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Human employees versus robotic employees: Customers and hotel managers' perceived experience at unmanned smart hotels

Fan Cheong^{12*}, and Rob Law³

Abstract: Hotel managers and researchers are increasingly interested in artificial intelligence (AI) and robots, which are vital to the future of the hospitality industry. However, adopting robotic services is challenging due to the current state of the art and insufficient understanding of the relationship between customer satisfaction and robotic services. Hotels are building a competitive advantage through high technology permeating various service environments. This study examined customer perceptions and satisfaction with smart hotels during COVID-19 based on online reviews by building a list of smart hotel properties that identifies well-performing and poorly performing service quality. Results highlight the advantages of smart hotels in the tourism environment and provide helpful guidance for hoteliers to apply high technology in the service environment. This study examines and demonstrates that the utility of new technologies in a smart hotel at modern times to deal with the challenges of COVID-19, and assures precision and speed in service delivery to improve sustained competition and guest experience.

Subjects: Hotel Management; Tourism Behaviour; Tourism Development/Impacts

Keywords: service quality; unmanned smart hotels; experiential quality; COVID-19

1. Introduction

Marketing studies show that the hotel industry is developing a new operating business model called the smart hotel (Wu & Cheng, 2018). Smart hotels are a novel solution for the travel industry and are relatively new. Information and Communication Technology (ICT) is a critical factor in the efficient function of smart hotels due to its unique role. It reduces labor costs, improves management and operational efficiency, and helps fulfill guests' needs in the age of technology. Additionally, COVID-19 accelerated the application of ICT services to create contactless systems to reduce the spread of the virus among guests (Seo, 2022). Smart hotels impress guests not only with hotels but with cities and countries. Therefore, developing smart hotels in practice is crucial for the hospitality industry.

Some hotels have implemented various technological innovations (e.g., service robots, AI, and the Internet of Things (IoT)) to enhance the guest experience. Several hotel chains (e.g., Marriott, Sheraton, Hilton, and Mandarin Oriental) are experimenting with service robots in certain parts of the United States, such as concierge robots (i.e., answering questions, providing directions, entertaining children, and providing travel advice), luggage robots (i.e., carrying luggage) and room

service robots (i.e., food delivery). FlyZoo Hotel, the world's first fully functional smart hotel, and Henn-Na Hotel, a hotel chain in Japan, showcase the future of hospitality. Some clients and practitioners are concerned about lacking human service interaction and encountering robot failures (Wirtz et al., 2018). In contrast to other industries such as banking, healthcare, and e-commerce, the usage of new technologies in a smart hotel—outside of chatbots—is still in its infancy. The hospitality industry also does not have a solid vision for new technologies-enabled solutions (Rawal et al., 2022). Contrary to the increasing examples of pandemic-related employment of new technologies, there has been limited scholarly research on how smart hotels affect customers and employees' perceptions.

Cutting-edge technologies are to achieve maximum efficiency through service automation. As such, the most evident advantage of a smart hotel, from the standpoint of a hotel operator, is financial gain through increased productivity and lower personnel costs (Wu & Cheng, 2018). Robots are an example in this regard because they can work around the clock and assist multiple customers simultaneously, which is typically impossible with human personnel (Ivanov & Webster, 2018). Another example is a chatbot, which communicates better than human due to its more comprehensive range of capabilities and use of multiple languages (Dalgic & Birdir, 2020). In addition, advantages from the client's perspective include shorter waiting times, effectiveness with non-human items, as well as intriguing and entertaining aspects of human-robot interaction in a smart hotel (Tussyadiah & Park, 2018). Due to data-driven technologies, a smart hotel can provide more individualized goods, services, or the transactional environment a customer prefers and requires (Piccoli et al., 2017). Prior research focused on usability, measurement of use, and customer perception or evaluation regarding cutting-edge technologies (Ivanov & Webster, 2018; Tussyadiah & Park, 2018), despite the growing adoption of advanced technologies based on the aforementioned advantages. Until now, no research has been done to identify a smart hotel's characteristics and employee perceptions thoroughly. Therefore, to embrace a technology-oriented context in the hotel industry, it is of paramount importance to identify the attributes of a smart hotel that distinguish it from other hotels and understand employees and customers' perceptions.

This study explores the perceptions of hotel staff and guests toward smart hotels that serve as a meaningful guide for future research on technique services in smart hotels. As the hospitality industry increasingly uses smart products, further analyses of employee and guest perceptions are required to measure the effectiveness of smart hotels. This study aims to understand the following research questions:

- (1) From the perspective of hotel guests, what are the advantages and disadvantages of smart hotels?
- (2) From the perspective of hotel staff, how can smart hotels enhance guest loyalty and provide the most effective practices for the management of unmanned smart hotels?

This study will provide insights into the advantages that hotel guests value most. Due to the high cost of building or transforming into a smart hotel, the perceptions of hotel guests and staff may impact the development of smart hotels. Furthermore, the participants' preferences in the loading factor will provide insight into how to alleviate potential hotel staff resistance to smart hotels and attract potential guests. The perceived benefits of various groups will reveal HR practices and marketing strategies. These benefits can be embedded in marketing messages received by customers or communicated in training workshops to enhance the support of employees and customers for features such as IoT, AI, and service robots. This study provides managers with a practical framework to recognize the advantages and disadvantages of their services and analyze the service quality of smart hotels. It could provide meaningful findings for future research. These results are invaluable for hotel managers to understand the challenges and opportunities of adopting new technologies.

2. Literature review

2.1. *Innovative service for the hospitality industry*

Consumers check in differently at smart hotels than at conventional hotels, where most of the goods and services are handled and provided to customers by human workers. Robots would act as porters or concierges, check visitors in at kiosks or with a robot front desk agent using fingerprint or facial identification, and allow access to the room (Kabadayi et al., 2019). Guests would benefit from a novel experience that allowed them to customize their chosen settings and environments because their stay encompasses a variety of activities, such as working out in the gym, attending events and meetings, and dining in a restaurant. A virtual or intelligent assistant executing tasks on each visitor's particular requests and an innovative guest experience would be provided by a robot server bringing food to a modern hotel restaurant (Hospitality Net, 2019). Depending on each consumer's preference, the departure experience would be extraordinary and include unforgettable moments using holograms or engaging the senses. At a smart hotel is better suited to modern technologies, the crucial moment would be handled differently than it would be done in a regular hotel with human staff.

This study reviewed the literature on hotel staff and guests' perceptions of smart hotels. Smart hotels have advantages and disadvantages. Smart hotels can improve service efficiency and quality, reduce customer wait times, and provide a seamless experience (Kuo et al., 2017; Tuomi et al., 2021). However, others argue that smart hotels may have potential technical glitches, raise privacy concerns, and lack personal interaction.

Previous research has found that a robot's orientation and approach speed are essential for human perception. Hotel managers should use various robots in different situations since people have different preferences. Researchers recommend using various robots (e.g., front desk and handling robots) to serve customers at various stages. Hotel robot applications are divided into reception, room service, catering, and other services. According to Ivanov and Webster (2018), robotic service is okay when people are in charge, and there is no physical interaction.

The advantages of technology that enables customers to satisfy their intensive wants are better than interpersonal service delivery, which were highlighted because the service environment is virtual and no longer strictly requires the presence of customers and service providers (Wu & Cheng, 2018). Also, due to technological breakthroughs, rising, anticipated labor shortages and labor costs in the future, hotel and tourism firms are encouraged to consider offering clients technology-based solutions. More advanced technologies (such as mobile delivery robots and check-in/check-out) have started integrating into hotel operations. As a result, it directly benefits guests. Due to data-driven technologies, hotel guests can receive customized services based on their past preferences or unique personal touches. In a similar vein, smart technologies have been adopted and are being investigated for usage in a variety of industries (Kabadayi et al., 2019). For example, some Marriott International hotels include showers with electronic doors so that visitors can record notes while taking a shower and email the image (Forbes, 2020). These streams of cutting-edge technology adoption would eventually coalesce into the concept of a smart hotel.

2.2. *Stakeholder theory*

A stakeholder is any group or individual that will be influenced by or influence the organization's goals. Stakeholder theory indicates that decisions should be made together, and all voices should be heard, regardless of the interests or power of different groups. The crucial point of good service is ensuring harmonious interactions between stakeholders (Ho et al., 2020). Thus, smart hotels should decide on technology development and adoption after discovering and understanding how multiple stakeholders (e.g., hotel staff and guests) evaluate smart hotels (Zhong et al., 2022).

The attributes of service robots can not only enhance the work experience of hotel employees but also improve consumer experience and the accuracy and efficiency of service. Previous studies

have focused on robotics design, commercialization, and adoption challenges (Ivanov & Webster, 2018); interaction failures value co-creation (Helkkula et al., 2018); and customer experience. Based on the Web of Science, few prior studies have examined how staff and customers perceive smart hotels. Hence, a thorough investigation of the connection between service quality, staff satisfaction, and guest experience in smart hotels could offer a solid foundation for understanding the application of new technologies in hospitality in the future.

2.3. User-generated content

The spread of big data, Internet connectivity, and the IoT has reshaped the economy at the macro and micro levels, revolutionizing consumption and production. ICTs make this behavior more manageable (Buhalis et al., 2019). Consistent with user-centered design trends, these technological advancements have the potential to deliver hyper-personalized content for everyone, enhance the service experience, and improve the placement of sponsored and advertising content. Service quality studies give industry managers helpful feedback on what customers value most about their products and services and how to effectively allocate the limited resources under their command to improve customer satisfaction. Customer feedback through UGC influences the final decision of other users and serves as information and guidance for potential consumers (Ukpabi & Karjaluoto, 2018).

Customers become suppliers' communicators, influencing their perceptions of specific service quality and positioning. Moreover, customers provide information and recommendations for product diversification and improvement to identify possible weaknesses or disadvantages that professionals can minimize or address—all of which may help foster the loyalty of the consumers. Therefore, applications and platforms such as TripAdvisor and Ctrip are convenient for managers and customers, as they foster loyalty and collaboration. Thus, online reviews (e.g., TripAdvisor) are becoming an essential focus for marketing, e-commerce, and e-travel research. Online review applications in management are regarded as the right decision.

2.4. Novel SERVQUAL standard

Traditional SERVQUAL methods have been extensively examined in the hospitality literature. However, the SERVQUAL model needs to be updated from information systems, digital technology, and the pandemic perspective as customer needs and expectations change over time (Chen et al., 2022). The novel dimension of the model is obtained through expert opinion and literature surveys. The proposed extended SERVQUAL model will be shown in the results. The SERVQUAL model is seen as the source of the development model.

3. Methodology

3.1. Study 1: Consumer reviews on TripAdvisor platforms

This study proposes UGC analysis, which is considered as an effective method of understanding customer perception. Because it is one of the most widely used websites for online reviews of hotels and travel destinations, we chose TripAdvisor as a data source (Luo et al., 2020; Vu et al., 2019). TripAdvisor is the platform with the most reviews at the time of collection compared with Agoda, Yelp, Booking.com, and other websites. We extracted text reviews and overall user ratings. We extracted other comment metadata, such as user location and comment date. After preprocessing the original dataset, we obtained 14,539 reviews using web spiders in June 2022 from 15 hotels (see Table 1), which comprised removing duplicate, incomplete, and invalid data.

The sample includes reviews of the famous automated hotels (e.g., Sonesta San Jose, FlyZoo Hotel, Henn-na Hotel, Hotel EMC2, and YOTEL) between 2019 and 2022 that generated sufficient and representative consumer reviews. Due to language barriers, we only collected reviews written in English. Reviews from different customer groups (such as business travelers, families, and solo travelers) were collected. After data collection, data were tabulated and qualitatively analyzed by

Table 1. Smart hotel review data

Hotel Name	No. of reviews	Star rating
Aloft Cupertino California	315	4
Crowne Plaza San Jose Silicon Valley	365	4
Flyzoo Hotel Hangzhou Zhejiang	3	4
Henn-na Hotel Fukuoka Hakata	1	4
Henn-na Hotel Huis Ten Bosch	33	3.5
Henn-na Hotel Maihama Tokyo Bay	19	4
Henn-na Hotel Tokyo Akasaka	14	4
Henn-na Hotel Tokyo Asakusabashi	15	3.5
Henn-na Hotel Tokyo Ginza	9	4
Henn-na Hotel Tokyo Hamamatsucho	28	4
Henn-na Hotel Tokyo Haneda	13	4
Henn-na Hotel Tokyo Nishikasa	4	3.5
Hotel EMC2 Chicago Illinois	542	4.5
Yotel New York	9,789	4
Yotel Singapore	3,389	4.5
Total	14,539	

Python based on content analysis, which provided graphical, statistical, and linguistic tools for text analysis.

We utilized a dictionary-based approach to identify attributes contained in reviews. In addition to the existing standard dictionaries, we have added additional dictionaries, including specialized terms and common words or Internet acronyms. The analysis revealed customer and employee perceptions of smart hotels, thus providing hotel managers with useful insights to improve their products and services.

3.2. Study 2: An interview with automated hotel managers

Study 1 defined key factors emerging in smart hotel experiences from a customer's perspective, and more opinions are needed from the manager's perspective. Exactly what prompted the strategic decision to join the smart hotel market and what type of high demands this new business model places on hotel practitioners remains unclear. There are two research questions:

Research Questions 1. What distinguishes a smart hotel from a traditional hotel, and why is there a difference?

Research Question 2. What distinguishes pre-pandemic services from post-pandemic services?

The second study seeks to comprehend smart hotels' services more thoroughly. Investigating the costs and advantages of offering smart hotel services gives this study an additional dimension to deepen its consequences. In July 2022, the study team conducted in-depth interviews with knowledgeable hotel managers using convenience sampling. This study investigated the questions above and developed a semi-structured interview methodology. Additionally, we enquired about

Table 2. Items and frequencies of customer smart hotel reviews

Themes	Items	Positive	Subtotal	Negative	Subtotal
*Innovativeness	Trendiness	11980 (5.91%)	33489 (16.51%)	580 (0.29%)	937 (0.47%)
	Timesaving	7025 (3.46%)		282 (0.14%)	
	Hedonic experience seeking	14484 (7.14%)		75 (0.04%)	
Perceived experiential quality	Interaction	15736 (7.76%)	43030 (21.17%)	670 (0.33%)	11283 (5.56%)
	Physical environment	7782 (3.84%)		6450 (3.18%)	
	Outcome	10659 (5.21%)		597 (0.29%)	
	Access	1789 (0.88%)		1679 (0.83%)	
	Accommodation quality	7064 (3.48%)		1887 (0.93%)	
Tangible attributes	Interior design	8999 (4.44%)	24115 (11.89%)	2368 (1.17%)	4413 (2.18%)
	Room size	1885 (0.93%)		1176 (0.58%)	
	In-room amenities	13231 (6.52%)		869 (0.43%)	
Intangible attributes	Hotel reputation	3 (0%)	30853 (15.21%)	103 (0.05%)	6040 (2.98%)
	Accessibility	23102 (11.39%)		4892 (2.41%)	
	Cleanliness	7748 (3.82%)		1045 (0.52%)	
Safety		827 (0.41%)	827 (0.41%)	211 (0.1%)	211 (0.1%)
Privacy		226 (0.11%)	226 (0.11%)	39 (0.02%)	39 (0.02%)
Value for money		2627 (1.3%)	2627 (1.3%)	838 (0.41%)	838 (0.41%)
Satisfaction		14032 (6.92%)	14032 (6.92%)	12593 (6.21%)	12593 (6.21%)
Loyalty	Recommendation Repurchase intention	9127 (4.5%) 7977 (3.93%)	17104 (8.43%)	278 (0.14%) 2 (0%)	280 (0.14%)
Total			166303 (81.94%)		36634 (18.06%)

* Extension dimensions in a smart hotel.

the unique procedures followed by smart hotels during COVID-19, customer opinions of their smart services, and the technology they employ. A total of 16 managers from smart hotels who also used to work in traditional hotels were connected through personal contacts. The interview lasts 15 to 45 minutes. Open coding is used to verify significant concepts in interviews, and similar codes are grouped.

4. Results and discussion

4.1. Study 1: Consumer reviews on the TripAdvisor platform

In total, 14539 reviews were coded from online reviews (Table 2). Positive reviews ($N = 166,303$) outnumbered negative reviews ($N = 36,634$). First, the positive attributes contributing to the experience, satisfaction, and loyalty are analyzed. Perceived experiential quality became the most mentioned topic ($N = 43,030$), followed by innovativeness ($N = 33,489$) and intangible attributes ($N = 30,853$). For negative reviews, the first three attributes are satisfaction ($N = 12,593$), perceived

experiential quality ($N = 11,283$), and intangible attributes ($N = 6,040$). These issues have acquired new significance in the context of smart hotels, notably during the COVID-19.

4.1.1. Innovativeness

4.1.1.1. *Trendiness and timesaving.* Customers value trendiness and time-saving in both positive and negative reviews. Compared with previous literature (Cheong & Law, 2022; Shin & Perdue, 2019), smart hotel travelers are more critical of trendiness and overemphasize time-saving. The negative reviews are searing due to high expectations. Moreover, they criticized the mundane nature of the technology, observing that the facilities are ordinary but featureless. These complaints were frequent, especially with smart goods such as voice-activated curtains or lights. For example: *"The hotel is nothing special. The room is ok, but is it different from traditional hotels?"*

Due to the lack of staff, the smart hotel exacerbates the service problem, as obtaining additional support if the device is too smart and is difficult for customers. A sample review below expresses a customer's negative sentiment about portion size: *"I have no support. Very few staff and service were not enough for me. This part is even too time-consuming for the young."*

4.1.1.2. *Hedonic experience seeking.* Hedonic experience-seeking becomes a key dimension of the smart hotel's innovativeness level. A total of 15 smart hotels received 14,484 compliments on hedonic experience seeking, especially during the COVID-19 pandemic. Customers appreciate their innovative, detail-oriented service and additional free items. With sanitation becoming one of the top concerns, some smart hotels are using robots for food delivery. An example of a positive review is as follows:

Fortunately, your hotel provides meal delivery service during COVID-19. Robots are so cute. I can feel your tech in food delivery, a happiness booster you're sending during special periods.

4.1.2. Perceived experiential quality

4.1.2.1. *Interaction.* While the smart hotel only allows limited customer-staff interaction, the quality of interaction still impresses customers in various ways. Positive reviews ($N = 15,736$) were mainly related to empathy and reassurance, while negative reviews ($N = 670$) were focused on reliability and responsiveness.

4.1.2.2. *Physical environment.* Reviews of a premium physical environment hint at high customer expectations for the physical environment as a differentiator. Positive reviews praise the sophistication and artistic design of the physical environment, its elegance, and its high quality. However, some customers are dissatisfied with the quality and design of the physical environment. For example, customer reviews say: *"It's just an express hotel"* and *"the environment is not classy enough."* Another customer was merciless with their criticism: *"The smart hotel is a gimmick."*

4.1.2.3. *Outcome.* Another prominent item frequently discounted in the smart hotel environment during the COVID-19 pandemic is the outcome. During the COVID-19, customers have been focusing on the outcome of food and fitness room to avoid possible illnesses and boost their immune systems. For example: *"We need to be reassured that it is safe here, especially in this special period."* Another customer complained: *"The restaurant was closed because of the epidemic. I chose your hotel for vacation during COVID-19, which is the result."*

While service and facilities were the most talked about topics in the hotel literature before (Cheong & Lee, 2021; Wu et al., 2018), they were less mentioned than the outcome-related topics in the smart hotel reviews, which is mainly because human services are uncondusive to presenting intelligence. Nevertheless, some customers were dissatisfied with the service outcome, proposing that *"More lobby staff should be provided in the future."*

4.1.2.4. *Access.* In a smart hotel environment, customers sometimes contact staff to change, cancel or confirm their order or for after-sales service. Many reviews highly rated the service staff's courtesy, friendliness, and patience. For example: *"The hotel staff is very friendly and patiently solved my technical problems."* Their reviews of access were mixed. A total of 1,789 reviews expressed satisfaction with prompt service and staff preparedness to resolve customer issues. However, another 1,679 reviews complained that they wasted time during their access. For example: *"It took me 20 minutes to check in at the machine."* Finally, in terms of access, some customers said that the parking lot could provide services accurately. There are also comments mentioning service failures such as missing information and wrong orders, considered rookie mistakes that should not happen to smart hotels.

4.1.2.5. *Accommodation quality.* Finally, 7,064 positive reviews for perceived experiential quality mentioned the quality of the stay. Customers are satisfied with the smart hotel's smart experience, avant-garde design, and clean environment.

4.1.3. *Tangible attributes*

4.1.3.1. *Interior design.* Although not a prominent factor in traditional hotel literature (Choi et al., 2020), interior design has become one of the most popular topics in the smart hotel business. Lacking the traditional staff factor that reflects service quality, interior design is a new cue to demonstrate the hotel's brand values and excellence.

4.1.3.2. *Room size.* A total of 1885 positive reviews related to room size, such as spaciousness, were collected. One customer commented: *"The room was bright and spacious! The floor-to-ceiling windows gave me a great view of the city!"* Spacious is also considered beautiful and high-end. Although the review was more positive, it still received some criticism ($N = 1,176$) - e.g., *"The room is so small that the luggage is filling the hallway!"*

4.1.3.3. *In-room amenities.* Good and complete in-room amenities are essential to prevent inconvenience and ensure guest satisfaction during their stay. Satisfied customers appreciate comprehensive equipment such as hair dryers, clutter-free, individually packaged toiletries, and a wide selection of beverage products. Disappointment may occur otherwise. For example: *"There is no desk in the room. It can't work! That's terrible."*

4.1.4. *Intangible attributes*

4.1.4.1. *Hotel reputation.* In a smart hotel environment, a coveted star rating symbolizes excellence and a guarantee of quality for customers. Among the positive reviews, customers recognized the brand's credibility and felt that the stay experience exceeded their expectations, and a star rating guaranteed excellence. Many customers commented: *"Smart hotel is indeed five-star quality."* Some customers have hinted that branding would be their focus during the COVID-19 pandemic, *"While prices are slightly higher than other business hotels, in the current situation, I would only choose one with a solid brand name."*

By contrast, some reviews mentioned mediocre quality, inconsistency with the smart hotel, and damaged reputation. They question whether smart hotels can outperform traditional hotels. The loss of hotel reputation also spreads to the entire group brand, such as *"These discredits xxx (hotel brand)."*

4.1.4.2. *Accessibility.* Accessibility is a crucial component of intelligent hotel service, which includes efficiency in the delivery of services. Most positive reviews are related to the ease of operation of the smart hotel. Being in the city center helps customers check in and visit the attractions for the best experience, which is most appreciated when there are itineraries to eat out or visit.

Negative reviews are mostly related to the remote location. Customers cannot easily reach remote city centers or smart hotels with inconvenient transportation. They said, *"Taxis are*

unavailable; it's remote, and I need to take the subway...not sure why." Negative reviews also involve issues such as poor identification of smart products and poor timeliness. Most customers do not distinguish whether a location is in a city center, which places smart hotels at risk of dissatisfaction and poor reviews.

4.1.4.3. Cleanliness. Another important element in the atmosphere of smart hotels is cleanliness. Among the positive reviews, customers appreciated the smart hotel and its environment as "hygienic," "clean," "safe," and "carefree." Clients hinted that they would turn to smart hotels during the pandemic to ensure cleanliness standards and proper crowd avoidance practices. Some reviews emphasize trusting the smart hotel's cleanliness, *"Hygiene is my number one concern right now. Unmanned hotels are both cleanliness and reassuring."*

The perception of cleanliness is also explained: *"The restaurant serves a buffet. Seal with plastic wrap, separate food, and automatic mopping and sweeping robots to clean up regularly. I feel at ease with the cleanliness of the environment."*

When cleanliness standards are not met, customers' high expectations could cause extreme dissatisfaction: *"The way the refrigerator is placed in the toilet may contaminate the food. I am very disappointed with your hygiene standards."*

4.1.5. Safety and privacy

Safety and privacy have become a new theme in the context of a smart hotel, along with more service errors. A total of 1,053 positive reviews expressed satisfaction with the smart hotel's security and privacy response, appreciating that the issue was appropriately handled and was well-received. Some clients also voiced dissatisfaction with the hotel's timely repairs, *"Last week, they gave me a room near the elevator, and after communicating with me, they gave me a free room upgrade today as reparation. The sound insulation is much better."* Moreover, 250 reviews mentioned that the smart hotel failed to solve the safety and privacy problems promptly and effectively.

4.1.6. Value for money

Different perspectives on value for the money were produced. In previous studies, value-for-money for smart hotel experiences is more complex than for traditional hotel environments (Luo et al., 2021), depending on the mass market used to compete with hotels without smart technology and low-end lodging experiences. The most important standard for value for money is the presence or absence of complimentary breakfast and parking. Some comments explicitly mocked the parking prices, such as *"How come you charge 60 RMB to park?"*

The smart hotel also improves value for money by offering dining opportunities in the room and eliciting sensory delight amid pandemic dining out restrictions. Satisfied customers call it *"moderate pricing for 5-star value."* The dining experience was valuable and novel, as noted in the reviews: *"The dishes were flawless"* and *"The buffet dining experience at the smart hotel is worth it."*

4.1.7. Satisfaction and loyal

While there are more positive than negative reviews, it is worth noting that most reviews about satisfaction vented negative emotions, criticizing the experience for failing to live up to expectations. Displeased customers did not broadly disclose their repurchase decisions or referral. On the contrary, satisfied customers with an extraordinary experience are willing to recommend the hotel and express a desire to try a different item or stay again. Some customers proposed that *"Hotels should keep their restaurants open,"* with some confirming that happy experiences stimulated them to stay at hotels after the pandemic. Their loyalty extends from the hotel to the group, *"I would support the xxx group from now on!"*

Table 3. Regression analyses of key research variables

Predictor variables	B	SE B	β	T	P	Adj. R^2
Dependent variable: Overall rating						
Value	0.264	0.009	0.263	29.631	0.000**	0.812
Service	0.276	0.008	0.268	33.446	0.000**	
Rooms	0.265	0.009	0.263	28.478	0.000**	
Cleanliness	0.117	0.009	0.099	12.607	0.000**	
Sleep Quality	0.147	0.007	0.149	19.670	0.000**	
Location	0.029	0.009	0.020	3.079	0.002**	

* $p < 0.05$ ** $p < 0.01$

4.1.8. Regression analyses of key research variables

Six multivariate regression analyses were performed to examine differences in key research variables determined by overall rating, value, service, rooms, cleanliness, sleep quality, location, and overall rating. Results have shown that all multiple regression analyses were significant (see Table 3). In all analyses, the overall rating was a positive predictor of value ($\beta = 0.263$, $p < 0.001$), service ($\beta = 0.268$, $p < 0.001$), rooms ($\beta = 0.263$, $p < 0.001$), cleanliness ($\beta = 0.099$, $p < 0.001$), sleep quality ($\beta = 0.149$, $p < 0.001$), and location ($\beta = 0.020$, $p < 0.01$).

4.1.9. Correlations of key research variables

The Python correlation revealed significant correlations between overall rating and value ($r_s = 0.78$), service ($r_s = 0.75$), rooms ($r_s = 0.79$), cleanliness ($r_s = 0.68$), and location ($r_s = 0.49$). All key research variables are significantly correlated, ranging from 0.49 to 0.79 (see Figure 1). Red indicates a positive association, whereas blue denotes a negative correlation. The relatively dark means the relationship is relatively weak. Results have shown that of the six key study variables. Rooms had the highest score of 0.79, followed by the value (0.78); location had the lowest score of 0.49.

Figure 1. Correlations of key research variables.

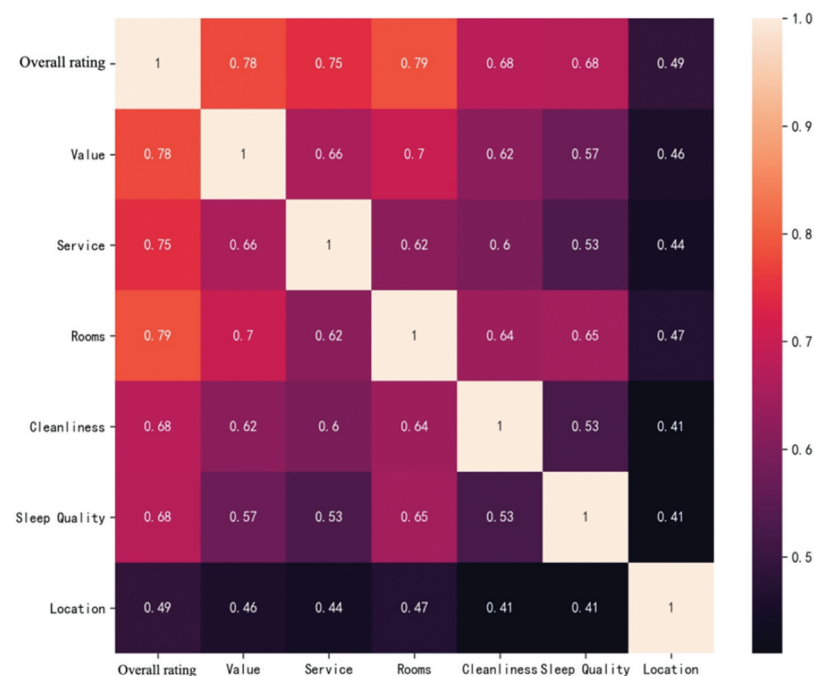


Table 4. Summary of the difference between a smart hotel and a traditional hotel

	Traditional hotel	Smart hotel
• Check-in experience	◊ High staff turnover	◊ Digital business platform
	◊ Unstable service quality	◊ Stable service
	◊ Inconsistent guests experience	◊ Improve efficiency and quality
• Safety indicators	◊ Complex personnel access	◊ IoT unmanned management
	◊ Local server storage	◊ Cloud storage
	◊ Low safety factor	◊ Ensuring check-in and data security
• Operational efficiency	◊ High training costs	◊ Intelligent service center
	◊ Rely on human management	◊ Fine-grained analysis
	◊ Inefficiency management	◊ Efficient management
• Customer management	◊ Unconnected data	◊ Online management
	◊ High customer acquisition costs	◊ Data precipitation
	◊ Difficult to refine management	◊ Customer tiered business strategies

4.2. Study 2: The difference between a traditional hotel and a smart hotel

The distinctions between a smart hotel and a conventional hotel are summarized in Table 4. Data analysis found four differences between a traditional hotel and a smart hotel: check-in experience, safety indicators, operational efficiency, and customer management. All interviewed professionals hinted at operational efficiency, including smart hotels eager to soften the blow of the pandemic. Another factor is customer operations, which prompted them to continue serving existing customers during the pandemic when travel options were discouraged or prohibited. The third reason aligns with hotel efforts' upward trend in safety metrics. Finally, some managers also revealed that the smart hotel depends on the strategic decision of the stay experience.

There are two reasons for a hotel not to offer smart services—offer limited smart services through hotel-exclusive channels (e.g., smart curtains or robotic meal delivery) or provide only human services. The main problems involved in the latter are as follows: (a) traditional hotels have a high staff turnover rate, service quality is unstable, and guests cannot have a consistent experience, (b) traditional hotel staff access is complex, and operation data is stored on a local server, and the safety factor is low, (c) traditional hotel training costs are high, relying on human management, low efficiency, and slow decision-making, and (d) traditional hotel client and background management data cannot be connected, the customer acquisition cost is high, and it is difficult to refine the operation. There are more concerns after the epidemic. In addition to cost, traditional hotels are also concerned about how to break the game. As for the rapid entry into smart hotels, lowering the threshold for industry replication and output, such as gathering most of the basic capabilities of smart hotels, accelerating digital transformation has become a major issue. People familiar with the matter also revealed that the epidemic might become normalized for a long time, and social distancing has become necessary for travel safety.

5. Conclusion

The current study's objective was to research and, for the first time, identify the key elements of patron and employee perceptions of the smart hotel. The current study is distinct from earlier ones in that it bases its understanding of how a smart hotel affects visit intentions, anticipated positive or negative emotions, and loyalty on a cognitive appraisal of the hotel's qualities (Gursoy et al.,

2019). Four dimensions from employees and nine from guests were used to determine the characteristic of a smart hotel. Findings of our study demonstrated a substantial relationship between each of the fundamental theoretical framework constructs. The parts that follow talk about the fascinating theoretical and practical repercussions.

5.1. Theoretical implications

Compared with previous literature (Hao et al., 2020), results have shown that perceived experiential quality and tangible and intangible attributes still stand out in a smart hotel environment. Nevertheless, some exciting digressions emerged after further examining the themes under the various service quality dimensions. First, although attributes such as outcome, accessibility, and in-room amenities are still relevant in the existing literature on hotels (J. J. Kim et al., 2021), trendiness and hedonic experience-seeking are more prominent in the smart hotel experience. Second, in smart hotels, customer and employee interaction levels are still fundamental. While physical contact is rare, virtual engagement is critical when properly handling customer concerns.

Interactions with robots also play a role in the assessment process. Third, because customers are less able to contact staff, the service leads of traditional hotels are lacking. Robots as a service function are often mentioned in the comments.

5.1.1. Smart hotel-induced factors

Tech services make robots part of the lodging experience. Customers expect a smart hotel's convenience, speed, and accuracy to save time and avoid potential hassles (J. J. Kim et al., 2021); thus, time-saving is considered an innovativeness factor that, if not meeting expectations, would lead to dissatisfaction. However, the robot's service quality is beyond the smart hotel's control. Achieving digital intelligence in operations management has always been one of the main concerns for hotels (Liu & Hung, 2021). This allows hotel operators to consider the risks and benefits of this strategic decision and formulate pandemic hotel occupancy accordingly, such as salary cuts and layoffs to reduce staff costs.

5.1.2. Smart hotel-modified factors

Among the three factors of innovativeness, trendiness was the second most discussed topic. However, trendiness was not a major theme of the researcher in previous hotel studies (Helkkula et al., 2018). These results also filled a gap in previous smart hotel studies that did not sufficiently investigate the importance of trendiness (J. J. Kim et al., 2019). This finding suggests that hotels have seen a surge in cost-cutting demand amid the pandemic. On the one hand, the importance of technology itself is reinforced in the atmosphere and context of social restrictions. This is especially true when smart hotels can expand their business to customers whose consumption experience is greatly influenced by the value of seeking novel experiences (Murphy et al., 2019). On the other hand, the lack of technical support can lead to criticism when customers cannot seek advice from the waiter after checking in.

This study substantially broadens the level of knowledge, and underlines the significance of the relationships between the most significant antecedents of customers and employees' tendency to accept new technology. The results of this study imply that SERVQUAL and other earlier technology acceptance models, which primarily focus on customers and employees' adoption of simplistic functional technologies, may not be applicable to assess customers' willingness to use new technology (Gursoy et al., 2019). This study proves that several of the most critical SERVQUAL adoption factors do not apply to smart hotels. However, those models exclude some important components that are designed for new technologies adoption behavior. A scale to characterize consumers' openness to using artificially intelligent robots in service interactions was created in a recent study (Lu et al., 2019). As a result, earlier frameworks fail to explain the complicated and multistage decision-making process used in this instance (Lu et al., 2019).

5.1.3. COVID-19 related factors

During the COVID-19 pandemic, social distancing orders and stay-at-home government restrictions have restricted people's movements and interactions. Reducing exposure becomes necessary when aggregation is inadvisable (Broadbent, 2017). This research is groundbreaking in identifying customers' concerns when turning to smart hotel services during the COVID-19 pandemic. In addition to smart hotels and cost reduction being a common consideration during the pandemic, trendiness and hedonic experience-seeking are two notable factors noted.

The behavior of novel experiences in a pandemic situation symbolizes trendiness. Most importantly, smart hotels embody trendiness, showing their customers' greatest needs at heart (Frey & Osborne, 2017); for example, entering a room via a QR code without worrying about the room card being lost. Results also reinforced research highlighting the importance of taking care of customer needs during the pandemic. The pandemic has hit the world hard, and people generally experience boredom to varying degrees (van Doorn et al., 2017). This adversity creates a sense of loss of control and uncertainty, fuels worry and fear, and ultimately increases anxiety and stress. Customers need a hedonic experience and are moved by the smart hotel's attention to their needs.

5.2. Practical implications

With the introduction of smart hotels, a positioning paradox emerged. Many customers complained about the hotel's mediocre news, noting that the experience was "*Too ordinary and not smart enough.*" Some reviews also revealed that their brand credibility was damaged when smart hotels failed to serve as expected. These complaints have intensified for complex operations or erroneous results. A paradoxical explanation is that because technology is a distinguishing feature of smart hotels, technology errors are considered problematic services (Murphy et al., 2017). Mid-price appeals to low-to-mid-income customers, who are prone to have an unfavorable attitude toward smart hotels and high expectations for technology (Baraniuk, 2018). This is also related to the theme of accessibility included in the research. Perceived accessibility is evaluated from many angles while considering various references and is constrained by individual preferences and expectations. Elderly customers are newcomers to smart hotels; they are accustomed to using the traditional experience of their stay as a reference point. These problems have also been verified in interviews, especially with those traditional hotels unwilling to cede staff support.

The "new normal" standards of how people connect, engage at work, and live are a reflection of the pandemic's long-term effects (Papageorgiou, 2020). Smart hotels will thrive as a response to customers' adaptation to new lifestyles and technology. This business model could need to be incorporated into a long-term strategy for conventional hotels. This study has important real-world ramifications for a hotel's strategy to offer guests an intelligent lodging experience using intelligent technology.

In order to reach the correct audience even by choosing, the smart hotel must first have a strong foothold in the traditional market. Robots and technology are critical cues that promote smart hotel cognition (Gebhart, 2018). Therefore, a smart hotel's priority is to continuously enhance the accommodation quality by ensuring state-of-the-art technology and sophisticated equipment. It's also vital that they do not compete on price to not damage the smart hotel's image. Smart hotels may create the maximum sensory experience to compensate for the lack of human service experience by providing information on how to contact both human and electronic operations, offering guidance on robotic services, and suggesting the best places to stay.

Compared to traditional hotel services that process customer requests immediately, smart hotels have challenges in providing appropriate service to the customer. Smart hotels must have a dedicated customer service team responsible for on-site support, customer complaints and inquiries. Training and comprehensive standard operating procedures (SOPs) are highly desirable. Smart hotels are encouraged to proactively embed customer-centricity in hotel employees' minds, for example, through personalized guidance and tips to show care.

In conclusion, our study is to pinpoint the fundamental characteristics of a smart hotel for the first time from the online review. Additionally, we are to comprehend how cognitive assessment of a smart hotel's features affects employees and customers' perception, which influences anticipated positive and negative reviews. Our study would be valuable as a cornerstone to use cutting-edge technologies to successfully revolutionize the hotel business as research on smart hotels is still at its infancy.

5.3. Limitations

There are several limitations in this study. First, this study only focuses on smart hotels. While many traditional hotels have turned to the application of smart technology, other hotels may prefer to transition gradually and have their exclusive technology features. The difference between these two modalities is a fundamental question that may leave for future studies. Second, the research's findings are based on consumer feedback from the start of this new trend. As government policies change and more traditional hotels enter the smart market, future studies can explore the impact of policy changes on customer responses. Further quantitative research could also be implemented to confirm the results and increase the depth of the exploration. Future studies might also focus on the policies of other nations in smart hotels before and after the epidemic to acquire a whole picture of this commercial behavior.

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