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Customers Satisfaction on Robots, Artificial Intelligence and Service Automation (RAISA) in the Hotel Industry: A Comprehensive Review

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Abstract

Due to the 4th Industrial Revolution, Artificial Intelligence and other internet technologies such as RAISA (Robots, Artificial Intelligence and Service Automation) have been adopted in various industries, including the hospitality and tourism industry. As the industry traditionally offers services through manual labor force, more companies adopt RAISA through a commercial service in the form of chatbots, delivery robots, robot concierge, conveyor restaurants, self-service information/check-in/check-out kiosks, and many others. The current academic resources mainly focus on customer perception or evaluation of robots themselves, and few studies link robot services with customers' overall experience of hospitality services. This study aims to evaluate the current status of RAISA studies in the hotel industry and propose directions for future research. Thirty-seven articles were identified from Google Scholar. These articles were reviewed from four perspectives, namely, journal/year distribution, methodology, research context, theoretical foundation. Findings reveal that most studies on RAISA in the hotel industry focus on RAISA's impacts on the hotel industry, RAISA service quality, customer acceptance of RAISA service, customer satisfaction and factors influencing Customers' Satisfaction on RAISA Service and quantitative approach is the dominant research method. To this end, five research directions cover outstanding themes as follows: 1) strategic assessment of RAISA performance, 2) hotel financial impacts on RAISA employment, 3) customers' satisfaction and RAISA service quality, 4) macro environment impacts on RAISA in hotels, and 5) premium determinants on customers' acceptance on RAISA.

Keywords

Robots, Artificial Intelligence, Service Automation, Customer Satisfaction,

Hotel Industry

1. Introduction

With the advent of the artificial intelligence (hereinafter referred to as: AI) era, which is considered the fourth industrial revolution, the replacement of human brain operations with computers and robots has become an important manifestation of enterprise technology transformation and upgrading (Agah et al., 2016; Ferreira et al., 2017; Ivanov & Webster, 2017). AI brings more new opportunities to the tourism and hospitality industry. The tourism and hospitality industry evidently have seized the opportunities.

According to the China service robot industry development research report as shown in **Figure 1**, sales of service robots in China gradually increased from 2015 to 2019. And the increasing trend of service robot sales is better than the one of industrial robots. However, it also can be seen that the sales amount of service robots in China is significantly less than the one of global service robots. Service robots sales in China continue to maintain a good growth momentum and are expected to become a global industry leader. More and more companies in the hospitality and tourism industry have also begun to use robots, artificial intelligence and service automation (Hereinafter referred to as: RAISA) in the production and delivery of their services. For example, in the hotel industry, Alibaba has applied many AI technologies to hotel services, named FlyZoo Hotel, and this unmanned physical hotel officially has started its commercial operation (Law et al., 2019). In the aviation industry, KLM uses an AI device called "Spencer" to answer questions from passengers and enhance their travel experience. In the retail industry, online stores (e.g. Taobao, Jingdong, Pinduoduo) use online AI technology to develop personalized recommendation systems to

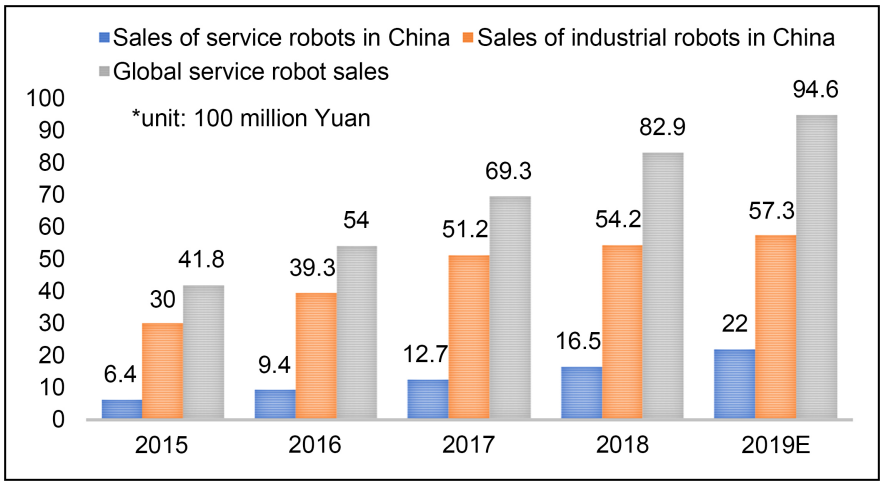


Figure 1. 2015-2019E Global/China service robot and China industrial robot Sales: Retrieved from International Federation of Robotics (IFR): http://www.ifr.org/.

help users choose the most suitable products. The AI system provides personalized recommendations to users through intelligent analysis of big data sets. This AI-based sales application can not only provide quick and accurate personalized suggestions, but also greatly save the labor cost of the enterprise. Therefore, the development of artificial intelligence is the general trend that is not only in line with the laws of social and economic development, but also the need for changes in social progress.

The study gives a comprehensive and systematic review on customers' perceived service quality of RAISA service and examines the factors that influence customers' satisfaction to accept services delivered by RAISA equipment. These findings can also help companies provide a model basis for decision-making in the AI equipment investment, R & D evaluation and even a new model of human resource training system.

The significance of this research is to examine if the services offered by RAISA tools can satisfy the majority of the customers. Customers' perceived service quality by RAISA tools needs to be tested. In the hospitality and tourism industry, the industry that takes human rights as the most important thing, whether customers have sufficient readiness and willingness to be served by RAISA tools is a significant question to be considered (Ivanov & Webster, 2017).

Research on customer satisfaction in the hotel industry focuses more on the definition and measurement of concepts, and mainly focuses on employees, and lacks attention on non-human factors such as environment and technology. There are few research results on RAISA in the tourism and hospitality industry, and those only focus on analyzing the influence of RAISA as a technical factor on the overall service results, ignoring the perception and evaluation of robots, AI facilities from customer's perception.

Traditional technology acceptance models explain the customer willingness to use RAISA service to a certain extent, but these models were originally used to study the service using non-intelligent technologies, such as commercial websites. As for RAISA tools, these do not require users to learn how to operate them. This makes all technical acceptance models with ease of use as the core indicator of service irrelevant to the willingness to check whether users accept AI devices, that is, in the validity test, the subject and object are not related (Lu et al., 2019). By drawing lessons from previous research models, combined with a comprehensive analysis of the influencing factors in the customer satisfaction on RAISA service, the preliminary model of RAISA equipment usage satisfaction will be constructed.

The progress of AI's development, integration, and application in the hospitality and tourism industry shows that the adoption of AI equipment is not just a technological fashion, but gradually rises to the industry development trend (Ernst et al., 2019). The reason is that the advantages of AI equipment over human employees are shown in the following aspects.

From the perspective of service delivery, due to the data storage function, high

processing speed and personalized recommendation function brought by AI technology, compared with human employees, AI equipment can not only provide more consistent, more timely service, but can also provide services with uniform quality standards (West et al., 2018). From an operational point of view, AI equipment can improve operational efficiency by reducing the number of personnel, meeting the demand for timely delivery, and reducing employees workload and working hours, thereby reducing operating costs.

More and more hotels deployed the RAISA strategies to gain competitive advantages. The current academic resources mainly focus on customer perception or evaluation of robots themselves, and few studies link robot services with customers' overall experience of hospitality services. This study aims to evaluate the current status of RAISA studies in the hotel industry and propose directions for future research.

This section discussed the background of the study, problem statement and Research Gap, research objectives, and research questions. It delineates the scope of the study and significance of this research as well as providing definitions of key terms. It also outlines the organization of the thesis. The next section reviews relevant literature in relation to RAISA, customer perceived service quality and customer satisfaction, and proposes the relationship that links these areas. In the following review process section, online databases are collected and listed through relevant published articles, and those published in or after 2010 were selected as potential articles for this research. Articles will be comprehensively reviewed through divisions of data demographics, theoretical models, methodology. Finally, the research findings, implications and salient conclusions are presented.

2. Review Process

2.1. Definition of RAISA

Robots, artificial intelligence and automation technologies (RAISA), is the term first coined by the two scholars: Stanislav Ivanov and Craig Webster (2017). They first attempted to research RAISA in the hospitality and tourism industry and did this from a social sciences perspective. Their research comprehensively covered the theoretical problems of RAISA adoption in tourism, principles of service automation, attitudes towards robots, and impacts of RAISA on business processes.

Robots may be described as "intelligent physical devices" (Chen & Hu, 2013: p. 161) with a certain degree of autonomy, mobility, and sensory capabilities that allow them to perform intended tasks (Murphy et al., 2017; Tan et al., 2016). The degree of autonomy in this case refers to the robot's ability to perform its tasks without human intervention.

Artificial intelligence (AI) refers to computational agents that act, respond or behave intelligently (Poole & Mackworth, 2010). AI is manifested in humanoid and non-humanoid forms (e.g. automated services) that can mimic or perform

human tasks and solve problems through learning, analyzing and interpreting data (Mellit & Kalogirou, 2008). AI has evolved rapidly from performing simple tasks (e.g. Siri) to undertake more sophisticated social functions such as recognizing customers' emotions for subsequent intervention (Prentice et al., 2020a). AI as an information technology (IT) innovation has progressively infiltrated the commercial world to facilitate internal business operations for the organization and external transactions with customers in both personal and impersonal service encounters (Prentice et al., 2020b).

Service automation refers to the process of using machinery for completing "predetermined or reprogrammable sequence of tasks" in the service delivery. Early examples of service automation included automatic teller machines (ATMs), conveyors, store self-check-out, and vending machines. Further development of information and communication technologies leads to continued advancement of customer experience and service efficiency (Law et al., 2014).

2.2. Article Selection and Review Procedure

Online databases are collected and listed through relevant published articles, and those published in or after 2010 were selected as potential articles for this research. Selected articles were searched from Google Scholar and published by the three large scientific publishers: Emerald Insight, Elsevier and Taylor & Francis. Each of the three covers various disciplines and provides a wealth of information for researchers and scholars in different fields. And these databases provide access to full-text articles and the latest, most reliable sources of electronic information, thereby improving search efficiency. Finally, if certain articles are listed in multiple databases, searching in three databases can reduce the chance of missing any related articles. The keywords for searching included "Robots", "service Robots", "Artificial Intelligence", "service automation", "hotels", "hotel industry", "customer experience", "customer acceptance" and "customer satisfaction". If one or more of the "keywords" defined above appear in any of the titles, abstracts or keywords of an article, the article was selected. The review covered empirical studies, theoretical articles, research notes and special issue editorial articles on the related keywords.

For a comprehensive review, there are two stages of selecting the sample. In the initial stage, articles whose title and/or abstract refer to those keywords were identified from the resources. Two items were used as criteria, namely, the article should have related to RAISA in the hotel industry from customers' perspective, and it should have been a full-length work. Initially, a total of around 329 articles were gathered from resources or databases such as Emerald Insight, Elsevier and Taylor & Francis. When the same article was identified as listed in multiple databases, the article was counted as one. Those articles abstracts that were clearly off the topic of "customer's satisfaction on RAISA services in the hotel industry", were eliminated so that finally the appropriate article pool was reduced to 106. Other relevant studies that did not use the keywords specified

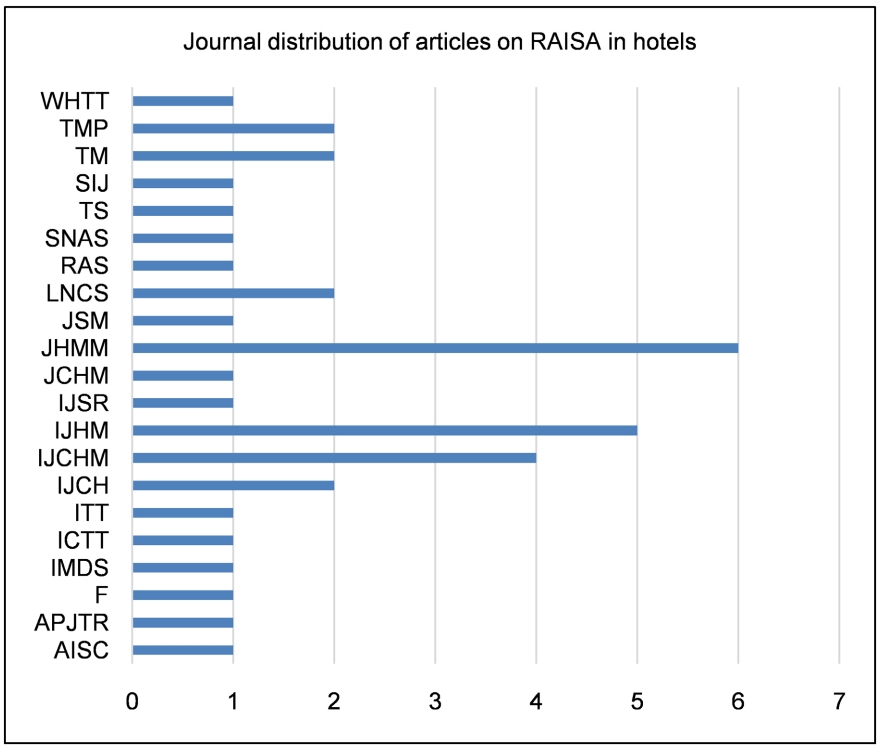
previously were not collected from this process.

In the second stage, the articles that should have been included were carefully selected in the analysis based on the criteria, namely, the article should have related to RAISA in the hotel industry from customers' perspective. All selected articles were published after 2010 (including 2021). Book chapters, newspaper articles, and meeting minutes were excluded because, in general, they lacked a rigorous peer review process and original research work. In the end, thirty-seven long articles passed the final review.

3. General Findings

3.1. Journal and Yearly Distribution

Figure 2 reveals the number of articles published in each journal. The Journal of



Note: Advances in Intelligent Systems and Computing (AISC), Algorithms for Intelligent Systems (AIS), Asia Pacific Journal of Tourism Research (APJTR), Futures (F), Industrial Management & Data Systems (IMDS), Information and Communication Technologies in Tourism 2018 (ICTT), Information Technology & Tourism (ITT), International Journal of Contemporary Hospitality (IJCH), International Journal of Contemporary Hospitality Management (IJCHM), International Journal of Hospitality Management (IJHM), International Journal of Social Robotics (IJSR), Journal of Contemporary Hospitality Management (JCHM), Journal of Hospitality Marketing & Management (JHMM), Journal of Service Management (JSM), Lecture Notes in Computer Science (LNCS), Robotics and Autonomous Systems (RAS), SN Applied Sciences (SNAS), Technology in Society (TS), The Service Industries Journal (SIJ), Tourism Management (TM), Tourism Management Perspectives (TMP) and Worldwide Hospitality and Tourism Themes (WHTT).

Figure 2. Journal distribution of articles on RAISA in hotels. *Figure created by author.

Hospitality Marketing & Management (JHMM) has the highest number of publications, followed by The International Journal of Contemporary Hospitality Management (IJCHM) and International Journal of Hospitality Management (IJHM). It is shown that except for the three journals, other tourism related journals averagely contributed to the studies on RAISA service in hotels after 2012. It is a relatively new subject when it comes to robots and other AI devices employed in hotels. With the advent of the fourth industrial revolution, the authors believe the current period is a remarkable time for studies on RAISA related subjects.

Figure 3 indicates the yearly distribution of articles included in the sample in the period of 2011-2021. Stanislav Ivanov and Craig Webster (2017) attempted to research RAISA in the hotel industry and do this from a social sciences perspective. Their research comprehensively covers the theoretical problems of RAISA adoption in tourism, principles of service automation, attitudes towards robots, impacts of RAISA on business processes. Before that, there are also many articles focusing on service robots. However, most of these articles are described from the perspective of robot attributes and lack of insight about the interaction between humans and robots. The earliest published article studied customers' perceptions on RAISA in the hotel industry in my sample were published in 2014. Thereafter, there is a blank for 2015 until 2016, when two articles were published. Generally, the number of articles on RAISA in hotels keeps on increasing from 2014 to 2019. And a peak was reached in 2020 with 19 articles published, followed by 2019 with eight articles published. Generally, it is predictable that the studies on RAISA in hotels will boom in the near future.

3.2. Methods and Data

Table 1 summarizes the methodologies and data sources used in the selected studies on RAISA service in hotels. Consistent with previous findings in the general discipline, the quantitative approach is the dominant method (n = 13, 35.14%), followed by the qualitative method (n = 11, 29.73%). There are five articles using

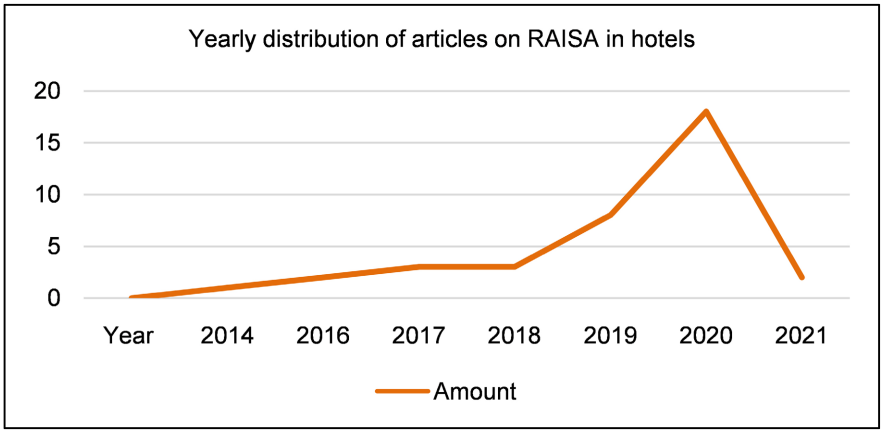


Figure 3. Yearly distribution of articles on RAISA in hotels. *Figure created by author.

Table 1. Research methods and data resources.

Research method	Primary	Secondary	Other	Total	Percentage
Quantitative	12	1		13	35.14%
Qualitative	6	5		11	29.73%
Descriptive/ theoretical/review			5	5	13.51%
Experimental/ Mathematical	3			3	8.11%
Mixed methods	5			5	13.51%
Total	26	6	5	37	100%
Percentage	70.27%	16.22%	13.51%	100%	

*Table created by author.

collaborative design for the research which contain both quantitative and qualitative methods, the same amount with articles that used descriptive, theoretical or review methods. Besides, there are three articles in which researchers carried out experiments or mathematical equations to examine the hypothesis. For data sources, 70.27% of articles used primary data; 16.22% used secondary data, and 13.51% used no data (i.e., theoretical, descriptive, review, editorial and commentary articles). In terms of quantitative research methods, 12 of the 13 quantitative studies (92.30%) used primary data through self-designed questionnaires. The remaining one study (7.69%) used secondary data. In terms of qualitative research methods, 6 of the 11 qualitative studies (54.54%) used primary data generally through expert panels and interviews. And the other five studies used secondary data generally from the online reviews. The five studies that adopted the descriptive/theoretical/review method used descriptive data. Generally, the primary data is the dominant resource either researchers collected from questionnaires, interviews, or experiments. In terms of analytical techniques, most of the quantitative articles adopted descriptive statistical analysis, reliability and validity analysis which are the dominant methods to measure the proposed model and hypothesis.

3.3. Research Context

The existing studies on RAISA in hotels focused mostly on China and the USA. Most studies adopted a single country or territory as research context, except Tussyadiah and Park (2018) who conducted a multi-country/territory study. **Figure 4** presents the countries/territories wherein studies on RAISA in hotels are conducted in our sample as shown in **Figure 4**. It turns out most studies on RAISA in the hotel industry did not explicitly mention the research targeted

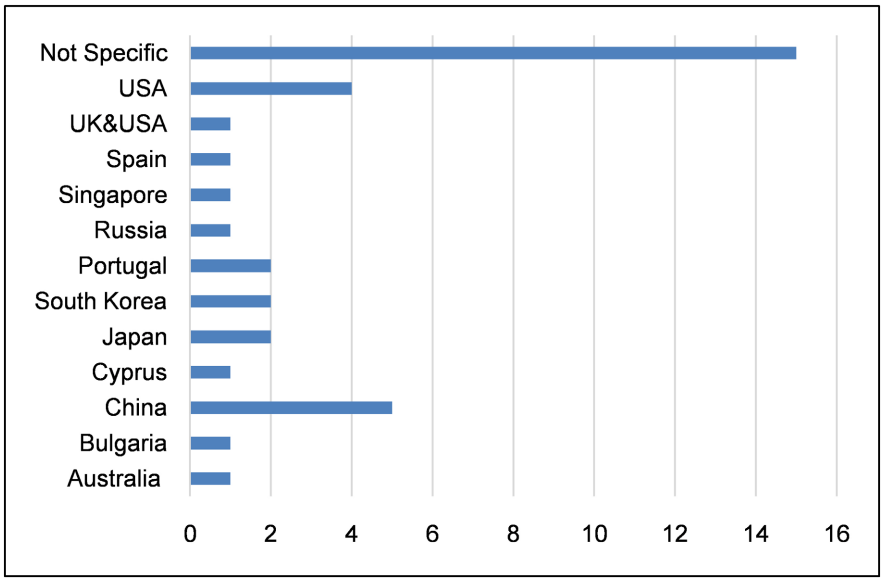


Figure 4. Research context of studies on RAISA in hotels. *Figure created by author.

country/territories (n = 15, 40.54%). Results reveal that the China (n = 5, 13.51%) and the USA (n = 4, 10.81%) are the dominant research contexts while indicate that there were two studies for each of Portugal, South Korea and Japan (5.41%), and one study per each of Spain, Singapore, Russia, Cyprus, Bulgaria and Australia (2.70%). However, fifteen articles (40.54%) were purely theoretical/descriptive studies and do not investigate RAISA in hotels in any specific context.

3.4. Theoretical Foundation

The authors classified the theories, models and paradigms employed in the 37 studies, as indicated in Table 2. Results indicate more than half of the articles adopted theories, with lots of articles employing more than one theory. Approximately one-fourth of the articles (13 in 37, 23.64%) did not employ any theory. Overall, 22 theories were adopted. Among these theories, Uncanny valley theory (n = 9, 16.36%) is the most widely used for studies on hotel M & As. The second and third most used theories are Unified Theory of Acceptance and Use of Technology (n = 5, 9.09%) and Theory of Planned Behavior (n = 4, 7.27%). Other theories, such as Theory of Reasoned Action, Media Equation Theory, Role Theory, Cognitive Appraisal Theory were also adopted. Fifteen theories, including Affordance Theory, Artificially Intelligent Device Use Acceptance (AIDUA) Theory, Engineering Theory, Fuzzy Theory, etc. were used once.

4. Main Findings

4.1. Overview of Topics

The progress of the AI development, integration, and application in the hotel Industry shows that the adoption of AI equipment is not just a technological

Table 2. Distribution of theories/models/paradigms.

Theories/models/paradigms	Total	Percentage
Affordance theory	1	1.82%
Artificially Intelligent Device Use Acceptance (AIDUA) theory	1	1.82%
Engineering theory	1	1.82%
Fuzzy theory	1	1.82%
Information theory	1	1.82%
Media equation theory	2	3.64%
Organizational change theory	1	1.82%
Person-Environment Fit theory	1	1.82%
Rational choice theory	1	1.82%
Role theory	2	3.64%
Spreading activation theory	1	1.82%
Theory of planned behavior	4	7.27%
Unified Theory of Acceptance and Use of Technology	5	9.09%
Uncanny valley theory	9	16.36%
Institutional theory	1	1.82%
Role congruity theory	1	1.82%
Technology Adoption and Utilization Integration Theory	1	1.82%
Theory of reasoned action	3	5.45%
Technology Acceptance Model	1	1.82%
Cognitive Appraisal Theory	2	3.64%
Cognitive evaluation theory	1	1.82%
Self-determination theory	1	1.82%
No theory	13	23.64%
Total	55	100.00%

*Table created by author; *The total number in this table is larger than 37 because several articles adopted more than one theory.

fashion, but gradually rises to the industry development trend. The reason is that the advantages of AI equipment over human employees are shown in the following aspects.

From the perspective of service delivery, due to the data storage function, high processing speed and personalized recommendation function brought by AI technology, compared with human employees, AI equipment can not only provide more consistent, more timely service, and can also provide services with uniform quality standards (West et al., 2018). From an operational point of view, AI equipment can improve operational efficiency by reducing the number of personnel, meeting the demand for timely delivery, and reducing employees workload and working hours, thereby reducing operating costs.

In recent years, with the rise of artificial intelligence (AI) and the continuous increase of labor costs, the penetration of intelligent service technology in the tourism and hospitality industry has become an unstoppable trend, and the application of service robots is particularly eye-catching (Willcocks, 2020). Forward-looking hospitality and tourism companies have begun to deploy service robots in order to gain future competitive advantages (Li, 2020).

In the future, artificial intelligence technology will increasingly penetrate the front-line service departments of the hotel industry and have a huge impact on customer relationships and service experience (Kumar et al., 2021). The research on the attributes of RAISA and their effects is helpful to understand the human-AI interaction mechanism, and has important theoretical and practical significance for the analysis of human-AI mixed management and customer-robot relationship management in the hotel industry.

4.2. RAISA's Impacts on the Hotel Industry

Tourism consumption increased significantly over the years while it picked up the demand for hotels. However, the traditional hotel industry faces problems such as rising labor costs, low work efficiency, and high service complaint rate (Bojanic, 1996). At present, technologies such as artificial intelligence and the Internet of Things are developing rapidly. Hotel voice chatbots provide customers with a faster and more convenient service experience as voice chatbots can keep in touch with customers anytime, anywhere, and respond immediately, which can not only improve the experience, but also help the hotel to improve its operation and reduce the cost of hotel employment (Buhalis & Cheng, 2020). Artificial intelligence brings new competitive advantages to hotels and comfortable experiences for customers, such as self-service check-in experiences, face recognition to open doors, smart guest rooms, voice interactive control, mobile phone one-click check-out, etc. (Stringam & Gerdes, 2021). Hotel intelligence can provide a new platform and new opportunities for the future development of the hotel industry, while big data has laid a solid foundation for the hotel's future precision operation (Liu et al., 2017). Hotels brought more attention to the intelligence of both operations and services, and the construction of an intelli-

gent operation system that is conducive to improving profit margins.

Unmanned models such as unmanned supermarkets and unmanned driving, unmanned hotels are gradually emerging. An unmanned hotel means that there is no lobby manager or service staff from check-in to check-out. Unmanned hotels use the Internet, Big Data, cloud services, and smart devices to connect to hotel operations and management to realize the unattended mode of the hotel, and provide customers with a scientific and technological accommodation experience. In 2015, Henna Hotel, the world's first unmanned hotel, opened in Japan. Since 2017, unmanned hotels have appeared in cities such as Chengdu, Shenzhen, Hangzhou, and Beijing, such as Leyizhu, Ali Future Hotel, and Yinshi Hutel. These unmanned hotels can provide 24-hour service through smart devices, which can meet 95% of customers' needs (Peng & Zhang, 2020). It can be seen that the emergence of artificial intelligence has promoted the transformation of the hotel industry. In the fierce market competition environment, RAISA has great development potential in the hotel market.

4.3. RAISA Service Quality

RAISA in the hotel industry is engaged in customer service work, such as welcoming guests, receiving consultations, responsible for delivering goods, and voice control of smart devices in guest rooms. Compared to traditional self-service facilities, one of the important attributes of service robots is deep learning ability. This attribute can reduce the learning process of users, thereby increasing customers' willingness to use (Lu et al., 2019). Automation is another important attribute of the service robot. A higher level of automation can reduce the physical input of service employees and customers, and improve service efficiency and reliability (Larivière et al., 2017). In addition, in order to be able to adapt to the complex daily environment, service robots also have a high degree of human-computer interaction. This kind of human-computer interaction is summarized by Belk (2016) into three dimensions: communication, programming and personification. Van Doorn, Mende, and Noble et al. (2017) believe that the level of socialization of service robot technology will continue to improve with technological progress, and put forward the concept of "Automated Social Presence" (ASP). The higher the ASP, the more users tend to see the robot as another social entity.

4.4. Customer Acceptance of RAISA Service

The research on market applications of AI equipment is showing rapid growth worldwide (Pillai et al., 2022). From assembly robots and testing robots used in automobile manufacturing production lines to genetic testing technologies used in hospitals, AI technology has gradually become a powerful assistant in many industries. At present, traditional tasks that require human participation, such as vehicle driving, simultaneous interpretation, translation, and portrait verifica-

tion, can now be easily implemented by AI equipment, which manifests itself in autonomous driving, speech recognition, semantic recognition, image recognition and other related tasks (Allen, 2019). Companies that provide various services have also begun to use AI technology in the production and delivery of their services.

These affirmative understandings exists AI as a service to humans. The object of the optimistic attitude is about the continuous improvement of human rights brought about by the development of AI (Shin & Jeong, 2020). However, more people talked about the possible negative impact of AI on human rights.

There is an alienation of the relationship between people. In the future, as a universal technology and tool system, AI will provide people with a full range of services. People only need AI to meet their needs without having to deal with others. Whether other people become a non-necessary existence for themselves, whether people lose meaning and interest in people is the alienation of the relationship between people (Wang, 2021).

The hotel industry belongs to the service industry after all. Consumers go to hotels not purely for so-called technology and convenience, but more to enjoy humanized services. This kind of "humanization" cannot be given by the current artificial intelligence mainly based on robots. In addition, there will be many problems in all aspects of the hotel's actual operation (FR Oswald & Mascarenhas, 2018). For example, when a group customer arrives, how can artificial intelligence meet the needs of everyone smoothly? Problems during check-in, check-in and check-out, how to solve them completely? For a five-star hotel that focuses on customer care, how can artificial intelligence be sufficiently humanized to provide guests with a warm and comfortable service experience? Artificial intelligence has many benefits, but today, when technology has not developed by leaps and bounds, absolute "unman" is not realistic. Over-reliance on artificial intelligence can undermine the core values and advantages of hotels (Liu & Maas, 2021).

Many people are obviously pessimistic about the development of artificial intelligence at the technical level. They believe that the future AI will think and possess human abilities. The large-scale replacement of humans by AI will inevitably bring about huge changes in social relations (Dong et al., 2020). How to solve or prevent related issues arise, letting AI serve rather than restrict the development of the hospitality and tourism industry is a problem that everyone is working to solve. Comparing the pros and cons, the positive impact of AI on human rights obviously exists, but its negative impact cannot be ignored.

In the hospitality and tourism industry, the industry that takes human rights as the most important thing, whether customers have sufficient readiness and willingness to be served by RAISA tools is a significant question to be considered. On the other hand, it is also to be examined if the services offered by RAISA tools are satisfied by most of the customers. Customers' perceived service quality by RAISA tools needs to be tested.

4.5. Customer Satisfaction and RAISA Service Quality

Customer satisfaction in the hospitality and tourism industry is the degree of hospitality customers perceive (Pijls et al., 2017). This perception has a significant impact on customer satisfaction, brand loyalty and other service outcomes (Mody et al., 2019). Tasci and Semrad (2016) found that the hospitality experience is manifested in three dimensions of warmth, comfort and flexibility in the process of service delivery. Most researchers believe that these dimensions are mainly achieved through the interpersonal interaction between service providers and customers (Blain & Lashley, 2014; Tasci & Semrad, 2016), but Pijls et al. (2017) found that the influencing factors of customer experience in the hotel industry not only come from the hospitality and behavior of employees, but may also come from the service environment, facilities, and service processes, and other non-human factors. Mody, Suess, and Lehto (2019) believe that customer experience is the subjective evaluation of customers' perceptions, emotions, and interactions of consumer products in the service consumption process of the hotel industry. They compared the general consumer experience proposed by Pine and Gilmore (1998). The dimensions (aesthetic, escape, education, and entertainment) are combined with the dimension of "hospitality experience" to jointly serve as a measurement indicator of customer experience in the hotel industry.

Numerous studies have shown that employee service is pivotal in determining customers' attitudes and behaviors (e.g., Delcourt et al., 2013; Prentice, 2013). Customers prefer personal interactions with service employees who are reliable, responsive, professional, and empathetic as shown in SERVQUAL measures (Parasuraman et al., 1991; Prentice, 2013), AI does provide unprecedented convenience (24-h automated services) to customers. However, given that AI is operated through machines and computer programs, the level of AI service is dependent upon both imputed data and programming capability. Each individual customer has different requests and demands (Prentice, 2013), and AI may not be equipped to provide customized services (Prentice et al., 2019). The choice of individualized services by employees and the convenience provided by machines may help satisfy individual preference.

4.6. Factors influencing Customers' Satisfaction on RAISA Service

The RAISA Use Satisfaction Model can be proposed by integrating the two models of cognitive dissonance theory (Festinger, 1962) and cognitive assessment theory (Lazarus, 1991). This model explains the multi-step acceptance evolution of customers in the process of using RAISA devices, and determines and subdivides the factors that affect users' willingness to accept AI devices during the service period. On the other hand, the use of AI equipment to replace the existence of humans has become a controversial topic (Makridakis, 2017; Kaler & Ruston, 2019). Therefore, support or opposition factors may coexist and inte-

ract to influence the customers' acceptance and satisfaction.

4.6.1. Social Influence

Customers believe that the use of AI equipment in service delivery is related and consistent with the norms of the social group they belong to. If the group is important to them, people are more likely to follow the norms of the group, and the customer's social network norms and attitudes are the key determinant of people's behavior and intention (Rather, 2018). When an individual does not have enough knowledge to make wise decisions, he will be more influenced by his community. Customers tend to adopt the culture, values and norms of their social group as their own evaluation criteria and make decisions accordingly. Adopting a group's code of conduct will strengthen the individual's sense of belonging to the group. If the customer's social network (such as friends, colleagues, relatives) has a positive opinion and attitude towards the use of AI equipment in service delivery, and recommends the user to use AI Device, then the use of AI devices will benefit the customer's social identity (Lu et al., 2019).

4.6.2. Hedonistic Motivation

Hedonistic motivation refers to the personal expectation of the pleasure of using RAISA devices in service delivery (Veenhoven, 2003). Some researchers believe that hedonic motivation is the main predictor of technology adoption (Allam et al., 2019; Venkatesh et al., 2012). When customers have fanatical motivations for AI devices, using AI devices will benefit customers by satisfying their personal interests or seeking novelty and entertainment needs (Fryer et al., 2017). As a result, users who are enthusiastic about using AI devices may have positive expectations about their reliability

4.6.3. Emotional Preferences

The emotional preference of accepting the use of RAISA equipment refers to the user's acceptance of using those equipment in future services, that is, after the customer's complex inner evaluation process, the emotion of using RAISA equipment will be generated, which will determine the user's acceptance of the service whether you are willing to accept AI equipment during the period, that is, the degree to which AI equipment is used from strong to weak (Watson & Spence, 2007). Research has found that emotions such as expectations, satisfaction, happiness, joy, and surprise affect the changes in users' expectations of accepting external things, thereby affecting the judgment of the reliable expectations of RAISA devices (Stock & Merkle, 2017). As suggested by cognitive assessment theory, users who have positive emotions about AI devices will be more willing to accept the use of RAISA devices in the service delivery process.

4.6.4. Humanistic Interaction

Humanistic interaction, also known as anthropomorphization, refers to the level of human-like characteristics of the object, such as anthropomorphic appear-

ance, self-awareness and emotion. The physical, intellectual, and logical redesign of AI equipment triggers the user's initial assessment of self-relevance. Whether this design conforms to the user's traditional use of service interaction technology, to a certain extent determines whether the user is interested in accepting use of the device (Kim & Kim, 2018). Humanistic interaction is the basis for users' important decisions regarding the behavior of using AI devices (van Doorn et al., 2017). Generally speaking, customers who have high demand for humanistic interaction with RAISA devices believe that RAISA with human-like characteristics will help liberate humans from monotonous and repetitive activities and enhance human uniqueness and self-identity. Since the characteristics of human interaction may be related to the reliable expectations of users using AI devices, it is possible to assess the relationship between the human interaction and reliable expectations of AI devices (Gursoy et al., 2019).

4.6.5. Efficiency Expectation

The use of RAISA in service delivery may also cause communication barriers between customers and AI devices (Lu et al., 2019), or require more cognition to understand the chaotic and complex design of AI devices (Thompson et al., 1991), which may increase the workload required for communication. Therefore, if the user thinks that using AI equipment will consume too much energy, the efficiency of the AI equipment will be expected to decline, resulting in negative emotions (Lazarus, 1991).

4.7. Others Models

Research on customer satisfaction in the hotel industry focuses more on the definition and measurement of concepts, and mainly focuses on employees, and lacks attention to non-human factors such as environment and technology. There are few research results on RAISA in the hotel industry, and only focus on analyzing the influence of RAISA as a technical factor on the overall service results, ignoring the perception and evaluation of robots, AI facilities from customer's perception.

Traditional technology acceptance models explain the customer willingness to use RAISA service to a certain extent, but these models were originally used to study the service using non-intelligent technologies, such as commercial websites. As for RAISA tools, these do not require users to learn how to operate them. This makes all technical acceptance models with ease of use as the core indicator of service irrelevant to the willingness to check whether users accept AI devices, that is, in the validity test, the subject and object are not related (Lu et al., 2019).

5. Conclusion

The topic of RAISA in the hotel industry has experienced growth since 2010, whereas empirical evidence on its development is sparse. Most studies concentrated on RAISA attributes and its service quality, and comprehensive efforts to

review existing knowledge are minimal. This study derives critical insights into the current status of RAISA studies in the hotel industry and proposes directions for future research. According to the comprehensive review results, remarkable advances have been made in the previous literature for the understanding of the impacts, service quality, customers' acceptance and satisfaction of RAISA in hotels.

With the current background of the epidemic and on the basis of several years of sustained high-speed growth, the service robot industry will continue to expand rapidly in the future and has huge potential. Also, the trend of population aging, the continuous reduction of labor supply and the continuous increase of labor costs have brought severe challenges to social development and enterprise employment, and jointly promoted the acceleration of the demand for AI devices to replace manpower and serve human beings. Thus, RAISA has also brought rising attractions in the hotel industry. Based on application scenarios and implementation functions, robots employed in the hotel industry can be categorized into guide and reception robots, terminal delivery robots and intelligent security robots, etc. Artificial intelligence and service automation tend to be integrated into the system to realize the real non-human/"contactless" service.

However, in fact, the overall price of service robot products is in a high range and the maintenance cost is high in the later period. Companies need to consider their own advantages and scene characteristics on the decision of employment of RAISA. On the other hand, previous research shows that not all customers are willing to accept AI devices during the service delivery period (Lu et al., 2019). Therefore, blindly investing in RAISA technology without a clear judgment on whether users will accept AI devices which may result in waste of resources and even the loss of originally loyal customers. This is particularly significant in the hotel industry. The interaction between employees and customers is considered a key determinant of customers' perceived service quality. Using RAISA equipment to fulfill the functional, social and emotional roles assumed by human employees fundamentally challenges customers' psychological and social needs when receiving services. Therefore, users may not be able to interact with AI devices without barriers during the service delivery period and may still require interaction with human employees. Therefore, understanding the factors that lead to customers' satisfaction on RAISA service is crucial for hospitality companies planning to introduce or employ RAISA equipment.

To this end, we have offered five directions that cover outstanding themes, including: 1) strategic assessment of RAISA performance, 2) hotel financial impacts on RAISA employment, 3) customers' satisfaction and RAISA service quality, 4) macro environment impacts on RAISA in hotels, and 5) premium determinants on customers' acceptance on RAISA

This study contributes to the literature by summarizing and classifying the different topics of RAISA in the hotel industry from previous literature. It also provides specific directions for future investigations. A major limitation of this study is that the 37 articles were retrieved exclusively from peer reviewed jour-

nals. Publications from book chapters, symposium abstracts and conference proceedings were excluded because of access limitation. Another limitation of this study is that although the keywords were thoughtfully considered, the omission of relevant articles remains a possibility. Therefore, future studies may consider a more comprehensive range of literature for critical review.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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