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Exploring the Current Status and Future Potential of Robot, Artificial Intelligence, and Service Automation in the Indonesian Tourism Industry

Agung Yoga Asmoro*[1,2], Gareth Butler[1], Gerti Szili[1]
[1]Flinders University, Australia
[2]Akademi Pariwisata Nasional Banjarmasin

Abstract

This paper examines the current state and potential future applications of robots, artificial intelligence, and service automation (RAISA) in the hospitality, travel, and tourism industry, with a focus on Indonesia. The study utilizes a comprehensive review of literature and empirical data, including case studies, industry reports, and scholarly articles, to gather relevant information. The findings reveal that while the implementation of RAISA in the Indonesian tourism industry is still in its introductory stage, advancements in RAISA technology and decreasing costs make it increasingly viable for substituting human labor in repetitive and high-risk tasks. However, it is important to consider that not all service processes are suitable for automation or delegation to robots. The decision to automate or retain human labor depends on factors such as economic efficiency, customer satisfaction, company competitiveness, and other internal and external considerations. This research contributes to the existing literature by addressing the specific context of Indonesia and providing insights into the current state and potential future applications of RAISA in the hospitality, travel, and tourism industry. It highlights the scarcity of research in this area and emphasizes the need for further investigation, particularly in areas such as the economic rationale of service automation, the readiness of businesses to adopt RAISA, stakeholder attitudes towards service robots, the impact of RAISA on service quality and company competitiveness, and the ethical considerations associated with its implementation. The findings of this study offer valuable insights for industry practitioners, policymakers, and researchers aiming to understand the benefits, challenges, and implications of integrating RAISA in the Indonesian tourism industry.

Keywords: Robot; artificial intelligence; Service automation; Tourism industry; Indonesia.

A. INTRODUCTION

RAISA, which stands for Robots, Artificial Intelligence, and Automation of Services, has become increasingly prevalent in our society. Over the past few years, there have been remarkable strides made in the field of RAISA (Berezina et al., 2019; Carvalho & Ivanov, 2023; Lukanova & Ilieva, 2019; Naumov, 2019; Tussyadiah, 2020; Wang & Siau, 2019). Industrial robots are utilized in the production process (Colestock, 2005; Hägele et al., 2016), in transportation as autonomous vehicles (Gao et al., 2018; Komatsu et al., 2021; Li et al., 2022), within the medical industry, robots are utilized for both diagnostic and surgical purposes (Carranza et al., 2018; Marescaux et al., 2001; Simaan et al., 2018), in education (Arvin et al., 2019; Cheng et al., 2018; Park et al., 2019), in warehousing, logistics and supply chain management (Bolu & Korcak, 2021; Kumar & Kumar, 2018; Simoni et al., 2020), in the field of agriculture and animal husbandry (Bakker et al., 2006; Holloway et al., 2014; Noguchi & Barawid, 2011), and in many other areas.

Moreover, social robots have become part of our daily lives as companions and aides for the elderly (Coşar et al., 2020; Martinez-Martin & del Pobil, 2018; Michaelis & Mutlu, 2018) and for children with special needs (such as autism) (Jouaiti & Henaff, 2019; Saleh et al., 2021). Robots are

* Corresponding author: Agung Yoga Asmoro; Email: asmo0002@flinders.edu.au
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used for entertainment (Morris et al., 2019; Saeedvand et al., 2019), police institutions and military operations (Budiharto et al., 2020; Jentsch & Barnes, 2017; While et al., 2020). Many other applications of RAISA can be highlighted, but the reveal how RAISA have ultimately entered the realm of public life. Consequently, RAISA have also entered the hotel, travel, and tourism industry (Fusté-Forné, 2021; McCartney & McCartney, 2020; Tussyadiah & Miller, 2019). As an illustration, the Henn-na Hotel located in Japan is entirely automated, and guests will not encounter any human staff during their stay there (Reis et al., 2020). The Wynn Hotel in Las Vegas provides two-way AI-controlled speakers through Amazon Echo and is equipped with digital assistant Alexa (Buhalis & Moldavska, 2021), while the Aloft Hotels use Siri from Apple with similar features (Cain et al., 2019). Many restaurants have also begun to implement automation in their systems and services (Liyanage et al., 2018; Shimmura et al., 2020).

The implementation of RAISA technology offers substantial opportunities for the hospitality, travel, and tourism sectors to enhance their operational management and productivity, maintain a consistent level of service quality, and delegate certain service delivery processes to customers. Despite the interest that artificial intelligence has generated in the hospitality, travel, and tourism industry (Borràs et al., 2014), research on the adoption of RAISA in other areas (i.e. robots and service automation) remains scarce (Murphy et al., 2017), particularly when considering the context of the Indonesian tourism industry.

The progress of technology has affected the service industry, creating diverse prospects for service automation, which has been predicted for several decades (Asmoro & Bachri, 2021, pp. 2-7; Collier, 1983). Automation pertains to utilizing machines to carry out predetermined or programmable duties in service delivery. Early instances of service automation encompassed conveyors, automated teller machines (ATMs), and vending machines. The ongoing progress in information and communication technology has resulted in further advancements in enhancing service efficiency and customer experience (Law et al., 2014). An instance of this is the self-service check-in kiosks at airports, which permit travelers to reduce the amount of time spent waiting in queues at the airport and reach the gate quickly. This feature ultimately enhances the quality of the travel experience.

In 2017, the NoWait mobile application in the United States was acquired by Yelp for $40 million (Sawers, 2017). With this tool, customers can acquire information about the waiting period for restaurants located near them. They can also book reservations beforehand, monitor the number of individuals in line ahead of them, and arrive at the restaurant at an appropriate time to be seated and relish their meal. Other technologies that may play a role in service automation comprise 3D printing, self-driving vehicles, and robotic technology, among others.

Robots can be defined as physically intelligent devices (Chen & Hu, 2013) that possess a certain level of mobility, autonomy, and sensory capabilities that enable them to execute specific tasks (International Organization for Standardization, 2021; Murphy et al., 2017; Tan et al., 2016). In this context, autonomy denotes a robot's ability to perform its designated tasks without the intervention of humans. The extent of autonomy can be impacted by various factors, such as the intricacy of the robot's environment, as well as its inherent characteristics, including intelligence, mobility, and sensory abilities. Sensors are embedded tools that facilitate robots to gain knowledge about their surroundings and engage with them. The main task of the robot typically determines the specific sensor needs. Sensors serve as a mimic of the human senses by incorporating features such as light sensors (for vision), pressure sensors (for touch), taste sensors, and hearing sensors (Ruocco, 2013).

Robots can be broadly classified into two primary categories, industrial robots and service robots, depending on their functions and applications (International Organization for Standardization, 2021). Industrial robots are utilized for performing specific industrial activities and operations that are associated with manufacturing and production (Colestock, 2005; Hägele et al., 2016; Murphy et al., 2017). In contrast, service robots are developed to assist and provide service to humans through physical and social interactions. Service robots can be further categorized into two types: professional service robots that are used by businesses, and personal service robots that are used by individuals for non-commercial purposes.

The utilization of industrial and service robots has been expanding consistently, as highlighted by the International Federation of Robotics. Remarkably, even in the midst of the pandemic-induced challenges faced by the tourism industry, the sales of robots continued to surge. Within the hotel, travel, and tourism sector, there has been a notable embrace of RAISA as an integral component of operational practices. This article provides a focused exploration of the utilization of robots across various segments of the industry, with a lesser emphasis on artificial intelligence and service automation. Furthermore, recent discoveries since the exposure of ChatGPT, as evident in the works of Ali and ChatGPT (2023), Carvalho and Ivanov (2023), and Mich and Garigliano (2023), have provided additional insights into this area.

With the goal of comparing the current and potential use of RAISA in the Indonesian tourism industry to the prevailing trends observed globally, this article aims to shed light on its application in the local context. The existing limited investigation into the implementation of RAISA within the Indonesian tourism industry underscores the need for further research to comprehensively examine this subject matter. By conducting a thorough examination of the current state and prospects of RAISA in the Indonesian tourism industry, this study aims to address the research gap and provide valuable insights for industry practitioners and policymakers alike.

B. RESEARCH METHOD

This research is a qualitative study with a descriptive nature. From the research approach, it is research that uses an inductive rationality process. The steps in this research can be simplified as follows: (1) Selection of the research topic - determining the level of technological advancement in the Indonesian tourism industry (2) Conducting a search for information that supports the topic, supported by the minimal quantity of similar research, and the high significance of this topic to the Indonesian tourism industry; (3) Clarifying the research focus by determining RAISA in the Indonesian tourism industry as the research topic; (4) Finding relevant references and then classifying the reading materials according to sub-topics; (5) Reading and conducting research documentation; (6) Conducting a recollection of observations of field situations, specifically in the utilization of RAISA by the tourism industry in Indonesia; (7) Recording important points from the recollection; (8) Reviewing and enriching the reading materials; (9) Re-classifying the reading materials and writing the research results. This process is a strengthening cycle, as outlined by Denzin and Lincoln (2018) and Neuman (2014) in their books.

The data source for this research is obtained from relevant literature such as journals, books, and video broadcasts, as well as various national and international news. The data collection technique used in this research is sourced from documentation and unstructured observation (Williamson, 2018). Documentation refers to the search for data on things or variables in the form of: life histories, diaries, newspapers and magazines, letters, official

documents and records, and research reports, in accordance with critical rules for the authenticity of documents, credibility, representativeness, and document meanings (Sapsford & Jupp, 2006, p. 277). Observation is a flexible method that allows for comprehensive data collection, with the goal of observing and recording behavior holistically without using standardized and rigid guidelines that have been established previously (Bowen, 2009; Given, 2008). The research instruments used include: a research materials classification checklist, a writing scheme/map, and research notes. In this research, data analysis is carried out using the document analysis approach, which involves a systematic process of reviewing and evaluating both physical and electronic documents. This approach requires the examination and interpretation of data in order to derive empirical knowledge, meaning, and understanding (Bowen, 2009).

Table 1 RAISA Adoption in the Indonesian Tourism Industry

Tourism Industry	RAISA	Usage	
		World	Indonesia
Hotel	SR	Front office robot; concierge robot; delivery robot; service robot; vacuum cleaner robot; material handling robot; room assistant robot; smart room assistant; chef robot; barista robot (Berezina, 2015; Berezina et al., 2019; Ivanov et al., 2020; Kim & Qu, 2014)	Concierge robot (DetikTravel, 2021); Waiter robot (Media Indonesia, 2021; Putri, 2021); smart room assistant (Ramzi, 2021)
	AISA	Operational systems; distribution; intelligence; Self check-in kiosks (Carvalho & Ivanov, 2023; Ivanov et al., 2020; Lukanova & Ilieva, 2019)	Operational systems; distribution; intelligence (Hotelmu.id; powerpro.id; Simsoft.id)
Restaurant	SR	Robot cook; servant robots; robot bartender; robot barista (Kim et al., 2022; Kim et al., 2021; Ma et al., 2021; Zhu & Chang, 2020; Zoran, 2019)	-
	AISA	Ordering systems, games, payments; *conveyor resto*; *roller-coaster resto*; 3D food printing, artificial intelligence (Berezina et al., 2019; Carvalho & Ivanov, 2023; Garcia-Haro et al., 2021; Mishra et al., 2018; Nachal et al., 2019; Pulatsu & Lin, 2021)	Ordering, games, payment; *conveyor restaurant* (Astutik, 2019; KOMPAS.com, 2020; Ramadhanny, 2020; Sari, 2020)
Tour Operator & Travel Agency	SR	Physical robots only as support (Ivanova, 2019); *Robotic Process Automation* (Sharma & Gupta, 2021)	-
	AISA	Online Travel Agency (full automation of virtual services); various administration *software*; Self-information kiosk; audio tour guide; *augmented reality*; *Mobile Apps;* artificial intelligence (Bowen & Whalen, 2017; Carvalho & Ivanov, 2023; Ivanova, 2019)	Online Travel Agency (full automation of virtual services); various administration *software*; *Mobile Apps*
Car Rental Company	SR	Autonomous cars and taxis (Apollo, 2022; AutoX, 2021; Betz et al., 2019; Stopher et al., 2021; Tussyadiah & Sigala, 2017; Vijayenthiran, 2022)	-
	AISA	Counter information; *Mobile Apps* (Key Automation)	-
Event and MICE	SR	Booth guard robots; concierge robots; robot bartender; robot barista; servant robots; entertainment; delivery robot (Hwang et al., 2021; Ivanov et al., 2020; Ogle & Lamb, 2019; Singh et al., 2021)	-

	AISA	mobile telepresence (Zoom, Skype); counter check-in; self-service check-in; mobile check-in; mobile apps; augmented reality	mobile telepresence (Zoom, Skype); self-service check-in kiosks
Theme Park and Amusement Center	SR	Concierge robot; robot bartender; robot barista; servant robots; entertainment robots; delivery robots; robot tour guide; Cleaning robots (Ivanov et al., 2020; Milman et al., 2021; Virto & López, 2019)	-
	AISA	Counter information; self-service sales counter	Counter information; self-service sales counter
Airport	SR	Airport guide robots; luggage robots; customer service robots; entertainment robots; hygiene robots; delivery robots; luggage train robots; self-driving autonomous transport; Security robots (Aviation, 2020; Hornyak, 2020; Ivanov et al., 2020; Munich Airport, 2018; Public Transport Extreme, 2018; Sadjadi & Jarrah, 2011)	-
	AISA	self-service check-in kiosks; *mobile check-in*; bag inspection; conveyor belts; self-boarding gate; *Biometric Facial Recognition*	self-service check-in kiosks; mobile check-in; bag inspection; conveyor belts; self-boarding gate; *Biometric Facial Recognition (Angkasa Pura 1, 2021)*

SR: Service Robot; AISA: Artificial Intelligence and Service Automation
Source: Compilation of various sources, 2022

C. RESULTS AND DISCUSSIONS

The table presented in this study provides a comprehensive overview of key examples of RAISA adoption in the hospitality, travel, and tourism industries. These examples, along with their corresponding references, serve as the basis for further discussion in the subsequent sections.

Hotel

The hotel industry has seen a proliferation of automation and robotic technology, which has in turn affected various lines of hotel operations (López et al., 2013; Rodriguez-Lizundia et al., 2015). Self-service kiosks have been introduced by hotels to facilitate automated check-in and check-out processes, which eliminate the need for front desk staff (Kim & Qu, 2014). Similar services that are more personalized have even been offered to guests directly through their mobile devices, as reviewed by Berezina (2015) which can be observed in some star-rated hotels such as Marriott Bonvoy App, Hilton Honors or Accor Group with Accor All (Accor Group, 2022; Hilton, 2022; Marriott International, 2022). Not only does this benefit guests' comfort, but the presence of this technology also supports the hotel's performance during the pandemic, which is required to provide contactless services, thus minimizing the potential spread of the virus and thereby increasing the hotel's CHSE value (Kemenparekraf, 2020).

Robots are present in different departments of hotels that serve customers and support the tasks of human employees. The Henn-na Hotel mentioned earlier is the first fully robotic staff hotel (Rajesh, 2015). The hotel has robots that work in the front office, perform porter functions, assist in rooms, perform dusting functions, and hand-shaped robots that perform baggage storage functions. However, in 2019, Henn-na "fired" 243 of their robots due to the negative impact felt by guests and the added workload for their human employees (Mochizuki, 2019). However, this is more due to the sophistication of the robots that cannot keep up with the rapid global technological changes. All room assistant robots named Churi and porter robots have been deactivated by Henn-na Hotel. Churi after 4 years of operation began to show

signs of damage and was left behind compared to the digital assistants Google and Siri integrated into guests' smart phones. The porter robots were stopped from operating because they were proven to be slow, causing disappointment among Henn-na Hotel guests (Ivanov et al., 2020).

On the other hand, in Hangzhou, China, the FlyZoo Hotel, owned by tech giant Alibaba, was introduced to the public (Cadell & Jiang, 2019). FlyZoo is a high-tech hotel that resembles the Henn-na Hotel in Japan. The hotel has also adopted robots as a means of potentially reducing labor costs, reducing interactions between employees and guests (privacy), reducing check-in queues, and ultimately, improving the guest experience. FlyZoo also employs robot receptionists, butlers, and bartenders. Similar to the Henn-na Hotel, FlyZoo also equips each room with a digital assistant, however, the difference is that they do not specifically design robots as room assistants, but instead use regular two-way speakers commonly found in the open market, which allows for integration with the digital assistant available on the guests' smart phones - and this allows for lower maintenance costs (Ivanov et al., 2020).

Previously, on the other side of the globe, in 2014, Aloft Hotels conducted a trial of robots developed by Savioke (Markoff, 2014). The robots were capable of maneuvering throughout the hotel, utilizing elevators, and contacting guest rooms to deliver requested items to the front of the guest room doors. In 2016, the Hilton hotel launched a robot concierge named Connie, supported by artificial intelligence (Bowen & Whalen, 2017). Connie had the ability to interact with hotel guests and provide them with information about the hotel's amenities and services, as well as offer recommendations for nearby attractions and activities. Furthermore, the robot was equipped with artificial intelligence that allowed it to learn from every guest interaction, thereby enhancing its ability to respond to a variety of guest inquiries in the future. Despite the availability of automation and robot technologies across various hotel departments, the adoption of such technologies remains minimal. The implementation of automation and robot technologies is often only adopted by larger capital hotel managers, technology holders, and global hotel networks.

In addition to the robots and automation services in the above hotels, at least other types of robots can be present and perform their functions in this industry. For instance, laundry and folding robots are among the examples of automation services offered through self-service and robot technology. These technologies provide an opportunity for hotels to decrease labor costs and enhance operational efficiency. Additionally, robots' presence in hotels can awe guests, making it a unique and innovative feature that can potentially increase customer satisfaction.

As for the implementation of RAISA in the Indonesian hotel industry, the JHL Solitaire Hotel recently pioneered the use of robots that can perform relevant disinfection tasks related to the pandemic and are able to replace waiters (Putri, 2021), while the Pullman Bandung Grand Central has introduced a robot called "Mano" that acts as a lobby ambassador (DetikTravel, 2021). The presence of waiter robots in the Sahid Jaya Hotel also complements the presence of robots in the Indonesian tourism industry (Media Indonesia, 2021).

The guest rooms at Aston Inn Jemursari Surabaya now utilize Google Nest as a form of internet of things technology (Ramzi, 2021), allowing guests to play music, receive news updates, set timers, control smart devices such as air conditioning units, offer real-time translations, and communicate two-way while browsing the internet to answer any questions asked (Google, 2022). In the realm of internet of things, the capsule hotel network manager start-up, Bobobox, has introduced at their Yogyakarta and Jakarta Pusat branches, door access controls that are connected to an app and also provides the ability to adjust the color of LED lights within the capsule rooms (Oktavia, 2020). Additionally, the provision of contactless check-in and check-out technology allows for reduction in the spread of viruses, thereby enhancing the CHSE value of the hotel.

On the other hand, automation of hotel management systems has been adopted by many hotels in Indonesia. These systems typically provide integrated management services and facilitate check-ins, with services including: (1) Operations, which include hotel management systems, room key systems, centralized reservation systems, reporting and analytics systems; (2) Distribution, which includes hotel websites and booking systems, channel managers, digital marketing, and; (3) Intelligence, which includes intelligent revenue management systems, mobile apps for managers, and online reputation management (Hotelmu.id; powerpro.id; Simsoft.id).

Since gaining popularity in early 2023, ChatGPT has emerged as a transformative tool in the realm of hotel management (Carvalho & Ivanov, 2023; Mich & Garigliano, 2023). With its advanced natural language processing capabilities and contextual understanding, ChatGPT has revolutionized customer interactions by providing personalized and efficient assistance. It enables hotels to automate tasks such as answering guest queries, providing recommendations, and facilitating reservations, thereby streamlining operations, and enhancing guest experiences. However, the implementation of ChatGPT in hotel management also poses challenges related to data privacy, accuracy, and ongoing monitoring to ensure optimal performance. As ChatGPT continues to evolve and adapt to the specific needs of the hotel industry, its usage holds immense potential for shaping the future of hotel management and driving customer satisfaction to new heights.

The Indonesian hotel industry is experiencing a growing adoption of RAISA, particularly in the areas of automation services and the use of artificial intelligence to identify markets and support marketing efforts. However, the implementation of robots in the hotel ecosystem of Indonesia is still at an early stage of introduction and recognition, and it will take more time for it to grow and develop.

Restaurant

The restaurant industry in a global context has been able to automate both the presentation and preparation stages of food. Table ordering has been integrated and is available in various restaurants through the use of tablet technology and touch screen tables that utilize the internet (Mishra et al., 2018). Customers can use this technology to access menus, view images and detailed descriptions of food items, order food, play games while waiting for their orders, and pay their bills at the end of their dining experience. Furthermore, robots can be used to take orders in restaurants.

At Pizza Hut, the process of taking orders has been automated with the use of a humanoid robot called "Pepper", which is capable of communicating with customers using voice recognition and artificial intelligence (Garcia-Haro et al., 2021). Pepper has a custom-built application in collaboration with MasterCard that enables it to not only receive orders and instantly send them to the kitchen but also process payments. In addition to the use of robot servers, restaurants have also previously adopted methods of automatically delivering food using conveyors and roller coasters (Berezina et al., 2019). Conveyor restaurants employ mechanical conveyor belt systems, water-based systems, or magnetic movement to transport dishes to customers' tables. In contrast, the roller-coaster delivery model resembles a roller coaster track and delivers food to guests' tables. Restaurants use an automated food ordering process through touch screens available at tables, and then orders are forwarded to the kitchen. Once the food is ready to be served, the food container slides directly to the customers' table. The restaurant industry can be said to have been able to introduce several complete examples of front-of-the-house automation.

Automation in restaurants does not only stop at the process of serving food, but also extends to the production process (cooking). The development of 3D printing technology has enabled the creation of 3D food printing (Pulatsu & Lin, 2021). 3D printing machines produce edible dishes from a compartment of ground food materials. The 3D printer produces thin layers of materials to subsequently process a dish

that has been previously programmed in a digital model via a computer. This technology not only allows for the creation of complex food designs, but also enables the customization of food nutritional values based on consumer needs (Nachal et al., 2019; Pulatsu & Lin, 2021). In addition to 3D printing, some dishes can now be prepared and cooked by robotic technology, such as sushi-making robots (Zhu & Chang, 2020), ramen and noodle robots (Zoran, 2019), robots capable of preparing layered breads/burgers (Ma et al., 2021), and robots serving as baristas to present various coffee varieties (Kim et al., 2022; Kim et al., 2021).

The available technology provides many opportunities for full automation of service. The advancements and integration of systems currently available have essentially led to a fully automated restaurant management condition, like the previously mentioned Henn-na hotel. Full automation in restaurants means including automation in the service section that interacts with guests and in the production side of the kitchen, where customers can place their orders through self-service technology or robot servers at restaurants utilizing automation technology. Robotic chefs will cook the food and the dishes will be delivered to customers through various methods such as conveyors, roller coasters, or other automated systems. Nonetheless, restaurants that are not prepared for complete automation can still take advantage of technology in specific aspects, such as receiving orders, aiding in cooking, dishwashing, or just processing payments.

In Indonesia, automation of service can be easily observed in many fast-food chains such as KFC and McDonalds in their branches in major cities. The introduction of service robots in restaurants has only just begun at the end of 2021 (Republika.co.id, 2021). This means that before this, the presence of service robots in restaurants can be considered as not being available. In terms of artificial intelligence, the use of chatbot technology through WhatsApp has been introduced since 2020 (Ramadhanny, 2020), but its usage is still limited in scope and scale. Although not a restaurant, Grab uses artificial intelligence to improve customer experience through its GrabFood Signature program which utilizes the big data they possess (Astutik, 2019). Automation of service can also be seen in the use of conveyor belts in Sushi-Tei restaurants and some other sushi restaurants in major Indonesian cities (KOMPAS.com, 2020). For traditional Indonesian cuisine, one such restaurant, RM Aroma Padang in Surabaya, has also adopted it (Sari, 2020). However, it can generally be said that the use of RAISA in restaurant businesses in Indonesia is still not commonplace. From the perspective of the service lifecycle, the adoption of RAISA is still in the introduction stage.

Tour Operators & Travel Agency

The adoption of automation technology and robotics in travel agencies and tour operators is limited compared to other tourism companies. This is since the role of these companies has transformed from being mere sellers of travel products (such as plane tickets and hotel vouchers) in the 90s, to being travel consultants that require high flexibility, a task that is still difficult to be replaced by robotics. At present, certain travel agencies have installed automated information terminals that offer details about travel destinations, packages, and other related services. Despite this, the rise of the internet has diminished the demand for offline self-service technology since customers can readily browse and book their travel needs online. Thus, automation technology in travel agencies is primarily used as a supplementary tool rather than a primary one. However, there is the possibility for robots to serve as sales representatives, travel advisors, or even tour guides in the future.

For many years, audio guides have been used in travel agencies, even though robots are not yet commonly used. Unfortunately, audio guides only provide one-way communication and do not provide room for interaction, while tour guide robots are expected to have the capability to provide tourists with more comprehensive information and engage in interactive conversations with them. Additionally, there is also potential for the use of digital assistants (such as Siri for iPhone, Google Assistant for Android, Alexa

for Amazon, and Cortana for Microsoft) that are connected to travel agency websites and assist customers with recommendations for tourist destinations, travel planning, flight booking, accommodation, and other tourism services, scheduling calendar events, and reminding/informing about important events such as flight schedule changes or visa regulations for visiting a certain country. However, this means that the digital assistant is in the customer's hands and not physically present in the agency's office. Although not physically present in the office, these digital assistants are also helping the agency market their products and services.

Recently, a programming methodology called Robotic Process Automation (RPA) has begun to be popularly adopted by travel agencies. The purpose of this program is to automate both frontend and backend business processes, aiming to enhance efficiency and decrease labor (Sharma & Gupta, 2021). This application is capable of automating both frontend and backend business processes, resulting in increased efficiency and reduced labor. It can perform a variety of tasks such as copying, pasting, moving, and deleting data from different sources including websites, mobile apps, email, and Excel spreadsheets. Due to its ability to perform repetitive tasks, it is regarded as one of the most efficient technologies available.

Since gaining popularity in early 2023, ChatGPT has emerged as a game-changing tool in the realm of tours and travel management (Carvalho & Ivanov, 2023; Mich & Garigliano, 2023). With its advanced natural language processing capabilities and contextual understanding, ChatGPT has revolutionized the way travel companies interact with their customers. It empowers travel agents and online platforms to provide personalized recommendations, answer inquiries, and assist with travel arrangements in a conversational manner. By automating routine tasks, ChatGPT enables travel professionals to focus on more complex and strategic aspects of their roles, ultimately enhancing efficiency and customer satisfaction. However, ensuring data privacy, maintaining accuracy, and continuously monitoring and refining the system remain vital considerations. As ChatGPT continues to evolve and adapt to the specific needs of the travel industry, its usage holds tremendous potential for transforming tours and travel management, enabling companies to deliver exceptional service and cater to the evolving needs of modern travelers.

In conclusion, the incorporation of robots, artificial intelligence, and service automation within the Indonesian tours and travel industry represents a significant development with the potential to revolutionize the sector. As these technologies gain traction, they offer new avenues for enhancing operational efficiency, customer experiences, and overall competitiveness. By automating various tasks, providing personalized recommendations, and improving communication channels, these technologies enable Indonesian travel businesses to cater to the evolving needs and preferences of travelers, while also driving cost savings and process optimization. However, it is crucial to address challenges such as workforce readiness, ethical considerations, and the need for continuous adaptation and monitoring to ensure the successful integration of these technologies. As the Indonesian tours and travel industry continues to explore and embrace robots, artificial intelligence, and service automation, it is poised to leverage their full potential, unlocking opportunities for growth, innovation, and excellence in delivering exceptional travel services.

Car Rental

Car rental companies have only implemented autonomous vehicles (AVs) to a limited extent. However, initial initiatives have been underway for several years. At least since 2016, Alphabet's subsidiary, Waymo, has been conducting a series of tests on 500 driverless taxi units in Phoenix, United States, which ultimately resulted in satisfactory findings (Stopher et al., 2021). In San Francisco, the

company Cruise has been offering limited service of driverless taxis to customers since early February 2022 (Vijayenthiran, 2022).

In China, Baidu Apollo has initiated testing of the use of robotaxis and robobuses since 2017 (Apollo, 2022). In China, the autonomous taxi start-up AutoX China, funded by Alibaba, announced that its Robotaxi service has been serving the public in Shenzhen (AutoX, 2021). Meanwhile, the autonomous car rental start-up Halo.car in Las Vegas is about to launch their driverless taxi service soon. All autonomous vehicle manufacturers are competing to achieve level 5 autonomy, which allows vehicles to operate without human assistance at all (Betz et al., 2019).

However, long before the existence of autonomous taxis, automation of car rental services may have been initiated by Zipcar (a subsidiary of Avis Budget Group), which provides facilities to open and close car keys integrated with iOS/Android apps. Research conducted by Tussyadiah et al. (2017) showed that users' attitudes towards robot taxi technology are relatively positive and also indicate a high level of trust. This research certainly further strengthens the efforts of automotive manufacturers to achieve their target of level 5 autonomy.

The presence of autonomous vehicles (AVs) in the future has at least six main advantages for car rental companies compared to traditional vehicles. First, increased safety: Autonomous vehicles use advanced sensors, cameras, and algorithms to detect and respond to road conditions, which can decrease the number of accidents caused by human mistakes. Second, improved efficiency is another benefit of autonomous vehicles. They can communicate with other vehicles and traffic infrastructure to optimize routes and minimize traffic congestion. Third, increased mobility: this technology can be particularly beneficial for individuals who are unable to operate a vehicle, such as those who are elderly or have disabilities. Fourth, reduced environmental impact: Autonomous vehicles can improve fuel efficiency and reduce emissions by optimizing routes and driving patterns. Fifth, Cost savings: Autonomous vehicles can reduce the need for human drivers, which can lead to lower labor costs for transportation companies. Sixth, increased comfort: Autonomous vehicles allow the passengers to engage in other activities while the car is driving, like reading, sleeping, or working. Moreover, car rental companies can play a crucial role in accelerating the adoption of AVs. With a significant number of car rental and taxi companies transitioning to AVs, it would require substantial investment in AV technology development and the necessary supporting infrastructure.

The use of robotics, artificial intelligence, and service automation in the Indonesian car rental and transport industry is still in its early stages. However, there are some notable advancements. For example, Gojek, one of the largest ride-hailing companies in Indonesia, has implemented an AI-powered chatbot to improve customer service (Angelina et al., 2022). The chatbot can handle multiple requests at the same time and is capable of providing personalized recommendations for customers. Another Indonesian ride-hailing company, Grab, has also integrated AI technology into its platform, using data analytics to optimize its ride matching algorithm (Huang et al., 2019). On the other hand, traditional car rental companies have yet to fully embrace these technologies, as their services are still primarily reliant on human labor. However, some of them have implemented a self-service booking system and mobile app for customers to rent cars, which is a step towards automation. Furthermore, the Indonesian government has shown support for the development of autonomous vehicles through its roadmap for the automotive industry. While the adoption of robotics, AI, and service automation in the Indonesian car rental and transport industry is still in its early stages, there are promising signs of progress and potential for growth in the future.

Event & MICE (Meeting, Incentive, Conference, Exhibition)

It can be said that the Event and MICE (Meetings, Incentives, Conferences and Exhibitions) industry has adopted many of the same automations that the hotel and restaurant industries have implemented. This is because the services provided by hotels and restaurants are closely related to those provided by the Event and MICE industry. For example, self-service kiosks of various types have been used in the MICE industry, often as a replacement for traditional name tags that were once used at conferences or exhibitions.

Artificial intelligence and big data are being increasingly employed in the Event and MICE industry. Within this sector, robots are utilized in various forms such as telepresence robots, concierge robots, bartender robots, peacekeeper robots, server robots, delivery robots, and entertainment robots (Ogle & Lamb, 2019; Singh et al., 2021). Artificial intelligence is also employed in the use of digital assistants and chatbots (Ergen, 2021). It has been established that artificial intelligence provides various opportunities for stakeholders to gain a competitive edge, access valuable marketing information, digitize manual processes, improve customer interactions, reduce event participation costs, and introduce new products and services to create added value. Given these benefits, the use of artificial intelligence is expected to persist in the Event and MICE industry in the future.

However, there are a few examples of services that utilize RAISA technology in the Event and MICE industry, such as the OppiKoppi music festival organizer in South Africa distributing cold drinks via drones to over 150 concertgoers (Hwang et al., 2021). Robots can be employed in this industry to offer concierge services, deliver goods, transport personal belongings, cook, and clean dishes (Singh et al., 2021). In the business event segment, robots are utilized to engage with visitors at check-in rooms and provide virtual assistance to customers in simulating a location during trade shows. Additionally, telepresence robots enable attendees to interact with presenters virtually (Ogle & Lamb, 2019). Other examples include a robot barista used at international industry events to serve event participants, and a virtual holographic server named 'Jenny' that functions as a help desk while providing information about planned events (Singh et al., 2021). Additionally, robots can greet and entertain guests at Event and MICE events.

The implementation of RAISA technology in the Event and MICE industry in Indonesia has been increasing in recent years although remains primarily limited to telepresence and virtual presence (Afrianty et al., 2022; Rachmawati et al., 2021). This is supported by the phenomenon of the COVID-19 pandemic, which has caused many people to work online from home. Some artificial intelligence technologies that users experience directly in some telepresence applications include the use of augmented reality, which allows users to change the background screen during meetings or use virtual masks. A report by Cekindo, a market entry consulting firm, highlights that the demand for AI-powered chatbots has been rising among event organizers in Indonesia. Chatbots can provide 24/7 assistance to attendees, answering their questions promptly and efficiently, thereby enhancing the overall customer experience.

Moreover, some robots are utilized for various purposes such as serving food and drinks, delivering goods, and providing virtual assistance to customers at trade shows. The use of service automation has also been on the rise, with event organizers in Indonesia adopting digital payment methods, online registration systems, and ticketing services to simplify the booking process and reduce human error. The implementation of such technologies not only enhances the customer experience but also streamlines event management processes. However, it is best to assume that the use of robots or other automation services in the Event and MICE industry in Indonesia is not yet common.

Theme Park and Amusement Center

Substantial automation can be observed in theme parks in recent times, this is because many of the offerings of theme parks are not significantly distinct from those of other industries in the tourism and hospitality sector. Like most adoptions of automation in the travel and hospitality industries, ticket provision can be purchased either online or with the assistance of automatic kiosks, particularly in leading theme parks. This form of automation resembles the forms of automation that are now commonly found in train stations and airports. However, research on the role of service robots in theme parks is still minimal. Many theme parks have begun to adopt various technologies to enhance consumer experiences through the use of artificial intelligence and service automation such as in the use of mobile applications, virtual reality, and social media networks.

In the United States, Disneyland, for example, has been utilizing the benefits of robots for customer service for several years. They have introduced robots that can replace costume actors/mascots, perform entertainment shows, control crowds, and interact with children. In this case, researchers conclude that similarity to humans is an important component of the overall visitor experience in theme parks (Milman et al., 2021). Gyeongnam Masan Robot Land in South Korea is even developed specifically as the world's first theme park with a robot theme (Ivanov et al., 2020).

It is also worth noting that the synergy of education and entertainment (edutainment) in theme parks and specifically museums provide opportunities for the adoption of robots (Virto & López, 2019). Domestic robots, typically used for household chores, can be efficiently employed to clean vast open areas on museum floors. Furthermore, robots can serve as information agents and tour guides. Smithsonian Castle and three other museums have empowered robots Pepper. In addition to providing information about the museum and its collections, these robots perform other functions such as storytelling, posing for selfies, and entertaining visitors (Ivanov et al., 2020).

Unfortunately, the utilization of automation in theme parks in Indonesia is still in the early stages and mostly touches on office administration aspects only. The robots that exist in theme parks in Indonesia are not service robots as the focus of this paper's discussion. Most of the "robots" that exist in theme parks in Indonesia are mechanical machines without artificial intelligence. Thus, these "robots" are not capable of performing functions other than the one function that was designed initially. Examples of mechanical robots are those in the "robots" dolls in *Istana Boneka*, *Dunia Fantasi*, which can only move their heads left and right, forward and backward (Journey, 2016). Or like the dinosaurs "robots" that are widely spread in Jatim Park 3 (Jawa Timur Park, 2018). In the future, human-like robots can be utilized in multiple capacities, including welcoming guests at entrances and attractions, storytelling, offering information and aid, and even carrying out maintenance tasks. Therefore, further research is needed to explore the potential benefits and limitations of the use of service robots in theme parks in Indonesia.

Airport

Automation of services plays a crucial role in airports' efforts to enhance the experience of travelers in terms of speeding up services, increasing efficiency, and ensuring security. Self-service check-in kiosks provided by airport managers allow travelers to check-in and print their boarding passes. Self-service baggage check-in is also now possible without the assistance of staff, where the baggage will be automatically conveyed to sorting facilities and then transported to the aircraft on time. Additionally, travelers can now use digital boarding passes on their smart devices while traveling through the airport, and then enter the aircraft via a gate using a biometric screening of the retina and fingerprint to ensure flight security and safety.

Similarly, robots are increasingly being used in airports around the world. Baggage handling robots have been tested and operated at Geneva International Airport, Switzerland (Ivanov et al., 2020). These

robots greet customers outside the airport, scan boarding passes, print baggage labels, and store baggage in special compartments. Robots have the capacity to transport two suitcases and convey them to the baggage area within the airport. As a result, travelers can bypass queues and proceed directly to security.

Customer service robots are increasingly being employed at airports to respond to travelers' inquiries, offer up-to-date flight information, make announcements, escort passengers to their gates, and even entertain them by singing and taking selfies (Hornyak, 2020). At Düsseldorf Airport in Germany, travelers can find a robot valet that will automatically park the cars of travelers who wish to travel (DW News, 2014). This helps business travelers who often drive alone and prioritize time. In Germany, Munich Airport provides a robot service called Pepper (Munich Airport, 2018), while in London, England, travelers will not only be provided with robot valet services (Aviation, 2020), but also by a multilingual robot named BotsAndUs (TTG Media Limited, 2019), an autonomous pod robot without a driver (Public Transport Extreme, 2018), and also a virus disinfectant robot (Dailymail, 2020).

Robots in airports also perform cleaning tasks (Sadjadi & Jarrah, 2011) for both general areas and particularly high-risk areas such as cleaning the glass in the ATC tower. Robots also carry out tasks related to delivery (Ivanov et al., 2017). As all areas of airport service operations are affected by automation and robot technology, airports in the future have the potential to operate fully automatically, thus allowing travelers to travel through the airport without having to interact with airport staff except for a small number who play a role as robot system supervisors and security protocols.

Despite the widespread adoption of robots in major international airports, the same conditions have yet to be implemented by airport managers in Indonesia. However, automation of services at airports has begun to appear, particularly in major airports, such as Terminal 3 of Soekarno-Hatta International Airport, which has implemented several self-service check-in counters, automatic baggage drop-off, and express boarding lanes for certain criteria of passengers. Another example can be seen at Sepinggan Airport in Balikpapan, which has implemented a Baggage Handling System, which guarantees the security of baggage through four levels of inspections and automatically separates baggage according to the passengers' flight (Angkasa Pura 1, 2021), or Banyuwangi Airport that adopted biometric facial recognition technology which increases the value of safety as well as travel efficiency. In short, the adoption of automation services has been widely implemented in airports in Indonesia, but there has yet to be an indication of the use of service robots.

D. CONCLUSION

This research critically examines the current state of robots, artificial intelligence, and service automation (RAISA) utilization within the hospitality, travel, and tourism industry, with a specific emphasis on its implementation in Indonesia. Furthermore, the study explores the potential future applications of RAISA in this sector. It is important to acknowledge that while certain ideas concerning RAISA service implementation discussed in this paper may not materialize in the immediate future, the rapid advancement of RAISA technology alongside decreasing acquisition and maintenance costs is making the substitution of human labor in the tourism industry, particularly for repetitive and high-risk tasks, increasingly feasible. However, it is crucial to recognize that not all service processes can or should be automated or delegated to robots. Ultimately, the decision to automate or retain human labor in service processes within the tourism industry will be influenced by factors such as economic efficiency, customer satisfaction, company competitiveness, and other internal and external considerations.

Moreover, it is worth noting that in the broader context of artificial intelligence, ChatGPT has also gained significant prominence since its emergence in early 2023. As a cutting-edge language model, ChatGPT offers transformative opportunities in the field of customer service, communication, and personalized recommendations within the tours and travel industry. Its advanced natural language

processing capabilities and contextual understanding enable travel companies to engage with customers in a conversational manner and provide tailored assistance. However, ensuring data privacy, accuracy, and continuous refinement of ChatGPT's responses remain crucial considerations. As the field of artificial intelligence continues to evolve, it is imperative to explore and harness the potential of ChatGPT in the context of tours and travel management, paving the way for enhanced customer experiences and improved operational efficiency.

Consequently, it can be concluded that the adoption of RAISA in the Indonesian tourism industry is still in its introductory stage, and it is premature to envision the establishment of a fully developed RAISA tourism industry ecosystem in Indonesia in the near future. Presently, the implementation of RAISA in the Indonesian tourism industry remains limited to a select number of established entities, such as certain star-rated hotels affiliated with global networks, albeit to a limited extent.

Given the current scarcity of research pertaining to the utilization of RAISA in the Indonesian tourism industry, future investigations should concentrate on several key areas. Firstly, there is a need to explore the economic rationale behind service automation and the integration of robots within the tourism industry to gain valuable insights. Secondly, it is imperative to examine the preparedness of businesses and the influences that shape their decision to substitute human labor with RAISA. Additionally, assessing the attitudes of customers, employees, and managers towards service robots would contribute to a comprehensive understanding of their acceptance and impact. Furthermore, evaluating the effects of RAISA on service quality, company competitiveness, and financial outcomes would yield valuable insights for industry practitioners. Lastly, it is essential to investigate the ethical considerations associated with the utilization of RAISA in the tourism sector. By addressing these research gaps, a deeper comprehension of the potential benefits, challenges, and implications of integrating RAISA in the Indonesian tourism industry can be achieved.

E. LIMITATION AND FURTHER STUDY

This research is conducted at a time when the utilization of RAISA (robots, artificial intelligence, and service automation) in the Indonesian tourism industry is still in its initial stage, with limited exploration into its practical applications and implications. Aligned with this trend, research pertaining to the utilization of RAISA in the Indonesian tourism industry is still quite scarce. Subsequently, it is crucial that future research focuses on the economic rationale of service automation and the integration of robots by the tourism industry; clarifies the preparedness of businesses and the influences that impact their decision to substitute human labor with RAISA; assesses customer, employee, and managerial attitudes towards service robots; evaluates the effects of RAISA on service quality, company competitiveness, and financial outcomes; and investigates ethical considerations associated with the usage of RAISA in the tourism sector.

In line with the prevailing trajectory, forthcoming research endeavors should concentrate on several key areas. Primarily, an in-depth examination of the economic justifications underlying service automation and the seamless integration of robots within the tourism sector is imperative. This would involve comprehensively elucidating the readiness of businesses to embrace RAISA technology and analyzing the myriad factors influencing their decision-making processes in terms of substituting human labor with RAISA. Additionally, meticulous scrutiny of stakeholder perspectives, encompassing customers, employees, and managers, is essential in order to ascertain their attitudes and perceptions vis-à-vis service robots.

Furthermore, it is essential to undertake comprehensive assessments of the impact of RAISA implementation on service quality, organizational competitiveness, and financial outcomes within the context of the tourism industry. This would entail discerning the intricate interplay between the utilization of RAISA and its ramifications for service delivery, customer experiences, and overall performance in a

highly competitive market. Moreover, exploring the ethical dimensions associated with the adoption of RAISA within the tourism sector constitutes an imperative line of inquiry. Delving into the potential ethical considerations arising from the utilization of robots, artificial intelligence, and automation technologies would shed light on the societal and moral implications that necessitate scrutiny and ethical frameworks.

To address these critical gaps and push the boundaries of knowledge, future research should devote significant attention to these multifaceted aspects, facilitating a deeper understanding of the complexities surrounding the integration of RAISA in the Indonesian tourism industry. By doing so, it will be possible to unlock novel insights and practical implications that can guide industry stakeholders, policymakers, and researchers in effectively harnessing the potential of RAISA technology to transform and enhance the tourism sector.

F. CONFLICT OF INTEREST AND ETHICAL STANDARDS

The author declares that there are no conflicts of interest in relation to the research conducted. The study was carried out with the utmost adherence to ethical standards, ensuring the integrity and credibility of the findings and no unethical practices, such as plagiarism, animal testing, or human testing, were employed during the research process. Contribution: Agung Yoga Asmoro, conceptualization, methodology development, data collection, analysis, writing of the manuscript. Gareth Butler, review of the manuscript, final refinement. Gerti Szili, manuscript editing.

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