024). Therefore, despite technological advancements, human element remains crucial. A endorsement is given to a collaborative approach between human staff and RAISA, which may result in a more efficient service environment (Reis, 2024).

CONCLUSION

With the advancement of novel technology, RAISA is increasingly introduced to hotels to assist human employees in dealing with customers' requests more efficiently (Leung et al., 2023). However, despite the importance of this technology in hotel industry, human-robot collaboration related to RAISA is not yet considered a mature field of research (Ivanov et al., 2019) and still under global debate. Thus, this chapter identified the current issues related to RAISA in hotel industry and further discussed the possibilities regarding RAISA employment which deeply connected with human employees.

Throughout history, human collaboration has been a fundamental aspect of societal functioning, often involving pairs or groups sharing task-related information through physical interaction (Reed and Peshkin, 2008). The efficacy of such collaboration hinges on factors such as team awareness, cognitive capabilities, and teamwork skills (Tokadli and Dorneich, 2019). However, integrating robots and AI into these complex workflows necessitates a deeper perspective (Wang et al., 2020), since robotic environments can disrupt the industry and lead to both positive and adverse behavioural and organizational changes as the traditional framework of a service-provider relationship is being re-constituted (Fuste-Forne and Jamal, 2021). To decide human-robot-staff relationship, it is important to understand RAISA acceptance and experiences in relation to employees in order to improve human-robot collaboration that will increasingly dominate the whole hospitality and tourism sector (McCartney G and McCartney A, 2020). Hospitality and tourism businesses must include employees in determining whether and how to best involve RAISA devices (Fuste-Forne and Jamal, 2021).

The assessment of human-robot-staff relationship should take user experience into account as well (Weiss et al., 2009). Customers expect for both robot services with high efficiency, and human services with emotional connections (Hollebeek et al., 2021). Hotel robots can substantially enhance service quality owing to the higher efficiency and accuracy (Xiao and Kumar, 2021). While through the critical and creative thinking, social understanding, and empathy, human employees can focus on responding to customers' emotional needs (Huang and Rust, 2018; Xiao and Kumar, 2021).

Consequently, those tasks involved with personalized services or emotional engagement should be handled by human staff, instead, standardized or repetitive task could hand over to robots since they can provide consistent services without human bias (Fang et al., 2024). Therefore, human-robot-staff collaboration is the ideal solution for future hotel industry which would maximum the advantages and minimum the disadvantages. However, much of the future is based upon the political

and social accommodations made to the new reality (Webster and Ivanov, 2020), thus, more empirical studies are surely needed for this new norm.

Implications and Future Directions

This chapter contributes to the existing literature on robotics, artificial intelligence and service automation (RAISA) in the hotel sector. Theoretically, the discussion summarized the role of performance as well as the benefits and challenges with RAISA adoption in the hotel industry. By providing the possible solutions and suggestions of RAISA implementation, this chapter enhances the understanding and knowledge of integration of RAISA technologies as part of the hotel employees which could leading to a better hotel practice. Besides, this chapter provides practical implications for hotel managers, business owners and tourism development associations in leveraging advanced technologies such as service robots and AI assistant to attract more customers. This would act as an alternative tool to enhance the customer experience, improve the hotel overall competitiveness and further capturing a novel way to resolve the current issues in hotel sector. Moreover, this chapter also presents a foreseeable future of human-robot collaboration which not only reinforces theoretical research but also provides supplementary perspectives regarding the complexities involved in service delivery of hotel industry.

Considering the unique features of new norm in hotel industry, future direction of RAISA adoption should focus on a three-part framework in which the interaction happens instead of a single variable. Unlike previously service environment, the service delivery or service interaction only featured between customers and hotel employees. The relationship is much easier to define and the result is also clear to observe. However, under the new norm of human robot collaboration, it is quite challenging to find the optimal combinations since the customer experience depends on three factors: robot design, customer features and human employee characteristics (Belanche et al., 2020). The service interaction across the three factors requires simultaneous analysis. Thus, future research should explore the three-dimensions of service interaction which could gain a comprehensive understanding of RAISA adoption. More specifically, customer-robot interaction and human staff-robot collaboration are truly needed for the future research.

Besides, since the robotics and artificial intelligence has transformed the hotel industry, they also blur the boundaries of human and nonhuman, culture and nature. One key issue that require much greater attention is privacy and ethics related to RAISA implementation. Thus, future research should study customer privacy, data security and robot ethics since robot ethics is important and might lead to conflict and ineffective regulations in the future (Chang et al., 2024; Gretzel and Murphy, 2019). Robot ethics is highly related to the human ethics of the designers, man-

ufacturers, service consumers and providers. Ethics is a young area in hospitality studies; however, studies are much needed regarding the cut-off on RAISA adoption. What is exactly the cut-off point on RAISA adoption and how to find the balancing between human employees and RAISA devices.

Furthermore, sustainable tourism based on Sustainable Development Goals (SDGs) is a hot topic in recent years. Tourism is widely acknowledged as a significant catalyst for the growth of local communities, since it constitutes a primary economic sector for many countries (Ivanov et al., 2023). Thus, tourism including hospitality has been considered as a “pivot” in achieving SDGs (Pasanchay and Schott, 2021). Meanwhile, it has been already recognized that technology can be a crucial instrument to attain the SDGs (Walsh et al., 2020). However, the relationship between SDGs and robotics are under discussion (Guenat et al., 2022). Further, the role of robots in tourism and hospitality’s contribution to the achievement of the SDGs has been largely neglected (Ivanov et al., 2023). Therefore, future research which measure the actual role of robots related to SDGs contribution in hotel industry are urgently needed.

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