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Robotic Service Quality Success in Increasing Purchase Intention and Customer Satisfaction: A Study of Five-Star Hotels in Egypt

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ABSTRACT

The objective of this research is to examine the role of potential robotic service quality (RSQ) in increasing purchase intention and customer satisfaction. To assess RSQ and customer satisfaction, we adopted a sampling method to collect data from customers at five-star hotels in Egypt. A total of 300 responses confirmed that automation, personalization, efficiency, and precision significantly and positively influenced purchase intention and customer satisfaction. It is imperative to understand how RSQ may affect customer attitudes and behaviors. RSQ can also be integrated into e-service to present a broader perspective on the quality of web-based services. RSQ can be applied to relevant industries and organizations that extensively use service robots to provide customer service. RSQ can help providers address the advantages and disadvantages of robotic services. RSQ can be a useful tool for them to communicate with service providers to address their appreciation and concerns. The study suggests that five-star hotels in Egypt can improve purchase intention. The study observes that there is a critical shortage of RSQ in Egypt and that a greater understanding of the factors that influence purchase intention is needed.

Keywords: Robotic service quality, purchase intension, customer satisfaction, automation, personalization, five-star hotels.

INTRODUCTION

Robotic service (RS) is not a new phenomenon since it has been used in many organizations over the past four decades (Ivanov et al., 2020; Huang & Rust, 2018, 2020; Lu et al., 2020; Wirtz

et al., 2018). In the past, the main reasons for using robots were increasing efficiency and accuracy, shortening service time, and taking over dull, dangerous, dirty, and unsafe tasks. The last reason given used to be more for industrial robots, but the Covid-19 pandemic created an entirely new application. The increased importance of RS became prevalent for safety from the virus (Chiang & Trimi, 2020; Korman and Mujtaba, 2020). The pandemic may have created a turning point for the adoption of RS in areas like healthcare, food delivery, and public safety (Talk & Lew 2020).

RS has been integrated into service organizations to enhance customer experience and create more agile work cultures (Aaman et al., 2024; Prentice & Nguyen, 2021; Prentice et al., 2020). RS is functioned through machine learning from the environment and experience to improve decision making, which is why there are more examples of organizations using the concept of digital twinning (Khanfar et al., 2024; Sheladiya et al., 2024). It may function through deep learning by mimicking the human brain to analyze data and draw conclusions manifested in image recognition and sound recognition (Wu & Tegmark, 2019).

Over the past few decades, more companies started using robots for various tasks such as the provision of information, cleaning, room service, delivering items, serving food and drinks, and entertaining guests (Ivanov & Webster, 2019).

There are various advantages and disadvantages of RS. These advantages are: robots' ability to work 24/7, the ability to implement their work correctly and on time, easy expansion of the scope of their tasks, robots do not get bored and can perform the same tasks numerous times without complaining, and they do not go on strikes or get ill (Ivanov, 2019; Ivanov & Webster, 2019). There are some disadvantages of RS as well. They are (1) robots can work best in structured situations, (2) they cannot implement tasks that they were not programmed for or if they lack the respective hardware, (3) robots have no social interactions with humans, (4) robots cannot always be used for service delivery, and finally (5) robots lack creativity and personal approach in their interactions with guests and employees (Ivanov et al., 2020).

RS have substituted some employees to save costs (Wirtz et al., 2018). Robotic technology in hospitality services may endanger customers' feeling of hospitability (Qiu et al., 2019; Tasci & Semrad, 2016). Human employees are the single source of hospitability, and that RS often contradicts the personalized experience (Qiu et al., 2020).

RS differs from traditional technologies in many ways, such as having features of automated social presence (Lu, et al., 2019). Robots have made customers feel that they have humanlike features to some extent (Russell & Norvig, 2016). Customers may perceive RS as another server that shares some commonalities with employees. From the standpoint of customers, their experience may be different in terms of service providers, processes and the environment (Qiu et al., 2019; Arifn, 2013; Tung & Law, 2017).

The rapid development of robotics is expected to influence and transform numerous aspects of the hospitality and service industries (Choi, et al., 2019; Tung & Au, 2018). The inclusion of robots appears to constitute the future of hotel services, particularly in a labor-intensive work environment (Pan, 2015). In recent years, an increasing number of hospitalities firms have

adopted RS in their operations, but the effectiveness of this technology application has been less than satisfactory. Driven by increasing labor costs and technology advancements, many hospitality firms have used RS to serve customers (Qiu et al., 2019; Tung & Law, 2017).

LITERATURE REVIEW

Robotic Service Quality

Robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools, or specialized devices through various programmed motions for the performance of a variety of tasks (Choi et al., 2019; Ziemke & Thill, 2014). Robots do not necessarily replace the employees but help them perform better in their job position. Robots may help organizations provide more decent work for their employees. Robots can interact directly with customers, such as performing guests' check-in, delivering requested items to the rooms, offering information to guests, as well as providing concierge services (Nam & Lee, 2020). A robot is an actuated mechanism programmable with a degree of autonomy, moving within its environment, to perform intended tasks. Robots perform useful tasks for humans or equipment excluding industrial automation applications (Ivanov et al., 2020).

Robots can interpret and learn from external data for predefined goals and tasks (Kaplan & Haenlein, 2019). Robots improve the financial performance of the company by reducing operational costs or generating additional revenues (Ivanov & Webster 2019).

Robot cannot replace certain aspects of hotel guest experiences including human interaction (Tung & Au, 2018). Robots can have a physical or virtual representation, with a humanoid or non-humanoid appearance (Wirtz et al., 2018).

Robots can reduce the labor input of employees and customers (Larivière et al., 2017). Robots are intelligent physical devices with programmed autonomy, mobility, and sensor ability to perform certain human tasks. Robots are intelligent machines acting like humans to perceive, learn, memorize, reason, and solve problems through machine learning (Prentice & Nguyen, 2021; Russell et al., 2016).

Robots can be classified based on morphology. Morphology is defined as 'the shape of its body and limbs, as well as the type and placement of sensors and effectors' (Pfeifer et al., 2007). Robots, known as humanoid robots, are mimicking human beings' appearance or behaviors. Due to their newness, robots can be used to create memorable experiences for customers (Tung & Law 2017).

Robots can perform automation tasks, such as cloth handling and cooking. Robots have been deployed in some hotels (Palvia & Vemuri 2016), retail stores (Grewal et al. 2018), and airports (Frick 2015; Lee et al. 2009). Robots are used in an industrial setting to perform repetitive tasks with high precision and minimal downtime (Arai et al., 2010).

Robots have a more demanding role in a service setting as they need to understand the users' requirements and solve their problems. There are other issues about using robots because some users may feel anxious when they interact with a robot (Nomura et al., 2006).

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There are different types of robots, such as the copresent and telepresent. *Copresent* robots are 'physically embodied as well as physically present in the user space'. *Telepresent* robots are physically embodied in the real world, but the interaction is mediated using a computer monitor, television or projector screen (Nam & Lee, 2020; Li, 2015). Robots can deeply affect customers' emotions, which further influence service outcomes (Ho & MacDorman, 2010).

Robotics technology is developing rapidly. However, the application of robotics technology is still at the early stage in service organizations. Robotics technology includes such sophisticated areas as intelligence, voice recognition, mobility and control, and image recognition (Lechevalier et al., 2014).

Robotic Service

Robotic services are mechanical devices that can mimic human behaviors to provide, autonomously or semi-autonomously, services to humans (Haidegger et al., 2013; Lechevalier et al., 2014). RS are different from industrialized robots in appearance and functions. Industrial robots are used for manufacturing and usually are in large scale machines. RS is usually used to automate menial, repetitive, cumbersome, complex, dirty, dangerous, and time-consuming tasks (Matarić, 2017).

RS performs useful tasks for humans or equipment excluding industrial automation applications (Chiang & Trimi, 2020). RS has exceeded the performance of human service providers in certain areas, e.g., memory, computing power, physical strength, and handling unpleasant or dangerous tasks (Huang & Rust, 2018).

RS may more easily recognize the limitations of robots than those with less experience (Yu, 2019). RS is not curiosity anymore as it has entered many aspects of our life. RS vary in terms of functions and performance; these differences are derived from the utilities of robots. RS are viewed as automated social presence, and their limited interactions with customers (Qiu et al., 2019).

RS can be system-based autonomous and adaptable interfaces that interact, communicate and deliver service to an organization's customers (Wirtz et al., 2018). RS requires new and innovative thinking of the relationships among different entities, where customer input and co-creation are necessary to ensure that robots provide what customers want (Baisch et al., 2017; Čaić et al., 2018). RS can fulfill tasks 24 hours each day and night without stopping to enhance efficiency (Čaić, et al., 2018). The key to success in deploying RS lies in their degree of autonomy and in the quality of human–robot interaction (Tung & Au, 2018).

RS has not been fully equipped with social elements and the ability to perform highly flexible work (Murphy et al., 2017); these robots should "work" together with human employees because of customers' pursuit of warm service that can vary from time to time (Huang & Rust, 2018).

RS has unique characteristics in that they carry out tasks in human daily settings, face complicated and changing environments, and work with humans around them (Tung & Law, 2017). RS has a great deal of contact and interaction with customers compared with those

dealing with objects (Murphy et al., 2017). RS may replace human labor to a certain extent in repetitive tasks, but jobs requiring creativity still largely depend on people (Zhong, et al., 2020). RS represents the application of many technologies, including electronics, computers, machinery, and communications. RS is a semi-autonomous or fully autonomous robot that has some mobility and can interact with people, usually in retail, hospitality, healthcare, warehouse, and/or fulfillment settings (Haidegger et al., 2013).

RS used to describe an autonomous or semi-autonomous robot that interacts and communicates with humans by following behavioral norms expected by the people with whom the robot is intended to interact (Choi et al., 2019). Today, RS find their ways into hotels (Lukanova & Ilieva, 2019; Nakanishi et al., 2020), restaurants (Ivanov et al., 2020; Lee et al. 2018), food delivery (Hwang et al. 2019), museums (Virto & López, 2019), airports, and transport stations (Shiomi et al., 2011). They serve as hosts and waiters at events as well (Ivanov et al., 2020; Ogle & Lamb, 2019). Consequently, RS may exert an influence on customers' hospitality experience, as do service staff (Beldona & Kher, 2015; Tung & Law, 2017). RS has been gradually introduced to the tourism industry, particularly in hotels all around the globe (Murphy, et al., 2019; Pinillos, et al., 2016).

Several elements of RS attributes have been identified and discussed in research. For example, anthropomorphism measures the extent to which RS simulates the characteristics, behaviors, or appearances of humans. The increasing level of anthropomorphism will first improve the impression of robots by humans and then cause hatred or fear after anthropomorphism reaches a certain point (Waytz, et al., 2010; Ho & MacDorman, 2010). RS attributes relate to how RS imitates human behaviors intellectually, which is called perceived intelligence. Animacy means to what extent RS looks and acts like living beings (Tung & Au, 2018; Bartneck, et al., 2009).

RS can be classified into two types, professional and personal. Professional robots can handle certain complex tasks such as operating automatic processes, performing dangerous tasks, enhancing efficiency, and improving productivity (Lee et al., 2018). Personal robots mainly provide services to humans (Chiang & Trimi, 2020). RS increases productivity and service capacity, provides consistent service quality, improves competitiveness by cutting costs, and improves financial results (Belanche et al., 2020; Ivanov & Webster, 2019; Wirtz, 2018).

Service Quality

Service quality (SQ) refers to customers' perceptions and value-judgments of a product or service. SQ leads to customer satisfaction and customer loyalty. SQ is the customer's perception or evaluation of a service organization's overall excellence. SQ has been recognized as an imperative factor for competitive advantage and organizational profitability (Prentice & Nguyen, 2021; Shi et al., 2014). SQ is determined by the consumer's overall assessment of the service (Parasuraman et al., 1988; 1991). SQ indicates the level of customers' perception that the service met their goals (Hemmington et al. 2018). SQ is a subjective cognitive value determined by the customer (Grönroos 1984). SQ is focused on measuring customers' opinions on the performance of the service delivered (Athanassopoulos et al., 2001; Orel & Kara, 2014; Svensson, 2006). SQ is an organizational asset and is considered a key component of organizational performance (Chiang & Trimi, 2020).

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Robotic Service Quality

Robotic service quality is still in the realm of brick-and-mortar facilities. Therefore, the performance of RS, as a front-line employee in a physical place may affect user satisfaction; thus, it needs to be measured (Bartneck et al., 2009; Chiang & Trimi, 2020; Kooijmans et al., 2007). RSQ should be assessed through customers, and assessment must be drawn from customers' perceptions and evaluations. The technology acceptance literature indicates that technology quality must be assessed from an information and systems perspective and evaluate how these factors affect users' beliefs, attitudes, and behaviors (Wixom & Todd, 2005; Xu et al., 2017). RSQ can complement the other SQ scales in industries where robots are used. RSQ can be used in conjunction with other services to measure SQ and understand its impact on customer satisfaction and behavior (Prentice & Nguyen, 2021; Karatepe et al, 2005).

There are four dimensions of RSQ, which are atomization, personalization, precision, and efficiency (Huang & Rust, 2018).

1. *Atomization* refers to the level of automation and performance by robots. This dimension captures customers' experience with AI system quality. Sluggish operating systems underlies the RS evoking a negative customer response. Advanced technology today has changed customers' expectations of technology-related services.
2. *Personalization* indicates how robots can be flexible, like service employees, to meet customers' requests and demands. RS are designed to represent and behave like humans. Customers expect their interactions with these robots to be like those with service employees. Robots represent these employees and provide the requested information and function like employees. Customers may have different needs and wants from the service provider. Whilst employees' adaptability is expected, they are nevertheless limited to fixed working hours and often inadequate training. Human physical and emotional constraints do not affect machine operated robots. These robots are available 24/7 and can store infinite amounts of information that can be adapted to meet customers' requests.
3. *Efficiency* indicates timely and responsive service from robots. The ability to respond to customer requests dependably and reliably affects customer experience, attitudes, and subsequent behaviors.
4. *Precision* is reflective of the accuracy and exactness of the information provided by robots. Such information is programmed through big data analytics and machine learning without unintended human intervention. Information generated by robots must be achieved in a timely manner and outdated information can be misleading. Customers expect information from robotic systems to be updated, objective, thorough, and accurate. Precise information can guide customers to make informed decisions on consumption and purchase activities.

Purchase Intention

Researchers have proposed six stages before consumers decide to buy a product, which are awareness, knowledge, interest, preference, persuasion, and purchase. Purchase intention (PI) is a topic of critical attention to strategy creators and commercial experts, and it is vital to recognize which variables in a certain buyer group impact their willingness to purchase (Kotler & Armstrong, 2010; Kawa et al., 2013). PI is a decisive factor to determine the purchase behavior of consumers. PI refers to the intention of consumers to buy certain products or

services (Zhong et al., 2020). PI studies in hospitality and tourism have increased. The service quality on the purchase and repurchase intention of tourists of a certain destination has proved the mediating role of service quality in determining the destination of tourists (Su et al., 2016). PI is largely overlooked, notwithstanding the expected technology growth in the hospitality industry (Tuominen & Ascenção, 2016). PI is a prime input that marketers utilize to project forthcoming sales (Morwitz et al., 2007). PI is related to the behavior, perceptions and attitudes of consumers. Purchase behavior is a key point for consumers to evaluate the product (Mirabi et al., 2015).

PI is an effective tool to predict the buying process. PI may be changed under the influence of price or perceived quality and value. In addition, consumers are affected by internal or external motivations during the buying process. Customers always think that purchase with low cost, simple packaging and little-known product is a high risk since the quality of these products is not always consistent (Gogoi, 2013).

PI is a kind of decision-making that studies the reason to buy a particular brand by consumer. PI is a situation where consumers tend to buy a product in certain conditions (Morwitz et al., 2007). PI is considered an indicator to predict the future purchase behavior of consumers (Rosa et al., 2006). So, PI can directly affect the purchase behavior of consumers (Isaid & Faisal, 2015; Kim et al., 2016; Leung et al., 2017; Spears & Singh, 2004; Zeithaml et al., 1996; Barber, Kuo et al., 2012; Chiang & Jang, 2007).

Customer Satisfaction

Customer satisfaction (CS) has been a central concept in marketing literature and is an important goal for all business activities. CS is more likely to lead to a repeat of buying products or services. Satisfied customers will also tend to say good things and to recommend the product or service to others. Dissatisfied customers may try to reduce the dissonance by abandoning or returning the product, or they may try to reduce the dissonance by seeking information that might confirm its high value (Kotler & Armstrong, 2010). CS has long been a topic of high interest in both academia and practice (Ganiyu et al., 2012). CS is a collective outcome of perception, evaluation, and psychological reactions to the consumption expectation with a product or service. It is a customer's overall evaluation of the performance of an offering (Kotler & Armstrong, 2010).

CS is a post choice evaluation judgment concerning a specific purchase decision (Lin & Wu, 2011). CS is regarded as the way customers can get more benefits than their cost (Liu & Yen, 2010). CS is one of the most important issues concerning business organizations of all types. CS is a person's feelings of pleasure or disappointments resulting from comparing a product's perceived performance in relation to his/her expectation (Veloutsou et al, 2005). CS is the necessary foundation for firms to retain existing customers. The customers who are unsatisfied with the products/services received would not be expected to have long-term relationships with the firm (Guo et al., 2009). Customers will be satisfied if the product or service exceeds their demand or expectation. On the other hand, if the product or service is below expectation, the customer will be dissatisfied (Schmitt, 2003; Goodman, 2009). CS has been defined in various ways, but the conceptualization, which appears to have achieved the widest acceptance,

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is that satisfaction is a post-choice evaluative judgment of a specific transaction (Bastos & Gallego, 2008).

CS has for many years been considered as a key factor in determining why customers leave or stay with an organization. So, organizations need to know how to keep their customers, even if they appear satisfied. CS is not a guarantee of repeat patronage. Satisfied customers jump ship every day, and the reasons are not always due to customer dissatisfaction (Michael et al., 2008). CS is an overall customer attitude or behavior towards a service provider, or an emotional reaction towards the difference between what customers expect and what they receive, regarding the fulfillment of some desire, need or goal (Hansemark, & Albinsson, 2004). CS is an attitude which is shown after purchasing behavior. However, CS is a behavior of continuing transactions. It is also progress for repeat purchasing (Woodcock et al. 2003). As shown by marketing analytics data, CS is a key factor in the formation of a customer's desire to purchase future products (Dar et al, 2021). CS is a corporate strategy, and it is a source of successful entrepreneurship. CS is a response pertaining to a particular focus. It occurs at a particular moment (Sureshchandar et al., 2002).

There are three dimensions of CS, which are satisfaction with the procedures, satisfaction with the employee, and satisfaction with an organization's services (Athanassopoulos et al., 2001).

1. Satisfaction with the progress of the procedures: The facilities that characterize an organization such as a bank include its design, location, number of branches, ease of communication, and explanatory signs for the required activities. The internal design of the bank facilitates smooth flow of transactions. For example, there is often more than one bank branch to meet customers' needs, the bank may offer special facilities, and it should be easy to contact the bank by telephone or via e-mail.
2. Satisfaction with the employees: This is the degree of satisfaction of the customer with the staff for their good treatment and their cooperation in providing services. For example, a bank's staff can be characterized by elegance, politeness, and their treatment is unique and distinguished with each customer. The staff are usually aware of the activities and work of the bank as they have the knowledge to serve each client in a timely manner. Additionally, bank staff work freely with customers when they have a problem, and employees in the bank do not hesitate to find the time necessary to provide the best service for each customer.
3. Satisfaction with the services of the organization: It reflects the view of the general satisfaction of the customers with the services provided in terms of multiplicity and rapid solving of problems they may face. If there is a problem, the bank will be willing to discuss this with the customer. Additionally, the bank may provide services to customers beyond what is expected, maintain good relations between staff and the organization, while offering a wide variety of services to meet each stakeholder's needs.

Just like a bank, the hospitality industry, more specifically hotels, deal with the balancing act of stakeholders' needs such as the conflicting expectations of employees, customers, and stockholders. So, the working life of five-star hotel employees and management in Egypt can be very complex. Therefore, we shed some light on robotic service quality in assisting the hotels in increasing purchase intention and customer satisfaction. With no concrete evidence in terms of the impact of RSQ on PI and CS and to test the relationship based on the literature that

supports RSQ as a strong indicator of achieving PI and CS, we propose that RSQ can enhance PI and CS at five-star hotels in Egypt.

H1: *There is a positive statistically significant effect of robotic service quality (Automation, Personalization, Efficiency, and Precision) on purchase intention.*

Three sub-hypotheses emerge from this hypothesis, depending on the dependent variable:

- H1a: There is no statistically significant relationship between Automation and PI at Five-Star hotels in Egypt.
- H1b: Personalization has no statistically significant effect on PI at five-star hotels in Egypt.
- H1c: There is no statistically significant relationship between Efficiency and PI at five-star hotels in Egypt
- H1d: There is no statistically significant relationship between Precision and PI at five-star hotels in Egypt

H2: *There is a positive statistically significant effect of* robotic service quality *(Automation, Personalization, Efficiency, and Precision) on* customer satisfaction*.*

Three sub-hypotheses emerge from this hypothesis, depending on the dependent variable:

- H2a: There is no statistically significant relationship between Automation and CS at five-star hotels in Egypt
- H2b: Personalization has no statistically significant effect on CS at five-star hotels in Egypt.
- H2c: There is no relationship between Efficiency and CS at five-star hotels in Egypt
- H2d: There is no statistically significant relationship between Precision and CS at five-star hotels in Egypt

The research population is represented by all customers who benefit from the services of five-star hotels in Cairo city in Egypt. Due to the large size of the community and the difficulty of accessing all its components, in addition to the time and cost constraints, it was decided to rely on the sampling method. Data was collected from the sample using an online survey. The names of these five-star hotels surveyed are Holiday Inn Cairo City stars, Cairo Marriott Hotel, Concorde El Salam Hotel Cairo, Conrad Cairo Hotel, Hilton Cairo Heliopolis, Dusit Thani Lakeview Hotel, Four Seasons Cairo At Nile Plaza, Fairmont Nile City Hotel, Sonesta Cairo Hotels, Intercontinental City stars Hotel, Intercontinental Cairo Semiramis, Holiday Inn Cairo Maadi, Royal Maxim Palace Kempinski Hotel, Le Passage Cairo Hotel & Casino, Waldorf Astoria Cairo Heliopolis, and The Nile Ritz-Carlton Cairo (Egyptian Hotel Associations, 2021).

METHODOLOGY

The research is based on the survey framework for data collection at five-star hotels in Egypt. We designed the model on the assumption that there is a positive statistically significant effect of RSQ on PI and CS, as shown in Figure 1.

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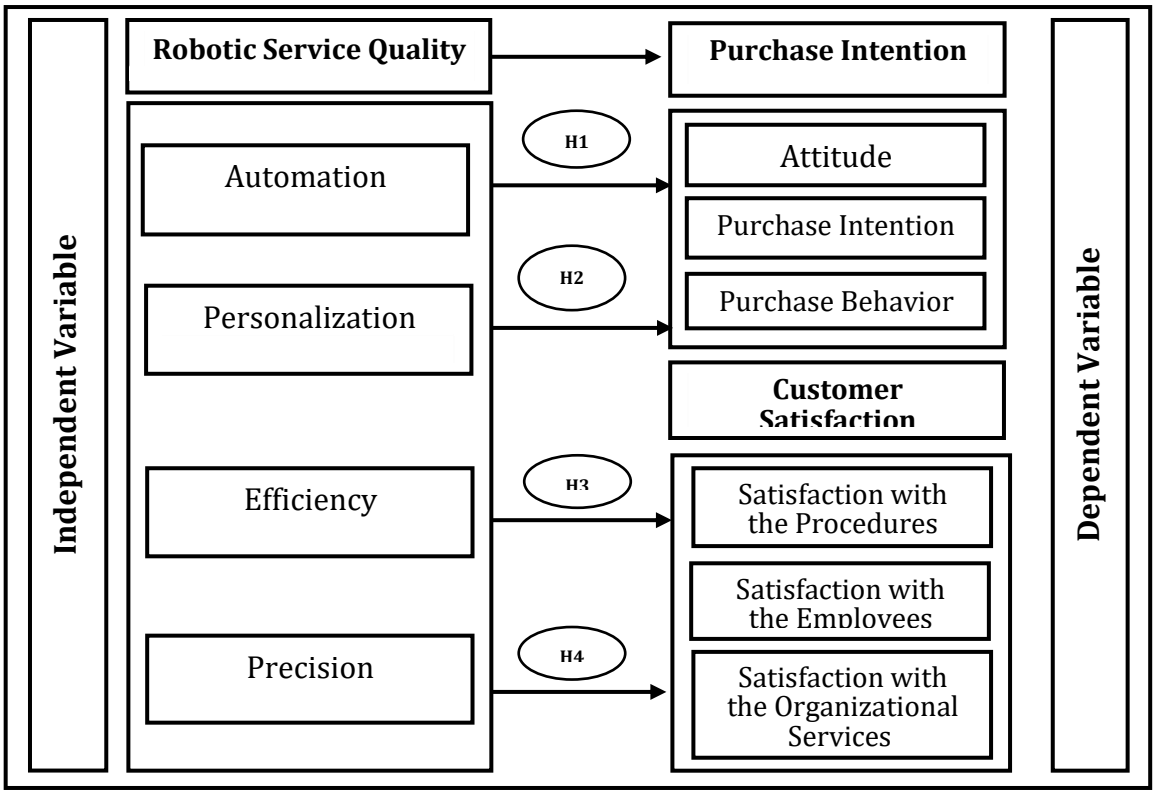

Figure 1: Proposed Comprehensive Conceptual Model

Participants

The research population consisted of all the customers who benefit from the services of the 18 five-star hotels in Cairo city. The method of selecting a statistically stratified group of people from a population of interest is known as sampling (Kamangar & Islami, 2013). Since the population of interest typically consists of too many people for any quantitative study to use as subjects, sampling is an important method for research studies. A fair survey is one that is broad enough to address the research question and is statistically representative of the population of interest (Browner et al., 1988). The research sample is represented in a group of randomly selected census from the study population, and the study was limited to five-star hotels in Cairo. We relied on the sampling method due to the large and enormous research population, as well as time and cost constraints (Daniel, 1999).

By referring to the statistical tool for determining the sample size from a research community of all customers of five-star hotels in Egypt, it was revealed that the appropriate sample size is 384 (Sekaran & Bougie, 2016). The questionnaire was designed and distributed to a sample size of 384 employees at five-star hotels in Egypt, but 300 were retrieved excluding 84 incomplete questionnaires (78% response rate).

Data Collection Instrument

For the purposes of collecting data and testing the study hypotheses, the authors designed the questionnaire items by reviewing the literature related to the topic. The questionnaire consisted of three parts.

The first part measured RSQ (based on the work of Huang & Rust, 2018; Prentice & Nguyen, 2021). The RSQ section contained 12 items distributed into four dimensions. The first three items measuring automation, the second three items measuring personalization, the third three items measuring efficiency, and the last set of three items measuring precision.

The second part measured PI (based on Zhong et al., 2020; Kim et al., 2016; Leung et al., 2017; Spears & Singh, 2004; Zeithaml, et al., 1996; Chiang & Jang, 2007; Barber et al., 2012; Chiang & Jang, 2007). The PI section contained 13 items distributed into three dimensions. The first six statements measuring attitude, the second four statements handle purchase intension, and the last three statements illustrate purchase behavior.

The third part measured CS (based on Athanassopoulos et al., 2001). The CS section contained 18 items distributed into three dimensions. The first six items measure satisfaction with the progress of procedures, the second six items measure satisfaction with the employee, and the last six items measure satisfaction with organizational services.

We used the Statistical Package for Social Sciences (SPSS) 24 for statistical analysis using descriptive statistics and Multiple Regression Analysis (MRA).

Table 1 shows the values of reliability and validity for RSQ, PI and CS. The research variables were above the acceptable limit of 60% (Sekaran and Bougie, 2016).

Table 1: Reliability and validity for RSQ, PI and CS

Variables	Reliability	Validity
Independent variables: (RSQ dimensions)		
Automation	0.936	0.967
Personalization	0.925	0.961
Efficiency	0.929	0.963
Precision	0.916	0.957
Dependent variable: PI	0.985	0.992
Dependent variable: CS	0.987	0.993
Source: Statistical analysis of field research data		

RESULTS

Table 2 shows a description of the variables included in the paper represented in the arithmetic mean measured on a five-point scale and its standard deviations.

Table 2: RSQ Variables Mean and St. Deviation

Variables	Mean	St. Deviation
Independent variables: (RSQ dimensions)		
Automation	3.31	1.08
Personalization	2.86	0.95
Efficiency	3.54	1.03
Precision	3.31	1.09
Dependent variable: PI	3.32	1.01
Dependent variable: CS	3.38	1.10
Source: Statistical analysis of field research data		

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The arithmetic means of automation scored higher than the average, according to the hypothetical mean of Likert's five-point scale (3). The standard deviation values showed a high degree of convergence of the total answers from their arithmetic means in the opinions among the sample vocabulary about the research variables.

Correlation Coefficients between RSQ, PI and CS

Table 3 shows the correlation coefficients between RSQ, PI and CS at five-star hotels in Egypt.

Table 3: Correlation Coefficients between RSQ, PI and CS

Variables	X1	X2	X3	X4	PI	CS
Automation	1					
Personalization	0.932**	1				
Efficiency	0.957**	0.921**	1			
Precision	0.945**	0.964**	0.974**	1		
PI **Y 1**	0.822**	0.793**	0.878**	0.830**	1	
CS **Y 2**	0.263**	0.256**	0.296**	0.297**	0.297**	1

According to the correlation data, there is a positive and strong correlation between the research variables. All correlation coefficients are high in general.

Hypothesis Testing

Table 4 show MRA for the relationship between RSQ and PI at five-star hotels in Egypt.

Table 4: Multiple Regression Analysis between RSQ and PI

Intervening Variable	R	R^2	ΔR^2	Adj R^2	F	*Sig. f*
Automation	0.825	0.680	-	0.677	209.9	0.000**
Personalization	0.819	0.670	0.010	0.667	200.5	0.000**
Efficiency	0.890	0.792	0.122	0.790	375.5	0.000**
Precision	0.840	0.705	0.087	0.702	236.2	0.000**
Note (s): N = 300 and p<0.000***						

As shown in the data regarding the relationship between RSQ and PI, we conclude the following points:

- The values of the correlation coefficients (R) indicate a significant positive correlation between the dimensions of RSQ and PI.
- The automation variable explains the variance in PI. It contributed to the explanation of 68% of the variance in PI.
- The personalization variable contributed to explaining 67% of the total variance in PI.

Tables 5 shows MRA for the relationship between RSQ and CS at five-star hotels in Egypt.

Table 5: Multiple Regression Analysis between RSQ and CS

Intervening Variable	R	R^2	ΔR^2	Adj R^2	F	*Sig. f*
Automation	0.264	0.070	-	0.061	7.42	0.000
Personalization	0.275	0.067	0.006	0.067	8.10	0.000
Efficiency	0.300	0.090	0.014	0.081	9.77	0.000
Precision	0.307	0.094	0.004	0.085	10.29	0.000

Note (s): N = 300 and p<0.000***

Regarding the relationship between RSQ and CS, we conclude the following points:

- The values of the correlation coefficients (R) indicate a significant positive correlation between the dimensions of RSQ and CS.
- The automation variable explains the variance in CS. It contributed to the explanation of 70% of the variance in CS.
- The personalization variable contributed to explaining 76% of the total variance in CS.

Table 6 shows the final form of MRA in the relationship between the dimensions of RSQ and PI.

Table 6: Final Form MRA between RSQ and PI

Intervening Variable	Beta	T	Sig. T	Constant Coefficient	F	Sig. f
Automation	0.100	0.947	0.364	0.149	268.83	0.000
Personalization	0.053	0.681	0.496			
Efficiency	1.45	10.49	0.000			
Precision	0.443	3.65	0.000			
Note (s): N = 300 and p<0.000***						

Regarding the final form of the relationship between RSQ and PI, we conclude the following points:

- There is a positive effect of all RSQ dimensions (atomization, personalization, precision, and efficiency) on PI. Therefore, the hypothesis is accepted
- T-value and Beta confirm that there is a positive relationship between RSQ and PI. The results of t-value indicate the significance of the model's parameters at 0.001. It is evident that there is a relationship between RSQ and PI.
- Accepting the validity of sub-hypothesis regarding the existence of a statistically significant relationship between RSQ and PI. Therefore, it is evident that there is a statistically significant relationship between RSQ and PI.

Table 7 shows the final form of MRA in the relationship between the dimensions of RSQ and CS.

Table 7: Final Form MRA between RSQ and CS

Intervening Variable	Beta	T	Sig. T	Constant Coefficient	F	Sig. f
Automation	0.245	1.12	0.260	4.47	7.75	0.000
Personalization	0.038	0.24	0.811			
Efficiency	0.319	1.121	0.262			
Precision	0.253	1.01	0.310			
Note (s): N = 300 and p<0.000***						

Regarding the final form of the relationship between RSQ and CS, and we conclude the following points:

- There is a positive effect of all RSQ dimensions (atomization, personalization, precision, and efficiency) on CS. Therefore, the hypothesis is accepted

- T-value and Beta confirm that there is a relationship between RSQ and CS. The results of t-value indicate the significance of the model's parameters at 0.001. It is evident that there is a relationship between RSQ and CS.
- Accepting the validity of sub-hypothesis regarding the existence of a significant relationship between RSQ and CS, there is sufficient evidence that there is a statistically significant relationship between RSQ and CS.

DISCUSSION

In this paper, the research model was built to analyze the impact of robotic service quality on purchase intention and customer satisfaction. The current study found that there is a significant relationship between RSQ, PI and CS at five-star hotels in Egypt. The study found that there is a lack of understanding regarding RSQ and PI at five-star hotels in Egypt. In other words, the dimensions of RSQ play a significant role in enhancing the dimension of PI at five-star hotels.

Today, most robots are engaged in guidance, cleaning, or movement support for specific service spaces. Robot mobility are functions by which humans distinguish robots from other kinds of technology (Choi et al., 2019; Tsarouchi et al., 2016). Also, the RS industry has begun to attract attention in the market since artificial intelligence is making their operation a bit more of a necessity to help human workers (Mujtaba, 2024). As explained by Mujtaba and Lawrence (2024), modern workers must possess competency in artificial intelligence since the workplaces of tomorrow will be very different. The need for personal RS increases as people seek to efficiently improve their quality of life, while the demand for home care, home security, and social welfare for people with disabilities increases worldwide. RS are more exposed to direct human interaction than industrial robots, and CS with such robots is partly related to the levels of communication they can offer (Lemaignan et al., 2017).

Furthermore, the development of robot technology promotes human-robot interaction as an emerging important issue for better serving customers in the workplace, including restaurants and even fast-food outlets (Mujtaba and Johnson, 2016; Mujtaba and Patel, 2007). RS are being used in commercial facilities. RS play an expanding number of roles and functions in shopping malls, hotels, and airports (Tung & Au, 2018; Ziemke & Thill, 2014). Also, robots exhibit important attributes that make them seem like human beings: mobility, intelligence, and safety (Epley et al., 2007). The success of deploying RS in the commercial facilities depends on the robots' levels of autonomy and human-robot interaction (Tung & Law, 2017).

Finally, RS should be assistants to human employees, especially in terms of repetitive manual labor (Larivière et al., 2017), which would improve the attributes of RS that are beneficial to the hospitality industry (Qiu et al., 2019; Wang, et al., 2017). Robots may have physical and virtual forms. The former includes humanoid robots that look and behave like humans and non-humanoid robots. The latter refers to online automated services (Prentice & Nguyen, 2021).

Contribution

This paper provides knowledge contributions for robotic service quality at five-star hotels in Egypt. There are four dimensions of RSQ, including atomization, personalization, precision, and efficiency. Atomization refers to the level of automation and performance by robots. Personalization indicates how robots can be flexible. Precision is reflective of the accuracy and

exactness of the information provided by robots. Efficiency indicates timely and responsive service from robots. This paper is the first attempt to research the relationship between RSQ, purchase intention and customer satisfaction in the Arab environment. The results of this paper provide additional guidance for effective practices in RSQ, PI and CS.

This paper also provides operational contributions at five-star hotels in Egypt. First, the results indicate that RSQ is beneficial for hotels in Egypt to benefit from it by raising PI and CS. Second, this paper encourages employees to be sensitive towards RSQ and how to use it to develop PI and CS. Third, we recommend implementing RSQ because it will help hotels, employees, and customers to positively perceive PI and CS. Fourth, this paper revealed a positive relationship between RSQ, PI and CS. Fifth, these results shed more light on the importance of RSQ as a tool for PI and CS.

Also, the five-star hotels in Egypt should use robots because of its ability to work 24/7, and the ability to implement their work correctly and on time. In other words, robots can fulfill tasks for 24 hours without stopping, thereby enhancing efficiency. Also, robots may replace human labor to a certain extent, but jobs requiring creativity still largely depend on humans. Also, the hotels in Egypt should use the robots because of its easy expansion of the scope of their tasks and it does not get bored. Additionally, robots can perform the same tasks numerous times without boredom or complaints, and they do not go on strikes or get ill.

Moreover, managers should know that robots cannot necessarily replace employees but can help them perform better. Also, robots may help hotels provide more decent work for their employees. Also, the robots play an important role at hotels in Egypt because it increases the service capacity of the company, makes the planning of operations easier because of the predictable service performance of robots, and it can be used to create memorable experiences for customers.

Furthermore, hotels should use robots to improve their financial performance by reducing operational costs or generating additional revenues. Also, it is used in an industrial setting to perform repetitive tasks with high precision and minimal downtime. Also, the hotels in Egypt should use the robots because it can interact and communicate with humans by following behavioral norms expected by the people with whom the robot is intended to interact.

Finally, the managers should know that robots carry out tasks in daily settings, face complicated and changing environments, and work with humans around them. Also, robots play an important role in hotels because they increase productivity, service capacity, provide consistent service quality, improve competitiveness by cutting cost, and improve financial results. So, it is imperative to understand how RSQ may affect customer attitudes and behaviors. In addition, RS is an online information-based service. RSQ can be integrated into e-service to present a broader perspective on the quality of web-based services. Also, RSQ can be applied to relevant organizations that extensively use robotics to provide customer service. RSQ can help providers address the advantages and disadvantages of robotic services. RSQ can be a useful tool to communicate with service providers and address customers' appreciation and concerns.

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Future Research

The present study attempts to reveal the dimensions of RSQ and its impact on PI and CS, but the scope of this study indicates that there are other areas for future studies. Among these research areas are studying the mediating role of RSQ between PI and CS, studying the relationship between RSQ and big data, studying the relationship between RSQ and SQ, and studying the relationship between RSQ and organizational performance.

"Statements and Declarations" / Acknowledgements:

This is original work and only submitted to this journal.

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CONCLUSION

The issues of robotization on a global level are addressed by the International Federation of Robotics, a non-profit organization founded in 1987 on the 17th symposium on robotics, associated with nearly all robot manufacturers worldwide. Robotization is a term often used with reference to the car industry. With the development of RS, we may expect that these technologies will be increasingly applied in the construction industry and other areas as well. Robotization of services is not a new phenomenon. Robotization may help organizations provide more decent work for their employees.

Robotization allows firms to minimize time, reduce the workforce costs and improve efficiency. Robotization will be either good or bad in the long run depending on the response of private firms and public policies.

Robotization reduces dangers to which workers are exposed to as part of doing their jobs. This is particularly the case in potentially dangerous industries such as construction or even tasks such as demining of war zones. The desire to increase performance and the profitability of processes in an increasingly complex and technology-enhanced society has led to the gradual replacement of the human person by machines.

Robotization has the capacity to significantly help the medical sector by recognizing and detecting diseases through fast, efficient and standardized means. Robotization has several rewards as it adds value to the economy through the creation of skilled jobs, innovativeness, digital know-how, and creativity. Robotization is facilitating firms to move up the value chain, through accelerated production and improved performance.

There is an impact of robotization on the external environment of the organization, but its influence on the internal environment remains unaddressed to some extent. The impact of robotization on the internal environment of the firms is a bit complex and depends on the policies that govern the organization.

The robotization of life must be wisely and critically considered as an opportunity but not as an absolute necessity and with a concern for those potentially left behind. It must also be noted that robotization is, in certain sectors, driven by factors which are themselves reinforced by the robotization they have created.

The advantages of using robots are that robots will handle complaints faster than human, protect guests' personal data better than human workers, deliver more personalized service to guests, will make fewer mistakes, will be faster than human beings in most repetitive tasks, calculate better than human workers, provide more accurate information, provide information in more languages, act friendlier than human beings, and robots will be more polite than human.

The disadvantages of using robots are that robots will consume too much electricity, malfunction during service, misunderstand a question/order, not implement special requests as they work only in a preprogrammed frame, and robots can't understand a guest's emotions. In the past, the main reasons for using robots were increasing efficiency and accuracy, shortening the service time, and taking over dull, dangerous, dirty, and unsafe tasks. The safety reason used to be more for industrial robots, but the recent pandemic has created an entirely new norm where many new applications and the increased importance of robotic service became prevalent for safety from the virus. The pandemic may have created a turning point for the adoption of robotic services in areas like healthcare, food delivery, and public safety.

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