THE CUSTOMER REACTION TO ROBOTIC AND HUMAN SERVICE FAILURE IN HOTEL FRONTLINE POSITIONS

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ABSTRACT

Service failure is very common during the service process, especially when human employees provide services to customers. Many previous researchers figure out many internal and external factors that may cause service failures in human employees such as lack of training and pressure from job content, colleagues, and family. All these factors prove when companies hire human employees, they do not only focus on the customers but also employees. It requires companies to spend a lot of time and money on human employees. Hence, service failure is very common in the hospitality industry because there are so many factors that affect human employees. Nowadays, the development of new technology helps hospitality workers reduce the number of service failures. The most famous technology is robot technology which can bring a lot of benefits to the industry such as lower labor costs and a small number of service failures. Moreover, robots will not be affected by internal and external factors like human employees. Hence, many hotel companies have started to develop robot technology in customer service such as robot employees. However, robot employees also have service failure while providing service to customers based on the previous study, so the goal of the research is to prove which kind of service failure is acceptable to the customers. In this research, the author conducted qualitative research (Text-mining) by collecting more than 400 online customers' negative reviews from OTAs (TripAdvisor, Expedia, and Booking.com) and analyzing these data into “Orange” (The text mining software which is developed by Bioinformatics Lab at the University of Ljubljana, Slovenia, in collaboration with the open-source community). The findings of the research revealed that human service failure is less acceptable than robot service failure. Finally, the implications of robot and human service failure in hotel operations are discussed.
# TABLE OF CONTENTS

COMMITTEE MEMBERSHIP ........................................................................................................ ii

ABSTRACT ................................................................................................................................ iii

LIST OF TABLES ..................................................................................................................... vi

LIST OF FIGURES .................................................................................................................... vii

INTRODUCTION ....................................................................................................................... 1

LITERATURE REVIEW .......................................................................................................... 4

The Influences of Service Failure in The Hospitality Industry................................................. 4

Frontline Employees and Service Failure in The Hospitality Industry................................. 5

The Development Of Technology in The Hospitality Industry .............................................. 6

Cyber-Physical Systems (CPS) in The Hospitality Industry .................................................. 7

Internet, Cloud Computing, And Big Data in The Hospitality Industry ................................. 8

Innovative Information System Behavior in Hospitality ......................................................... 10

Frontline Employees and Information System ..................................................................... 11

Artificial Intelligence and Robot ........................................................................................... 13

Robotic Service in Hospitality Industry ................................................................................ 15

The Differences Between Robotic and Human Service ......................................................... 17

Customer Expectations of Robotic and Human Service Outcome ....................................... 18

Text-Mining ............................................................................................................................ 19

Customer Online Comments and OTAs ............................................................................. 21

OBJECTIVES ......................................................................................................................... 23

RESEARCH METHODOLOGY ................................................................................................. 24

Data Collection ....................................................................................................................... 24
Data Analysis......................................................................................................................... 24

DISCUSSION .................................................................................................................................. 31

Practical Implication .................................................................................................................... 33

LIMITATION AND FUTURE RESEARCH .................................................................................. 35

REFERENCES .................................................................................................................................. 37
LIST OF TABLES

Table 1. The score of “Negative” in total in human and robot service failure from customer reviews including average in total 19 hotels (Maximum score of “Negative” is 0.9997) 27

Table 2. The top 10 customer reviews in human service failure (Scores from highest to lowest) ............................................................................................................................................. 28

Table 3. The top 10 customer reviews in robot service failure (Scores from highest to lowest) ............................................................................................................................................. 29
LIST OF FIGURES

Figure 1. The heat map of “Negative” score in total in human and robot service failure (Total) (Source: from “Orange” software) .............................. 28
Introduction

In the future of the hospitality industry, robotic service has become the most potential and important part of customer service. According to the research, the author claimed many hoteliers used robotic service to enhance their performance and efficiency in hotel marketing, management, and even the whole operation (Tuomi, 2021). Bellini & Convert (2016) provided an example which is robotic concierge called “Connie” made by IBM and work in Hilton Worldwide Hotels to provide customer services such as answering hotel related questions and welcoming guests. Also, another example from previous research is that more than 1.3 million robots were in operation in 2015 and the value of robot marketing was $135 billion in 2019 and the trend was keeping growing (Wilson, 2015; Xiao & Kumar, 2021). All these examples prove that robotic services are worth investing in the future of the hospitality industry. And, although there are still many technical problems and issues in robotic service, more and more American hospitality and service companies start to invest and improve related technology so that they incorporate robots into customer service (Forlizzi, 2014; Xiao & Kumar, 2021). Therefore, the innovation and investment of robotic service are the most important areas in customer services that all hoteliers need to focus on to improve and create a brand-new customer service experience.

Hotel employees in the frontline positions are the most important part of the department in the whole hotel operation. According to the research, “hotel employees who work in hotel frontline positions are responsible to connect internal and external environment by helping customers solve problems and meet individual requirements” (Kim et al., 2009, p 612). Moreover, the service performances of hotel receptions and even luxury hotel receptions usually decide hotel business success (Wang et al., 2021). In addition, the study demonstrated that hotel
frontline employees who work at hotel receptions are very stressed and nonfixed, so they lack time of resting and releasing stress (Wang et al., 2021). It means those frontline employees are easier to have both physical and psychological health problems than hotel employees in other departments. As a result, frontline employees are very difficult to keep providing high quality service to the customers all the time because of these two kinds of health problems, and they will choose to quit and leave their job positions eventually when they are tired of work (Yousaf et al., 2020). Therefore, service failure will happen very frequently and impossibly avoid during the service process because of high pressure from work environment and work tasks in the frontline positions.

In the hospitality and tourism industry, service failure is very common to see especially the service from frontline employees such as servers in the restaurant and employees in the receptions. The study demonstrated that unique features such as inseparability, heterogeneity, and perishability, and a very high level of customer and employee contact are two main reasons that cause service failure (Koc, 2007). The truth is the solution of avoiding service failure in the hospitality and tourism industry is the most important topic that all hoteliers are studying are on currently. The report from Technical Assistance Research Programs (TARP) (2007) demonstrated business companies only hear nearly 4 percentages of dissatisfied customers and the rest of the dissatisfied customers are ignored by the companies. The report (Technical Assistance Research Programs) also demonstrated that in those of rest dissatisfied customers, more than 90 percent of dissatisfied customers are willing to switch to another business company at the end (TARP, 2007). In conclusion of the report, when business companies do not pay enough attention to dissatisfied customers and try to change and improve product quality, they will lose this group of customers eventually. According to the research, more than 90
percentages of satisfied customers will choose to suggest and introduce products to their family and friends, and more than 95 percentages customers will choose to repurchase the products (Kim et al., 2010; Swanson & Hsu, 2009). Based on those reports, hoteliers need to create and use specific strategies to increase the number of satisfied customers as the most important part of the business plan. Hence, Koc (2019) claimed that a lot of researchers have started to study related topics such as service failure in the service industry in the past few years.

The fundamental change of customer service in the hospitality and tourism industry has a huge influence on the development and growth of robotic service in this industry (Huang & Rust 2017; Bitner, 2017; Wirtz & Zeithaml, 2018). Currently, there are so many technologies in hospitality such as Cyber-physical Systems (CPS) (Internet, Big data, Cloud Computing), AI, Robots, and Information system (Osei et al., 2020; Contreras et al., 2017; Grandison et al., 2010; Lee et al., 2019). Notably, robotic service is the most potential and important investment and part of the hospitality business (Ivanov et al., 2017). Unfortunately, Xiao & Kumar (2021) demonstrated that the previous relevant research and reports are not enough to prove the positive and negative influences of service failure in frontline employees between robotic service and human service.

Therefore, the purpose of the article is to provide different customer reactions based on different robotic service failures and human service failures in the hotel frontline positions. Then, this research will focus on the customer reactions to the influences of robotic service failures and human service failures in those hotel frontline positions. Additionally, as hotel managers or hoteliers, they are able to refer to this research to decide which service failures are the most acceptable so they can develop relevant strategies and training programs to avoid the least
acceptable service failures in the hotel frontline positions. Finally, the findings of this study are contributed to the influences of robotic service in the hospitality frontline position service.

**Literature Review**

**The Influences of Service Failure in The Hospitality Industry**

Service failure is defined as “any type of mistake or problem that happens during the process of the service which cannot satisfy customer needs or requirements” (Koc, 2017). In fact, the most reason why service failure happens is because of a lack of qualified and well-trained employees. Bitner *et al.*, (1990) explained that service failure also can be defined into three categories which are “the nature of failure (unavailable and slow services, etc.), the nature of the request (special needs or requests from customers, etc.), and the nature of employee (culture and behaviors norms, etc.)”. According to the study, although the hospitality business will keep developing and expanding in the future especially in the Asia-Pacific region, the shortage of professional, qualified, and well-trained employees and managers is the most important dilemma in the current hospitality and tourism industry (Trianasari *et al.*, 2018). Finally, the shortage of professional hospitality employees in the industry will cause a percentage of service failure in the whole service process (Trianasari *et al.*, 2018).

Service failure also affects the survival and development of the whole hospitality business very negatively based on the previous study (Villi & Koc, 2018). According to the study report, negative influences which are caused by service reduce the level of customer satisfaction, spread negative mouth-of-word, lose customers eventually (Sparks & McColl-Kennedy, 2001; Cranage & Mattila, 2006). As a result, customer emotions and behaviors will be very negative when they meet service failure during the service process (Lewis & McCann, 2004; Wen & Chi, 2013). In fact, a lot of research proved that service providers and firms are responsible for any kind of
service failure during the whole service process (Silber et al., 2009). In addition, one customer’s experience from service may be affected by others’ service experiences (Baker & Kim, 2018). Thus, when employees provide services to the customers, they should know the quality of the service may affect other customers’ impressions (Kim & Baker, 2020). As a result, these customers will use impressions as references before they purchase the service. Hence, it is very important to recover from service failure as much as possible because service failure will affect the whole service experience. Otherwise, it is extremely difficult to rebuild old customer loyalty, build new customer loyalty, and increase customer satisfaction (Weber, 2009 & Koc, 2017).

**Frontline Employees and Service Failure in The Hospitality Industry**

Frontline employees are recognized by practitioners but also by a lot of experts in marketing (Kennedy et al., 2002). According to previous research, frontline employees represent beauty, helpfulness, cheerfulness. (Ahearne et al., 1999; Sutton & Rafaeli, 1988; Bitner et al., 1990). At first, when people discuss beautifulness, physical beautiful appearance is always the standard and assessment for evaluating the frontline employees (Ahearne et al., 1999). Then, helpfulness is defined as those service providers who are willing to provide service to customers, so they give customers the impression of willingness to serve (Sutton & Rafaeli, 1988). Sutton & Rafaeli (1988) and Pieters et al, (1998) also state that customers’ expectations are focused on the service delivery process and consequences are the reason why helpful frontline employees are able to influence customer satisfaction. Finally, cheerfulness is defined as when service employees present smiling and friendliness to the customers (Bitner et al., 1990). According to the study, cheerfulness from employees may cause the intentions of purchasing goods and individual thoughts of overall service quality and improve customer satisfaction eventually (Sutton & Rafaeli, 1988; Forgas & George, 2001).
Wang et al. (2020) empathized hotel frontline employee is the most important part of hotel business, but service failure also is the most important issue that frontline employees always need to learn how to avoid during the service process. Tsaur & Tang (2012) claimed that multitasking is the most critical skill that hotel employees especially employees in frontline positions because they must face and communicate with different customers and employees from other departments every day which means they must know how to solve problems from both customers and employees at the same time; otherwise, the possibility of service failure will increase during the service process. All these negative influences such as psychological and physical health problems from multitasking lead to the increasing possibility of job burnout and resignation in frontline job positions (Yousaf et al., 2020). Therefore, “How to decrease the times of service failure in the frontline job positions in hotels service?” is the problem that all hoteliers need to focus on and solve to improve service quality at frontline positions. Additionally, when hoteliers focus on how to improve customer satisfaction by increasing service quality, frontline employees are always the first factor that needs to consider during the whole service process.

**The development of technology in the hospitality industry**

The previous industrial revolutions have had a huge influence on the technology development in the hospitality industry. The previous study demonstrates that the invention of Watt steam engine coaches in the first revolution provided fast and easy trips to the customers (Osei et al., 2020). Then, Osei et al. (2020) also state that electricity, as the second invention of revolution, develops electrically powered machines in hotels to make rooms safer and more convenient. In the third industrial revolution, the developments and inventions of computers,
information technology, and the internet also have a very deep positive and significant influence in the hospitality industry by saving and studying customer information (Osei et al., 2020).

Finally, the fourth industrial revolution is called IR 4.0 which significantly influences and changes the hospitality industry (Osei et al., 2020). According to the research, “3D printing, self-driving cars, service automation, artificial intelligence, and robotic technologies are the key components of the fourth revolution” (Ivanov et al., 2017). Hence, these new developments of technologies significantly change the operations and developments of hotels and provide a completely different living experience for the customers.

**Cyber-physical Systems (CPS) in the hospitality industry**

The developments and inventions in Fourth Industrial Revolution connect both the physical virtual worlds (Kagermann et al., 2013). Hence, the Cyber-Physical Systems is to be created based on “the development of computer science, information and communication technologies, and manufacturing science and technology” (Monostori et al., 2016, p 621). In fact, a lot of researchers prove that CPS is classified as the most critical part of the Fourth Industrial Revolution (Chen, 2017; Hermann et al., 2016; Lu, 2017). According to Monostori et al. (2016), CPS creates the whole virtual society effectively which includes cultural and social areas. Additionally, previous researchers claim that the influences of CPS provide a lot of benefits to the industry such as manufacturing and hospitality (Hoffmann & Rusch, 2017; Zhong et al., 2017).

In hospitality, CPS significantly changes every aspect of the whole industry operations. According to Zhong et al. (2017), CPS helps hoteliers combine people, machines, and products by using the network to provide more easy and succinct service process, data collection, and employee communication. In addition, Hoffmann & Rusch (2017) state that the inventions of
CPS can assist hotel employees to improve their efficiency of cost and time in the working environment. Finally, CPS is the foundation of technologies such as the Internet, Big data, and Robots (Osei et al., 2020). Hence, it is important to understand the concept of CPS before developing Intern, Big data, and Robots in relevant areas.

**Internet, Cloud Computing, and Big Data in the hospitality industry**

At first, the “Internet of Things (IoT) is one of the main bridges between the physical and digital applications enabled by the Fourth Industrial Revolution” (Schwab, 2016, p. 22). According to the concept from previous research, internet technologies have a significant influence on both manufacturing and non-manufacturing industries (Turcu & Turcu, 2018). Additionally, previous academic literature has various and different definitions of IoT. However, according to the literature review in this study, IoT is defined as “the network of physical and virtual objects (things); for the purpose of collecting, sharing and/or exchanging information through a unified platform over the internet which enables automated solutions to multiple problem sets” (Osei et al., 2020). Also, Contreras et al. (2017) state that the Internet of Services (IOS) is part of IoT. A lot of industries such as business in retail, agriculture, supply chain management, and manufacturing are positively influenced by the improvement of decision-making and productivity because of IoT (Osei et al., 2020). Hence, it is almost impossible to ignore the influences of IoT in all industries, especially hospitality.

Indeed, Cloud computing (CC) is one of the critical parts of the information technology community. To some experts, as a major technological revolution and role in the Fourth Industrial Revolution, CC has remarkable and significant influences in both social and economic aspects (Goundar, 2012; Hahm, 2018). Recently, almost every company develops related technologies for their new business such as APPs to manage customer and company information
and data (Leitao et al., 2016). In this study, “a technological concept, that deploys infrastructure, applications and data resources through the Internet as a distributed service by a service provider; based on virtualization, scalability, on-demand and pay-per-use basis” is the definition of Cloud computing. (Grandison et al., 2010; Gangwar et al., 2015). Finally, the Hospitality and tourism industry receives enormous benefits from Cloud computing. To some experts, a lot of hotel companies choose cloud-based services from Amazon Web Service, IBM, and Samsung Cloud on hotel software applications, daily maintenance, and developments so they can save cost, increase resources usage and virtualization (Leitao et al., 2016; Osei et al., 2020; Grandison et al., 2010).

The result of the developments of IoT and CC is to increase the huge and various computing and lead to the increased amount of data. Indeed, different forms, contents, sources, and components of data are the main reason for the increasing trend of data usage and computing in smart technology and devices (Wu et al., 2016). At the same time, a lot of business corporations need to collect and face these data from different sources. According to the research, “machines, social networks log files, customer feedback, reservations on software, and even sensors” are the data that these corporations normally need to collect from the sources (Zhong et al., 2017). Egan & Haynes (2019) emphasize that Big Data is the most important and newest technology that fits all industries such as hospitality and tourism in the information technology literature. One of the most critical parts is database management applications in which many business companies develop relevant technologies to collect and analyze the data from their customers (Cheng & Jin, 2019). Hence, in this study, the definition of Big Data is “the technical term to describe collections, processing, analysis which are beyond the capabilities of the methods of traditional data management and analytics; within an acceptable and convenient elapsed time” (Osei et al.,
In the hospitality and tourism industry, many establishments such as hotels, restaurants, resorts, theme parks, airlines, and casinos start to analyze data from customers to improve effective customer relationships and provide them personalized services eventually.

**Innovative information system behavior in hospitality**

“Information system is a set of technology, data and operational practices which demonstrate information and communication tasks” (Lee et al., 2019). This system is able to create effective management of quality in the organization based on the Big Data (Piccoli, Anglada, & Watson, 2005; Chathoth, 2007; Bouncken, 2002; Minghetti, 2003; Barata & Cunha, 2017). Next, innovative information system behavior is the behavior of using information systems as a tool to innovate original methods or strategies (Huang et al., 2017; Li et al., 2013; Nambisan et al., 1999; Wang et al., 2014). Additionally, this behavior is used to complete previous non-recognized work processes (Wang & Hsieh, 2006). In fact, according to this behavior, people are able to develop and improve system functions by figuring out different technologies’ features and accumulating new knowledge and concept of business in the workplace (Urban & Von Hippel, 1988; Nambisan et al., 1999).

The business environment requires companies to have enough abilities to innovate original and develop new products and services if they want to maintain the competition in the whole market. According to the research, employees’ innovation abilities are the key source of the whole organizational innovative capabilities (West & Farr, 1989; Scott & Bruce, 1994; Yun & Lee, 2017). In fact, professors, scientists, and researchers are responsible for innovation study in the early times so they directly develop and innovate new products and technologies (Scott & Bruce, 1994). However, some experts agree with those employees should be trained in their innovative abilities but not limited to those professional researchers or scientists (Dorenbosch et
al., 2005). Based on this situation, Dorenbosch et al., (2005) state that researchers start to develop the concept of innovation behaviors and thoughts in the workplace on the job training programs. After the advances of research in innovative behavior, all companies are able to train their employees in all departments about innovation. For example, to some experts, innovative behavior is part of frontline employee service analysis in hospitality (Maria et al., 2017; Li & Hsu, 2016; Kim & Lee, 2013). Overall, when companies or organizations have a clear guideline to use innovative information system behaviors, the protentional of business development will be very high due to innovative strategies and employees with enough high abilities.

**Frontline employees and information system**

In hospitality, customer service in hotels is always the most important part such as a high volume of face-to-face interaction between customers and employees especially frontline employees (Front desk agents, Waiters, Waitress, Concierges, even securities, and so on) (Karatepe & Kilic, 2007; Maria et al., 2017). Thereinto, service quality is the core part of customer service which influences future relationships with customers (Minghetti, 2003). Hence, hoteliers must know that frontline employees play a critical role in interacting with customers as hotel representatives and contribute a huge part of a long-term relationship with them (Karatepe & Kilic, 2007; Maria et al., 2017). Additionally, hoteliers must know the negative influences from frontline employees because not all of them can make sure to provide the best service quality and performance with enough speed and efficiency based on internal and external factors (Lee et al., 2019).

In fact, Information system has a significant relationship with service performance. Minghetti (2003) states that if employees would like to provide the best and most successful interaction with their customers, it is very crucial to use information such as customers’
requirements, preferences, or even personal behaviors. For instance, customer services such as check-in and check-out processes require enough customer information and professional knowledge to support the whole service process by providing enough speed and high efficiency (Minghetti, 2003; Melián-González & Bulchand-Gidumal, 2017; Bouncken, 2002). Therefore, Lee (2014) and Melián-González & Bulchand-Gidumal (2017) emphasize when frontline employees have a strong and effective information system as support, they can search for relevant information to improve the quality of customer service. According to the previous paragraph of innovative information system behaviors, employees are able to have enough knowledge to innovate and develop new services and figure out solutions based on information systems to satisfy customer special requirements in the most efficient way (Wang et al., 2014; Huang et al., 2017; Lee et al., 2013).

To some experts, hotel information system with Technology Acceptance Model (TAM) literatures is more about the prediction of customer’s acceptance behavior (Kim et al., 2008; Huh et al., 2009; Lam et al., 2007). They find out that that customer’s acceptance behavior is the most crucial part of operational efficiency and customer service quality, and positive attitude from customers is the direct predictive factor in information system prediction (Kim et al., 2008; Huh et al., 2009). According to the research, Lam et al., (2007) “the quality of service and information, perceive usefulness, perceived ease of use, self-efficacy, and subjective norm are the factors of predictions of individual attitudes in information”. In fact, a lot of hotels force employees to use information system so Technology Acceptance Model (TAM) in hospitality is limited theoretically and, people who use this model are considered as passive recipients not proactive innovators (Melián-González & Bulchand-Gidumal, 2017; Wang et al., 2014; Huang et al., 2017).


Artificial Intelligence and Robot

In fact, it is important to understand the current goal of developing AI is to help humans solve their problems. Machines learning and task automatization are two descriptions of Artificial intelligence, and it is allowed computers to understand, analyze, and learn previous and current information through “hierarchical concepts” by themselves (Hahm, 2018). Wu et al. (2016) claimed that the reason and goal of creating artificial intelligence (AI) are to support and make robots simulate human activities and behaviors. Osei et al. (2020) state that AI development is efficient enough to support complicated machines such as robots to solve general operation problems. Also, the solution which is provided by AI is based on the “input of algorithms to a system, in order to transform the input data into appropriate solutions” (Wu et al., 2016).

In addition, there are a total of three developmental spots in AI history which are highlighted by experts (Huang et al., 2018). “The early upsurge in 1950–1970, represented by symbolism, early reasoning system, early neural network (connectionism); the second upsurge in 1980–2000 represented by statistics, machine learning, neural network; and the third upsurge after 2006 which is characterized by the widespread use of large data, the emergence of deep learning, machine learning, and mass communication of AlphaGo” (Huang et al., 2018, p. 282). But most importantly, current developments of AI have significant influences on a lot of industries such as hospitality and manufacturing. In this study, the authors conclude the definitions of AI are “human-based intelligence that is different from natural intelligence, which allows machines to learn without being explicitly programmed and tasks to be automated with little human intervention; coupled with their ability to be environmentally friendly in realizing
goals through the maximization of opportunities and problem-solving” (Chen, 2017; Wu et al., 2016; Hahm, 2018; Huang et al., 2018).

Based on the previous paragraph, the robot is the core part of AI technology. To some experts, the foundations of AI in computer science and engineering are critical to robot designing and production (Tirgul and Naik, 2016). They developed the definition of the robot which is “a machine that gathers information about its environment (senses) and uses that information (thinks) to follow instructions and to do work (acts)” (Tirgul & Naik, 2016, p. 1787). Additionally, according to the World Economic Forum, the report in the forum mentions the definition of robots in supply chains based on the impact of Fourth Industrial Revolutions is “devices that act largely or partially autonomously, interact physically with people or their environment, and are capable of modifying their behavior based on sensor data” (WEF, 2017, p. 7). These two definitions of robots prove that robots are able to present human-based behaviors and characteristics such as a strong sense of thought, sensing, actions, cooperation, flexibility, and autonomy (Osei et al., 2020). Hence, according to these two definitions of robots, some experts conclude robots in the hospitality and tourism industry based on the impact of technology of IR 4.0 as “an electro-mechanical or bio-mechanical machine or group of machines, that autonomously interact with people and environment; gather information about its environment through sensors and uses that information to follow instructions and perform repetitive or pre-programmed tasks” (Osei et al., 2020, p 37).

In fact, a lot of scholars and researchers from different academic areas and fields keep focusing on the topic of the influences of robots in the industries and often claim how robots increase the protentional of work efficiency in Industrial Revolution 4.0 (Ivanov & Webster, 2017; Kuo et al., 2017; Kamble et al., 2018; Ivanov et al., 2017). For example, robots will be
able to interact with other robots and work with humans safely in the future (Kamble et al., 2018). However, other scholars and researchers also discuss and study the negative factors of robots in the workplace (Alexis, 2017; Tirgul & Naik, 2017; Oztemel & Gursev, 2018). These negative factors are “unemployment issues, change of traditional work profiles as well as the potential inability of humans to keep robots under control” (Osei et al., 2020, p 37). However, to some experts, they encounter-claimed robots are always controlled by humans because robots work based on “input algorithms” (Osei et al., 2020, p 37; Oztemel & Gursev, 2018). Hence, the algorithms which are inputted by the programmer are the only reason for whether the robots lose control or not.

**Robotic service in hospitality industry**

Robotic service is treated as one of the most significant innovations and transformations in the hospitality industry (Ivanov & Webster, 2019). Previous research demonstrated that robots are starting to be introduced into the human environment, such as customer services in the hospitality industry, because of computer science and data collection (Ivanov et al., 2017). In addition, J, Bowen & Morosan (2018) claimed that a lot of restaurant companies have already started to use and invest robots into customer services and products production. For instances, previous research reported that some American restaurant companies in California had burger robots which can make more than 100 burgers less than one hour (Troitino, 2018). In addition, British restaurant and technology department invest more than $1 million in service robots (Dobberstein, 2019). Also, Canales (2018) reported that Café X had robots which can make more than two beverages in less than 45 seconds at the same time. Additionally, Osawa et al., (2017) a lot of Japanese hotels have already replaced some frontline employees at receptions by robots. Finally, to some experts, they conclude some examples of robots in the hospitality industry
which are “Front desk robots, room assistant robots, robot chefs, delivery robots, airport-robot guide, self-driving cars, etc” (Osei et al., 2020, p 37). Therefore, all these examples demonstrated that robotic service in the hospitality industry is the most efficient and potential service market.

Next, the reasons why most hospitality companies are willing to develop robot technology and invest money into robotic service are “increasing the effectiveness of using budget and recourses by, maintaining the quality of service by improving and innovating management process, and decreasing and even remove service failure such as human mistakes in the whole service process by using robots to provide services” (Ivanov and Webster, 2019). Additionally, the advantages of robotic employees in hospitality industries are financial benefits, labor turnover, the quality of customer service, efficiency in supply chain and employee work performance and hotel operation, and as solutions of lack of employees (Ivanov & Webster, 2017). Then, Huang and Rust (2018) claimed that robots can keep working without feeling tired and even being emotional during the whole service process, but robots still have some moral thoughts because of programming by people. According to the report, when countries are planning to maintain productivity and increase gross domestic products at the same time, service robot is the top choice of investment in the whole development national plan (International Federation of Robotics, 2018). Also, the report demonstrated that the shortage of professional hospitality laborers in the market is because of “increasing number of elder populations with more travel and leisure requirements by that group of people, strict immigration law, and decreasing number of youths in the country such as Japan and Korea which is one of the most important labor sources in the hospitality industry (Schneider et al., 2018; Frey et al., 2016). Therefore, as hoteliers, it is necessary to keep looking for new employees such as robotic
employees to replace previous employees, maintain the high quality of service, and even have enough employees to expand the business.

Finally, robotic service is different from self-service technology because robotic service is about interaction with the customers (Belanche et al., 2020). According to the research, self-service technology requires customers to input commands to drive the machine such as ATM, automatic checkout which means this not technology cannot provide interaction with customers (Meuter et al., 2000, p 50). However, robots can be treated as service providers when they can interact with the customers, such as answering related questions and even show their emotions on the screen. The previous study demonstrated that robots with AI have basic logical and critical thinking ability to provide human-like service to the customers such as answering questions after listening to customers’ questions (Huang & Rust, 2018). Hence, it is possible to replace humans by robot to provide service in the hospitality industry. Additionally, Ivanov et al. (2017) states that when robot can replace some human work such as answering customers’ questions and reduce the time of check-in and check-out process, human employees are able to have more free time to provide more innovative and creative services to the customers. The reason is “once an interface has been set up between the customer and the producer, employees are no longer required to manually enter data” (Osei et al., 2020).

**The differences between robotic and human service**

Although robotic and human service can interact with customers directly, they still have some differences in the interaction (Krämer et al., 2012). According to the research, the main features of human and human interaction are to understand different thoughts and accept opinions from different customers, assume for others (able to understand why customers do this which are affected by emotions, culture, beliefs, or others), and have common experiences which
can help employees to exchange knowledge, thoughts, or experiences with the customers (Clark, 1992; Carruthers and Smith, 1996). However, although robots can imitate human behavior features such as oral and body language (speaking in human languages instead of using sounds “Beeping”) to talk to the customers directly, it only can answer limited questions that are related to the company or specific places (Krämer et al., 2012). Hence, when customers have some psychological issues or other personal requirements during the service, robots cannot provide related services constantly.

In contrast, human employees are able to give an immediate response to the customers’ requirements and have empathy from customers as well because of unique human features (Clark, 1992; Carruthers & Smith, 1996). For example, Tsarenko et al., (2019) empathize with those customers who also can interact with human employees and understand their personal situations and even show their empathy to those employees who may accidentally perform service failure during the service process. Hence, robotic and human service are different because of the ways of interactions and service performance.

**Customer expectations of robotic and human service outcome**

Most likely, customers focus on negative factors happening during all kinds of events rather than positive factors (Van Vaerenbergh et al., 2014). Smith et al., (1999) claim that customers are more sensitive to service failure than successful service performance from human frontline employees. A lot of customers are willing to consider the reasons for service failure when they experience it because they want to prevent these uncomfortable experiences from happening again to themselves (Dabholkar & Spaid, 2012). Gelbrich (2010) also emphasizes that the behavior of blaming service failure to the service providers is the coping mechanism for demonstrating and releasing their anger, stress, disappointments, and other negative emotions.
Therefore, as customers, they are very easily influenced by service failure if the service provider is a human employee. It also explains that interaction between customers and human employees increases the expectation of service outcomes.

When customers have a service experience with robots, they most often feel no anxiety and have no reason to keep figuring out the cause of service outcome rather than human employees because of weak interaction (Belanche et al., 2020). In fact, customers usually feel very excited about robots such as curiosity and happiness because of new experiences, and disappointed such as limited service provided by robotic employees with also a low level of control (Kaipainen et al., 2018). According to the research, Kaipainen et al., (2018) state that customers realize that robotic technology still require a lot of time, money, space to develop, innovate, and invest by technical staff and robot companies, so they believe frontline robotic employees are not stable and predictable because of not completed technology. Additionally, customers still worry about radical innovations that may cause the increased possibility of system and program errors (Kaipainen et al., 2018). As a result, they will exaggerate the service failure that happens to robotic employees even it is just a very insignificant and acceptable error and requires all hotels to provide robots without any single error happening during the service process (Huang & Rust, 2018; De Keyser et al., 2019). Hence, customers also have high expectations from robotic employees because they are not allowed robots to have a single error to bring them uncomfortable experience.

**Text-mining**

Text-mining is the method of study because it can collect text-described information (key words and phrases about emotions, thoughts, and behaviors). Indeed, previous research uses traditional content analysis to look for valuable information from the text, but text-mining are
able to find out more interesting concepts and keywords by using computer analysis (Feldman et al., 1998). Additionally, another reason for using text-mining is to look for relationships or trends in text-described data or information. According to previous academic journals, text-mining is the best method of highlighting the most valuable and explicit text as data from any kind of text information (Semio Corporation, 2004). Therefore, it is necessary to find out, analysis and highlight those keywords and create concepts based on all founded customers comments by using text-mining method.

Karanikas & Theodoulidis (2002) conclude total nice categories operations of text mining objectives which are “feature extraction, test-based navigation, search and retrieval, clustering (unsupervised classification), categorization (supervised classification), summarization, trends analysis, associations, and visualizations”. At first, “feature extraction” is to identify if the noun phrase is described a location, organization, or person (Singh et al., 2007). This operation is to demonstrate the numerical calculation of each term's appearance in the text (keyword). Next, “test-based navigation” could help people focus on important terms and demonstrate the relationship between context and those terms (Singh et al., 2007). In “search and retrieval”, Singh et al., (2007) state that “this operation allows the user to search and retrieve relevant information based on pre-specified search criteria”. “Clustering or unsupervised classification” is to search all keywords and put them together based on similarity or dissimilarity measurements. For example, “the most common clustering algorithms are based on statistical classification procedures” (Singh et al., 2007). Then, “categorization or supervised classification” is the same operation as the previous one but focuses on the relationship between a set of specific terms. In addition, “Summarization” is to summarize and keep main parts and factors in the texts and reduce other unimportant data such as words or phrases. “Text analysis” is the operation of
searching trends of time from textual data. “Association analysis” is another operation of selecting the association between two models or patterns. Finally, “Visualizations” is the text-mining operation of providing visual features such as pictures, charts, or other visual tables to present the main and important concepts and topics that researchers want to demonstrate and highlight from the study. In fact, it is very clear and simple for readers and other researchers to figure out the main concepts and importance of the study.

**Customer online comments and OTAs**

Customer online comments (online reviews) have become the research objective of electronic word-of-mouth (eWOM) since the nineties (Hennig-Thurau, *et al.*, 2004). In fact, the development of OTAs increases the number of online reviews on hospitality service, and those reviews can help customer express their thoughts directly. Hence, it is necessary to use those online reviews from OTAs as an objective in this study.

The TripAdvisor site is one of the largest online travel communities in the world. According to the previous study, TripAdvisor has more than 20 million visitors each month, more than 6 million registered members, and nearly 15 million comments and reviews on the platform for each hotel and travel company (Sparks, & Browning, 2010). Hence, the reason for using TripAdvisor is to treat this site as a source of looking customer comments because of the huge number of registered members and views. Additionally, based on this information about TripAdvisor, it is very convenient and efficient to find out a lot of customers' comments about hotel frontline employees' service from both human and robotic employees.

The Expedia site is one of the largest and most popular online travel communities in the world, and it is headquartered is located in North America. Law & Chen (2000) conclude the following services and functions of Expedia which are “Reservation, Vacation and Cruise
Package, My travel, Place to go and interest & Activities, Expedia Maps and other services (Currency exchange, weather reports, etc.)”. Thereinto, “Reservation, My travel, and Place to go and interest & Activities” are services and functions focused on in this study to figure out customer's comments about robotic and human frontline employees in hotels. At first, “Reservation” is the booking source that provides hotels, cars, and airlines (Law & Chen, 2000). It can be used to look for whether hotels provide robotic service or not. Then, “My travel” is the source that helps customers create their own page so it can be used to view their preferences about hotel frontline services from robots and humans individually (Law & Chen, 2000). It also can help authors select the most appropriate customers to check their comments and feedback about robotic and human frontline employees. Finally, “Place to go and interest & Activities” is the source of sharing information about the destination (Law & Chen, 2000). In fact, many hotels which provide robotic frontline employees can be considered destinations because of the freshness of new technology. Thus, it is necessary to view all customer's comments from this source.

Booking.com is one of the largest and most popular OTAs in the world. Its headquarters is located in Amsterdam, and more than 25 million listings and registered members (Mariani, & Borghi, 2018). In fact, its business model is different from the other two OTAs (Expedia and TripAdvisor). According to the study, “The business model used by Booking.com is an agency business model, while that of TripAdvisor is an advertising business model – meta-search platform and Expedia is a merchant business model” (Ivanov & Atanasova, 2019). Additionally, Booking.com has already provided more than 30 languages in more than 200 countries. Ivanov & Atanasova (2019) also state that there are more than one million room nights reserved on this platform. Therefore, Boooking.com is a good source of customer online reviews.
Objectives

Dabholkar & Spaid (2012) claimed that customer reactions to service failure in frontline robotic service are very significant because a lot of hoteliers currently start to develop more robotic service in hotels especially frontline positions, but there is still not enough research in relevant fields or service industries. In addition, some relevant research and literature about service failure and robotic service are at the very primary and basic level (Wirtz et al., 2018). A lot of research demonstrated that some robots could replace some human employees such as frontline employees in luxury hotels to provide very simple services such as check-in and check-out, and even answer hotel-related questions to the customers such as room locations, basic information about nearby places, and operation time of hotel and restaurants (Tuomi, 2021). Moreover, frontline robots at receptions are treated as a tangible facility of hotels that provide customers first impression, so it is very necessary to try to avoid service failure by developing robotic technologies and giving customers a good first impression (Weiner, 2000). Finally, Dabholkar and Spaid (2012) demonstrated that there are not enough robotic service studies in hotel receptions especially frontline positions such as guest relation, front desk agents, and bellmen. Therefore, this study focuses on different customer reactions to robotic service failure at receptions as robotic frontline employees in luxury hotels and develops the following research questions as objectives:

1) What reactions (thoughts, emotions, and behaviors) do customers have when they have robotic service failure experiences in hotels’ frontline positions?

2) Do customers have the same reactions (thoughts, emotions, and behaviors) when they experience robotic and human service failures in hotels’ frontline positions?
Research Methodology

Ivanov & Webster (2019) claimed that hospitality companies are interested in frontline robotic service in hotels but there is still not enough literatures and research to support robotic service and robotic service failure in actual work environment especially at frontline positions such as front desk agents, concierges, and room service. Hence, this study collects relevant information (text-described) from OTAs (e.g., Booking.com, TripAdvisor, Expedia) about customer reactions (emotions, thoughts, and behaviors) to the service failures to design the research. And a qualitative method (text-mining) is appropriate for this study.

Data collection

In this study, the author collects online customer reviews as data on different OTAs, (e.g., TripAdvisor, Expedia, and Booking.com) and imports them into Orange (Text-mining software). All selected customer comments (include are required to have contents of service experiences from human and robotic frontline employees in hotels which means they must have service experience with both robotic and human employees. In addition, this article focuses on frontline positions in hotels (e.g., employees from reception and concierges, waiters and waitresses in restaurants, and room services). Thus, they must have direct communication or interaction with those human and robotic employees from these frontline positions. Finally, this research requires service failure experiences so all selected customer online comments must also have relevant information and the score must be lower than average (e.g., Expedia (Poor or Terrible), TripAdvisor (Poor, Terrible), Booking.com (Poor, Very Poor).

Data Analysis

The text-mining software that the author uses is Orange which “is developed by Bioinformatics Lab at University of Ljubljana, Slovenia, in collaboration with the open-source
community” (Demsar et al., 2018). This software is designed to analyze all data including text-described data visually (Demsar, & Zupan, 2013). In addition, researchers do not need to pay anything to use this software, and it is very convenient to operate the whole system (Demsar, & Zupan, 2013).

To analyze data, the author uses this software to conduct sentiment analysis (one method of text-mining). The purpose of conducting sentiment analysis is because this type of analysis is to focus on analyzing online customer reviews (Sparks, & Browning, 2010). At first, the author collects all online customer reviews about human and robotic service failure in front positions from OTAs. Then, it is important to import all text data into software called “imported documents” to make sure all data is in the appropriate format to read by the machine. After that, the author uses sentiment analysis to analyze the data and have results in table and heat map format. In these two formats, the scores are categorized into “positive, negative, natural, and compound”. In this study, the purpose of analyzing human and robotic service failure is the purpose so the author only uses “negative” scores from data as results to compare human and robotic service failure. The higher the score is, the darker the color is in the heat map format. In addition, a higher score means customers do not accept this kind of service failure. Finally, the scores are reported in the result part of this study to demonstrate which kind of service failure (Human or Robots) in frontline positions is more acceptable to the customers.

Another data analysis in this study is to analyze the top 10 customer online reviews in human and robot service failure. The purpose of this data analysis is to provide relevant information about customer reactions to both human and robotic service failure based on the concept which is developed by Sparks & Browning in 2010. They develop eight categories of online customer review complaints which are “Internal to the hotel room features, customer
service, public areas of the hotel, star reference, food or beverage, value reference, tour company, ambiance, and external to the hotel location” (Sparks & Browning, 2010). At first, the author will list the top 10 customer reviews based on the “Negative” scores in human and robot service failure from highest to lowest in the table. After that, all these customer reviews will be analyzed based on Sparks & Browning’s concept. Finally, the analysis of these top 10 customer reviews in both human and robot service failure will be used for further concept development and explanation.

Overall, the first part of the data analysis is to compare human and robotic service failure in frontline positions. The second part of the data analysis is to highlight 10 customer reviews for concept development and explanation in this study to demonstrate what reactions customers have when they face human or robotic service failure.

Findings & Results

This study collects a total of 412 customer reviews (336 human service failure and 76 robot service failure) from OTAs (Expedia, TripAdvisor, and Booking.com). A total of 19 hotels were chosen as the target data based on the requirements of customer reviews in this study. In addition, the software (Orange) only analyzes words in customers reviews and provides the number as results. The number of words will not increase or decrease the scores. Finally, overall data and results are presented below in figures and tables.

Table 1 shows that the score of “Negative” in human and robot service failure from customer reviews in total 19 hotels with 336 customer reviews in human service failure and 76 customer reviews in robot service failure. According to the table, on the left side table 1., a total of 19 hotels’ names are presented. The middle part and right side represented the “Negative” scores of human and robot service failure based on the customer reviews which were collected
by the author. Additionally, *figure 1* is the heat map of both human and robot service failure which proves both service failures do not have much difference. Finally, according to the total average score of “Negative” in both human and robot service failure, human service failure has more negative impacts on customers (Total average: 0.101>0.081).

*Table 1. The score of “Negative” in total in human and robot service failure from customer reviews including average in total 19 hotels (Maximum score of “Negative” is 0.9997)*

<table>
<thead>
<tr>
<th>The Name of the Hotels</th>
<th>The “Negative” Scores (Human)</th>
<th>The “Negative” Scores (Robots)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Henn na Hotel Huis Ten Bosch</td>
<td>0.084</td>
<td>0.069</td>
</tr>
<tr>
<td>2. Renaissance Beijing Wangfujing Hotel</td>
<td>0.087</td>
<td>0.155</td>
</tr>
<tr>
<td>3. Luma Hotel Time Square</td>
<td>0.096</td>
<td>0.075</td>
</tr>
<tr>
<td>4. The Westin Buffalo</td>
<td>0.106</td>
<td>0.141</td>
</tr>
<tr>
<td>5. YOTEL Singapore</td>
<td>0.122</td>
<td>0.093</td>
</tr>
<tr>
<td>6. Hotel Monville</td>
<td>0.114</td>
<td>0.067</td>
</tr>
<tr>
<td>7. Embassy Suites by Hilton Seattle Downtown Pioneer Square</td>
<td>0.081</td>
<td>0.174</td>
</tr>
<tr>
<td>8. Sheraton Los Angeles San Gabriel</td>
<td>0.099</td>
<td>0.038</td>
</tr>
<tr>
<td>9. YOTEL Boston</td>
<td>0.124</td>
<td>0.093</td>
</tr>
<tr>
<td>10. The Westin Bund Center Shanghai</td>
<td>0.09</td>
<td>0.022</td>
</tr>
<tr>
<td>11. Hotel EMC2, Autograph Collection</td>
<td>0.087</td>
<td>0.057</td>
</tr>
<tr>
<td>12. West Wing Boutique Hotel</td>
<td>0.084</td>
<td>0.094</td>
</tr>
<tr>
<td>13. Henn na Hotel Maihama Tokyo Bay</td>
<td>0.058</td>
<td>0.068</td>
</tr>
<tr>
<td>14. Henn na Hotel Tokyo Asakusabashi</td>
<td>0.107</td>
<td>0.084</td>
</tr>
<tr>
<td>15. Henna Hotel Tokyo</td>
<td>0.159</td>
<td>0.087</td>
</tr>
<tr>
<td>16. Henna Hotel Tokyo Akasaka</td>
<td>0.222</td>
<td>0.083</td>
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</tbody>
</table>
17. Cosmo Hotel Hong Kong  
18. Van Dyk by Wildes  
19. Aloft Silicon Valley

Total (Average)

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<tr>
<td>17.</td>
<td>0.119</td>
<td>0.134</td>
</tr>
<tr>
<td>18.</td>
<td>0.106</td>
<td>0.009</td>
</tr>
<tr>
<td>19.</td>
<td>0.101</td>
<td>0.034</td>
</tr>
<tr>
<td></td>
<td><strong>0.101</strong></td>
<td><strong>0.081</strong></td>
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</table>

Figure 1. The heat map of “Negative” score in total in human and robot service failure (Total)

Source: from “Orange” software

Table 2 and Table 3 demonstrate the top 10 customer reviews in human and robot service failure based on the score from highest to lowest. The left side of both tables demonstrates the original customer reviews from OTAs (Expedia, TripAdvisor, and Booking.com). The right side indicates the “Negative” score of each customer reviews from highest to lowest. The results of both tables prove that human service failure has more impact than robot service failure. However, when customers post their terrible service experience online in robot service, they usually describe more than human service failure.

Table 2. The top 10 customer reviews in human service failure (Scores from highest to lowest)

<table>
<thead>
<tr>
<th>Customer reviews (Human service failure)</th>
<th>The “Negative” Scores (Human)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Terrible customer service.</td>
<td>0.508</td>
</tr>
<tr>
<td>2. Staff not smiling and not welcoming.</td>
<td>0.494</td>
</tr>
<tr>
<td>3. Bad front desk service.</td>
<td>0.467</td>
</tr>
<tr>
<td>4. The service is really bad and the staff arrogant.</td>
<td>0.466</td>
</tr>
</tbody>
</table>
5. Staff are rude and stubborn, room is small and view is a graveyard. 0.411

6. There was almost no service provided by the hotel. Even simple things like ice, you have to DIY at the Restaurant. The staff are cold, unfriendly and not very helpful. Given the location is good for a hotel in orchard, but for such prices I can get better service in other parts of Orchard and bigger rooms with decent table for working on my laptop and walking space. I ate on my bed. I work on my bed. I did not enjoy my stay. 0.383

7. I cancelled this reservation, and you charged me. Not sure why this would happen. 0.344

8. The service is not good. 0.325

9. Room is too small, spoken to Sue Ann regarding my booking, she is horrible person. Management must pay attention. Very disappointed. 0.304

10. The room is ok, but you are not able to open a window for fresh air. This is not healthy at all!! Also no wardrobe at all or even shelves to put your clothes. The breakfast hall looks very depressing, it's very dark. The personnel doesn't speak English at all which is frustrating being in Hong Kong. The food is very very bad never tasted so bad breakfast! No matter what you take it taste like it's old and awful. For a 4star hotel this is bad! The variety is also not much. Cosmo please put some light on and work immediately on your breakfast quality! 0.295

Table 3. The top 10 customer reviews in robot service failure (Scores from highest to lowest)

<table>
<thead>
<tr>
<th>Customer reviews (Robot service failure)</th>
<th>The “Negative” Scores (Robot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. uncomfortable comes to mind despite the interesting concept of modernity.... Expensive for an overall claustrophobic...noisy experience....the personnel seems also confuse with the concept and the robots are blocking accesses.</td>
<td>0.265</td>
</tr>
<tr>
<td>2. A little bit late leaving a review but here we are , been several times before but this visit was poor. Both my wife and I had starter and main courses which were all tasteless a very disappointing meal &amp; to be served by a robot.</td>
<td>0.19</td>
</tr>
<tr>
<td>3. If you replace the &quot;strange hotel&quot; service with mechanical power, the accommodation fee should naturally be cheaper. But not cheap. You can check in/check out according to the screen display, so you don't need a robot at the front desk. Also, the artificial</td>
<td>0.183</td>
</tr>
</tbody>
</table>
intelligence in the guest room is meaningless. Suddenly he started speaking English, and that English was useless. It was an inconvenient hotel that was disproportionate to the price and was only topical. Stayed two nights and was disappointed. We do not recommend consecutive nights.

4. We are Hilton Honor's members and stayed at the Embassy Suites Pioneer Square Seattle on a Friday and Saturday end of September 2018. Horrible experience Saturday night. At 1am, a blaring ear-piercing room siren and robot voice, telling us to evacuate IMMEDIATELY, USE THE STAIRS NOT THE ELEVATOR over and over again!! Stumbling out of our room on the 13th floor, I thought I was going to have a heart attack. My wife, 4-months post-op from a broken shoulder, almost fell down the stairs from the terrified rush of guests. Huddled with the other terrified guests from the 12, 13, 14 floors out on the sidewalk, they refused to tell us what was going on. I finally found it out myself - a FALSE ALARM, SOMEONE SMOKING IN THE STAIRWELL!!

5. Staying for 3 days in this hotel was terrible experience for me. The bed was too soft make bad quality sleep. And just stated in the check in process that will no daily cleaning for 3 nights. It is a new regulation that it was not stated when you booked the room. The robot often being broke down so that when you need something in the room, it takes for a long time to send. The gym was not good as well. Static bike and elliptical was broken. Had not repaired yet so I couldn’t use it. The only good thing of this hotel, just the location. It's near to ion, isetan and big malls at orchard.

6. The deposit of my room hasn't released yet, currently has been charged to my credit card and no news from the hotel at all. this is the threat of using robot by check out, so no human interference right away for checking the customer account, such as release the deposit, etc.

7. The deploy these robots to send water to your room which is nice until you have to fight it with your luggage as they block the exits of the lift.

8. I thought the reception was amazing, but other than that, it wasn't much different from a normal hotel, and even though I made a reservation for a family of four, towels and other items were only prepared for two people, and the robot in the room reacted. It was bad
and not very comfortable.

9. This stay was disappointing before it even began. We had received an email asking us if we wanted to pay for an upgrade which we did and replied accordingly. We were told we would receive a response within 48 hours, and it never came. We waited in our car near the valet sign for ten minutes before realizing no one was showing up. We ended parking ourselves and the staff were just chatting with each other while they saw us struggling with our luggage. But they interrupted themselves to welcome us to the Westin, which is indicative of the superficial service. No warm welcome at check in. The kids were looking forward to the hotel robot the whole way there only to be told it was broken once we arrived. The mini bar was empty. There was an old banana peel in the garbage. But other than that, it was a basic stay and no reason to return. Quite disappointing overall.

10. I booked the room for the robot service, but no robots served us. (Ridiculously, they sent the email indicated that there were robots serving us.) The quality of free breakfast and dinner is low. The hotel can also take care of the bed’s size. We checked that the large kings bed is actually a combination of two single beds. The air conditioner sound is also disturbing. My boyfriend adjusted the aircon, but the temperature didn’t change much. It actually badly affected our hotel experience. I hope the hotel can improve its overall quality. Next time I won’t come here.

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<tr>
<td>Discussion</td>
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</table>

At first, according to the results in Table 1, although human and robot service failure does not have significant differences in the influence of customer service, the data notes that customers accept robot service failure more compared to human service failure.

Then, according to the concept which is developed by Sparks & Browning, the human service failure customer reviews do not have a lot of categories (2010). According to No 5, 9, and 10 in the customer review in Table 2, customers notice “Internal to the hotel room features”. For example, customers mention the room size is too small or the windows are broken. Additionally, customers mention “Star Reference” and “Food or Beverage” in number 10. In this
customer review, customers mention their breakfast tasted so awful even though this hotel is a four-star hotel. No 1, 2, 3, 4, 7, and 8 customer reviews in Table 2 are about “Customer service”. All these customer reviews only emphasize the terrible customer service experience. Some of them such as No 1, 2, 3, 4, and 8 only conclude low-quality customer service by using one sentence. Therefore, human service failure customer reviews do not include many categories but only have 4 out of 8 categories. Additionally, the analysis of Table 2 proves that “Customer service” is the main category of human service failure in customer reviews.

Robot service failure customer reviews are very different from human service failure customer reviews. Table 3, No 1 is about “Ambiance”. This customer review narratives that the whole hotel makes customers feel very uncomfortable such as claustrophobic because of the concept of modernity which is related to the robot. No 4 and 7 focus on “Public areas of the hotel”. Both customer reviews mention the noisy hotel public area because of loud sounds from robots at 1 AM. In addition, some robots block the exits of the elevators. No 2 and 10 focus on “Food & Beverage”. Although these customers focus more on the terrible taste of hotel food, they also mention robot service is a disaster. For example, No 10 emphasizes that they forgot to provide robot service even though they mention robot service is available in the email. No 3 and 6 focus on “Value reference”. These two customer reviews express that it is not worth paying a lot of money in robot hotels because of terrible robot services such as complicated interaction modes with robots. Finally, No 5 focuses on the “Internal hotel room feature” by complaining about the soft bed, and No 9 is about “Customer service” by complaining about the no-welcome service from hotel staff. Overall, robot service failure customer reviews include 6 out of 8 categories.
Overall, according to the results from customer reviews in Tables 1, 2, and 3, and Figure 1, human service failure has more negative impacts than robot service failure. When customers describe their human service failure experience, they usually conclude all experiences in one sentence rather than providing more sentences with details. For example, the No 1 customer review in Table 2 only includes “Terrible customer service” to demonstrate customers’ negative emotions by using just three words to express how angry and disappointed they feel when they have this kind of service. Additionally, “Customer service” is the most important factor and category in customer reviews. Hence, most parts of customer reviews in human service failure are to describe their terrible customer service experience rather than others. In contrast, robot service failure does not have much negative influence compared to human service failure based on the data in Table 1 and Figure 1. However, customer reviews in Table 3 demonstrate that when customers have terrible robot service experiences, they usually describe more details than human service failure. Their personal emotions and experiences will be added to their reviews. Moreover, customer reviews in robot service include more factors or categories of online customer reviews complaints than human service failure.

**Practical Implication**

The human employee in frontline positions in the hospitality industry always is the most important part of the whole operation, and they usually have service failures during the service process (Wang et al., 2020). After that, customers will have terrible experiences, so they are willing to choose to post their negative thoughts and feelings on the Internet such as OTAs. Previous researchers found that many customers are very satisfied with service recovery which is managed by frontline employees (Palmer, A. et al., 2000). Additionally, according to the research, hotel managers must develop a standard response process in customer online reviews
about service failure (Hart & Blackshaw, 2006). Hence, this research suggests that when managers can provide correct responses and processes based on the standards to those negative customer reviews, the negative influences from these customers to others who view these reviews will decrease eventually. In fact, when managers can focus more on the employees on frontline employees by providing related training programs such as teaching them how to respond to online customer reviews complaints, it is possible to reduce the influence of online complaints. Unlike robot employees, human employees are very common to make mistakes during the service process; however, if managers understand the specialty of human and human interaction, it is possible to make up for the mistake and even increase customer satisfaction. Therefore, managers should analyze and respond to online customer negative reviews frequently and create related training programs to make sure their employees can avoid the same mistakes next time. Moreover, the response will let customers know the managers care about their complaints and will solve the problems.

Researchers in the previous study prove that robots and humans have different ways of interacting with customers (Krämer et al., 2012). According to the research, Robot employees in frontline positions in the hospitality industry do not have enough technologies and experience to support their operations (Ivanov & Webster, 2019). As a result, customers may complain more about their online reviews because they usually have high expectations when they choose robot hotels (Huang & Rust, 2018; De Keyser et al., 2019). However, robot service failures are much more acceptable than human service failures based on the results of this research. Moreover, examples that the author collected prove that customers are willing to describe more details of robot service failure in their reviews compared to human service failure. Therefore, as managers, it is essential to know the risk of robot service although robots can provide a lot of benefits such
as low labor costs. To lower the risk of robot services, managers must hire professional employees such as technical engineers to maintain robots regularly. Moreover, managers need to know how to analyze and respond to those negative reviews just like negative online reviews of human service failure.

Overall, although robot service is a new service operation mode, the ultimate service mode is human-to-human. As hospitality workers, it is necessary to have a basic knowledge of new technologies such as robot operation to make sure to increase and keep the high service efficiency and quality. For instance, the result of this research proves customers accept more robot service failures than human service failures so managers should provide more robot services to the customers to avoid more negative influences from human service failure. In addition, managers should know how to analyze online customer reviews, especially complaints or negative reviews so they can understand what customers need or expect from the service. Hence, regarding organizational conditions, management should use robots as assistance but not the main part of the service process when they make related strategies, especially in the service recovery after service failures. Moreover, it is important to develop robot operation training programs to provide customer services that combine both human and robot employees.

Limitation and Future Research

This research suffers some limitations except for many new findings. At first, customers may provide wrong information or misunderstand the service from staff or robots. Sometimes, it is hard to be sensible when they face terrible customer experiences (Sparks, & Browning, V., 2010). It means they may exaggerate the negative part of the service experience because of the level of anger or disappointment. Then, this research does not focus on the same level or categories of hotels so although hotels have robot services, they may provide different services
because of budget or operation mode. Customers may use have the same expectation as those hotels because of robot services. Hence, when they post their reviews on the OTAs, it is difficult to analyze them fairly because of different hotel levels or categories. Another limitation is that different countries have different rules and policies regarding service standards based on local culture. In some counties, if hotel companies want to have business in that specific place, they must follow the local culture and provide related services. Hence, some customer reviews may not describe the service experiences objectively based on their own culture and experiences.

Therefore, there are some suggestions for future research in this study based on those limitations. At first, future researchers can focus on the same level or categories of hotels. For example, researchers can only focus on robot and human service failure in five-star hotels or luxury hotels. Then, researchers also can find the same race of people as requirements to conduct the research. For instance, the topic can be Asian customers' reactions to robot and human service failure in Asian countries’ hotels. Finally, robot and human service failures in frontline positions can happen in many situations such as front desk, restaurants, and other places where customers can face-to-face with frontline employees. Hence, researchers can focus on one place such as customer reactions to the robot and human service failures in front desk positions.

In conclusion, this research contributes to the difference between robot and human service failure in the hospitality industry including the influences of both service failures on customer satisfaction. It is also an important study to provide details of online customer reviews about both service failures to help hotel managers analyze which kind of service failure is more acceptable to the customers.
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