

# Empirical impact of AI smart hotel technological services on consumer attitudes: A comparison before and after the COVID-19 pandemic

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## Abstract

*This longitudinal study explored the change of consumer attitudes towards smart hotel technological services before and after the pandemic. Based on expert interviews and literature collection, the topics of smart hotel services were extracted and summarized into four dimensions, namely, automatic reception, smart rooms, hotel intelligent services, and immersive artificial intelligence (AI) smart systems. The questionnaire covered 27 technological service items, and each topic was measured in terms of its enablers and inhibitors. Before the pandemic in 2019, a pre-test was conducted on 65 subjects using this questionnaire. Three years later, the same questionnaire was administered to the same subjects as a second test. A total of 57 valid questionnaires were collected and tested to understand the differences before and after the pandemic. The results showed that the enablers of the consumers' attitudes significantly increased, while the inhibitors significantly decreased. In individual dimensions, in addition to the dimension of automatic reception, the enablers of smart rooms, hotel intelligent services, and immersive AI smart systems were significantly improved, while the inhibitors were significantly reduced. In summary, COVID-19 had a catalytic effect on consumer attitudes towards the use of technological services in the hospitality industry.*

## Keywords

*COVID-19, artificial intelligence technology, technological services, AI smart hotel, smart hotel room*

## 1. Introduction

Technological applications have become an indispensable factor in modern life due to the rapid development of artificial intelligence (AI) technology. Everything from food delivery, online shopping, mobile payments, reservations, ticket purchases, car rentals, and even doctor registration can now be completed over the network using mobile phones and apps (Ramgade & Kumar, 2021). These technological services have replaced many traditional service forms, creating new values and experiences, and gradually forming new life patterns and consumer behaviors.

However, with the advent of the digital age, technological services are continuing to develop and apply to people's lives, and daily life is becoming inseparable from technology. The proportion of services provided by technology has increased significantly, in the process changing or replacing the traditional manual service mode [Pizam et al., 2022; Shin and Jeong, 2022].

The rapid development of information and communications technology (ICT) has changed business operation procedures and the purchase intention of consumers in the hotel and tourism industry [Leung, 2019]. Technological services have assisted the service efficiency of hotels and reduced the probability of service errors over recent years. Moreover, technological equipment has helped maintain the privacy of hotel guests and improved the service quality of hotels. Even luxury hotels, which rely on the attentive interaction between staff and customers, have begun actively introducing technologies

to enhance guest experience and satisfaction [Shin and Jeong, 2022]. At the same time, there are also consumers who do not like technological services or think it is not humane enough due to the absence of tenderness, the lack of interaction with people, or privacy and security concerns [Leko, 2021; Yang et al., 2021; Papagiannidis and Davlembayeva, 2022].

The outbreak of COVID-19 at the end of 2019 seriously affected people's lives and behaviors. Governments worldwide took control measures in order to prevent the spread of the virus, and people began to reduce the chance of contact with others so as to reduce the spread of COVID-19. Internet operations, videos, remote control operations, online communication, home delivery, and other means were used as much as possible to address the limitations of normal face-to-face contact and interaction during the pandemic [Qiu et al., 2021; Kaushal and Srivastava, 2021; Ye and Law, 2021; Shen and Chen, 2011]. The Freedonia Group, a U.S. market research firm, predicted that the market will increasingly demand service robots, with their usage surpassing that of industrial robots. At present, consumers have gradually adapted to engaging in situations without human entities, through which they can complete business and consumption behaviors.

In terms of hotel services, the change in demand caused by the pandemic has promoted the development of automated and intelligent service types and reversed the old service mode that was highly dependent on people in the past [Rivera, 2020]. Technological services in hotels have gradually replaced manual services. At the same time, scholars from the hotel industry have also called on hoteliers to further strengthen the service functions of contactless technologies to ensure the health and safety of guests during the pandemic period [Hao et al., 2020; Jiang and Wen, 2020]. Moreover, the new normal

of the hotel industry in the future has shifted from a high-tech, high-contact focus to one that is high tech and low contact [Hao, 2021]. Is the trend of hotel development moving towards introducing automated technology and AI robots into the hotel service mode? This is a topic of great interest and concern to both hoteliers and consumers.

This study summarized four dimensions of smart hotel service types and developed a questionnaire with 27 items on smart hotels for the hospitality industry based on the preliminary research results in 2019 [Yu and Hsu, 2019]. A total of 65 subjects were tested with this questionnaire to explore consumer attitudes toward hotels introducing smart technological services. The large-scale COVID-19 outbreak occurred three months after the completion of the questionnaire from the preliminary study in 2019. Person-to-person contact service was avoided, triggering the motivation of this study to investigate whether the high-tech, low-contact services of smart hotels would promote the positive attitude of the subjects. The study was conducted in a longitudinal manner three years later, after the pandemic had slowed. At this time, the same questionnaire content and the same samples were used for testing to understand the differences in attitudes towards AI smart hotel services before and after the pandemic.

## 2. Literature review

### 2.1 Smart hotel service indicators

As the younger generation becomes an important market in the hotel industry, the introduction of technological services has become a necessary condition for hotels [Delporte, 2018]. Thus, more advanced technologies are needed to enhance the guest experience [Nath, 2019]. For example, in-room voice assistants can provide efficient service and convenience that enhance the guest's stay experience [Glion, 2018]. The term smart hotel refers to an accommodation facility that uses the Internet of Things (IoT), AI, machine learning, and a variety of high-tech solutions in its operating system to improve guest satisfaction and experience, as well as save labor.

Relevant literature on smart hotels states they are intelligent hotels that adopt a series of new information and communication technologies (ICTs) [Wu and Cheng, 2018] and that use artificial intelligence and service concepts to provide customers with a new intelligent experience [Xia, 2018]. There are also unmanned smart hotels in the market, which have a perfect AI smart system in which hotel management and services can be achieved through information and networking [Nieh et al., 2021].

However, consumers are unfamiliar with smart hotels [Yang et al., 2021], and the definition and service content of smart hotels in academia is not unified or comprehensive [Leung, 2019; Domanski, 2020; Nieh et al., 2021]. Smart hotels are still in the embryonic stage, as they are a relatively innovative hotels [Leung, 2019; Fu et al., 2022]. Moreover, the number of smart hotels on the market is few, the degree of intelligence is incomplete, and only a few consumers have actual accommodation

experience.

To fully define the scope of smart hotels, the Industrial Development Bureau of the Ministry of Economic Affairs commissioned the Market Intelligence & Consulting Institute (MIC) to implement the 2019 Smart Hotel Multi-Functional Robot Integrated Service System Development Program [Bureau of Industry of the Ministry of Economic Affairs, 2019] to collect literature and expert interviews in order to explore the content of smart hotel technological services. The content of the smart hotel technological service indicators in this study were based on a preliminary study of the program results report, meeting minutes, expert interview records, and other documents. A total of 27 technological service indicator topics were extracted and summarized as the four dimensions of automatic reception, smart rooms, hotel intelligent services, and immersive AI smart systems [Ministry of Economic Affairs, 2019; Yu and Hsu, 2022].

### 2.2 Technology readiness of consumers

Parasuraman [2000] proposed the concept of technology readiness (TR), which is defined as "people's tendency to accept and use new technologies to accomplish their daily life or work goals". The structure of this construct can be divided into a positive direction (enablers) and a negative direction (inhibitors). The enablers include optimism and innovativeness, while the inhibitors include discomfort and insecurity.

Users' technology readiness mainly consists of two factors: enablers and inhibitors. Due to diverse personal needs, different conditions will affect individuals' technology readiness, including positive optimism and innovativeness, which enable people to want to use technological products or services, thus improving the degree of technology readiness. In contrast, the inhibitors generated by negative discomfort and insecurity reduce people's technology readiness and willingness to use it. In the face of technological products and services, the higher the technology readiness of individuals, the higher the willingness to use it, while the lower the technology readiness is, the lower the willingness to use it.

The COVID-19 pandemic has changed people's behavior patterns and consumption perceptions. Due to the reduction of human contact in order to prevent the spread of the pandemic, a large amount of consumption behavior has shifted to online. According to the 2020 statistics of Taipei Fubon Commercial Bank, Taishin International Bank, and Hua Nan Commercial Bank, the trading volume of people using digital channels such as Internet banking and mobile banking since the outbreak of the pandemic showed a significant growth of more than 30% compared with 2019 [Chen et al., 2022], indicating that the pandemic has had an impact on consumers' technology readiness regarding the use of technological services. At the same time, unmanned smart hotels with intelligent technological services in the market have attracted public attention. The service innovation of robot technology has been different from the traditional impression on the operating mode with hotel providing

service with people as the main body in the past, improving the public's attention and motivation to use hotel technological services [Nieh et al., 2021].

In conclusion, the COVID-19 pandemic has increased consumers' motivation to use technological products and services and also affected the change of consumers' technology readiness. Although consumers have positive perceptions of the optimism and innovativeness for smart hotel services, they also have negative perceptions of discomfort and insecurity. Therefore, this study intended to explore the influence of consumers on the technology readiness of smart hotels after the COVID-19 pandemic, namely, the change of consumers' perceptions of the enablers and inhibitors of smart hotels in providing technological services. Based on the above, H1 and H2 were proposed:

- H1: Consumers' enabling attitudes towards the overall technological services of smart hotels are higher after the pandemic than those before the pandemic.
- H2: Consumers' inhibiting attitudes towards the overall technological services of smart hotels are lower after the pandemic than those before the pandemic.

Further discussion on various dimensions of technological services revealed that consumers had different feelings and attitudes. During the pandemic period, customers' perceptions on the self-service check-in and check-out procedures handled by the check-in/check-out machines used for automatic reception, as well as the check-in and check-out procedures operated by virtual robots providing information services, were changed [Shin and Kang, 2020; Zhong et al., 2022]. Thus, H3 and H4 were proposed:

- H3: Consumers' enabling attitudes towards automatic reception are higher after the pandemic than those before the pandemic.
- H4: Consumers' inhibiting attitudes towards automatic reception are lower after the pandemic than those before the pandemic.

In addition, consumers' demand for smart devices in hotel rooms, such as using mobile phones or voice to control the lighting, air conditioning, or audio and video equipment in the room, has reduced the probability of touching the buttons of the devices and has also improved the convenience, showing innovation [Zhong et al., 2022]. Thus, H5 and H6 were proposed:

- H5: Consumers' enabling attitudes towards smart rooms are higher after the pandemic than those before the pandemic.
- H6: Consumers' inhibiting attitudes toward smart room are lower after the pandemic than those before the pandemic.

Furthermore, the application of service robots in hotel intelligent services has provided consumers with luggage handling

services, in-room dining, and a variety of delivery, information, and entertainment services. The services, assisted by robots, have not only enhanced the convenience and sense of technology but also increased the freshness and curiosity of consumers through providing services that are loved and welcomed by consumers [Nieh et al., 2021]. Therefore, H7 and H8 were proposed:

- H7: Consumers' enabling attitudes toward intelligent services are higher after the pandemic than those before the pandemic.
- H8: Consumers' inhibiting attitudes toward intelligent services are lower after the pandemic than those before the pandemic.

In addition, with the increased familiarity with technology, consumers have increased their demand for intelligent services and are gradually gaining a higher degree of demand for ubiquitous immersive AI environments. The consumption, check-out, and personalized services can be provided by the hotel's AI services. Moreover, the hotels can always know the location of the consumers, their moods, and real-time needs, thus increasing the opportunity to immerse customers in exquisite intimate services [Zeng et al., 2020]. Thus, H9 and H10 were proposed:

- H9: Consumers' enabling attitudes toward immersive AI smart systems are higher after the pandemic than those before the pandemic.
- H10: Consumers' inhibiting attitudes toward immersive AI smart systems are lower after the pandemic than those before the pandemic.

### 3. Research method

#### 3.1 Questionnaire formation and pre-test

In the first stage of the preliminary study, literature discussion and expert interviews were conducted to collect opinions and establish 27 technological service indicators, which were summarized into four dimensions and used to create the questionnaire items. The perceptions of the enablers and inhibitors of each service indicator were taken as questions. The subjects needed to evaluate the enablers and inhibitors for each item of the service indicators at the same time. One to ten points were applied to express the degree, using a 10-point Likert scale with the highest degree of 10 and the lowest of 1.

After the questionnaire was formed, nine experts were invited to conduct a pre-test in order to determine the appropriateness of the 27 questions and test the expert validity of the questionnaire. After the pre-test, the experts indicated that all 27 items should be retained and that no supplementary content was required. Thus, it could be judged that the questionnaire was fully developed and had good expert validity.

### 3.2 Research structure

Based on the theory of technology readiness of consumers, 27 technological service indicators in four dimensions of smart hotels were used in this study to empirically demonstrate the impact of the COVID-19 pandemic on consumers' technology readiness. The research framework is shown in Figure 1.

### 3.3 Sampling and data analysis

Since smart hotels are still gaining popularity in the market, fewer consumers have experience in staying smart hotels and using technological services. An intentional sampling method was therefore used in this study, aiming at taking relevant experts and scholars with professional experience in hotel management, hotel design, or tourism as the questionnaire respondents. Due to the limited prevalence of smart hotels in the market, there are few consumers who have experienced staying in smart hotels and using technology services. In an initial study conducted in 2019, purposive sampling was employed, targeting experts and scholars in hotel management, hotel design, and tourism. The survey included 40 current senior executives in the hotel industry, 11 tourism and hospitality professionals, 6 hotel information system operators, 5 experienced travelers who have stayed in hotels, and 3 architects and

interior designers involved in hotel design and planning. These participants responded to 27 questions related to the enablers and inhibitors of smart hotel services.

The first questionnaire test of this study was conducted before the pandemic, in November 2019. A total of 65 questionnaires were distributed and 65 valid responses were collected. The same questionnaire was also used to test the same group of samples in December 2022, during the post-pandemic period. A total of 65 questionnaires were distributed to the subjects in the second survey, and 57 valid responses were recovered. Data analysis for this study was conducted on the 57 samples tested both times.

The experts and scholars were selected by the intentional sampling method in this study. The parameters were not normally distributed, and the sample size was small samples. Therefore, the Wilcoxon test of nonparametric two dependent samples was adopted to test the differences between the enablers and the inhibitors of consumers for various intelligent services before and after the pandemic.

## 4. Research results

A nonparametric Wilcoxon correlation was used in this study to test the cognitive differences between the enablers and

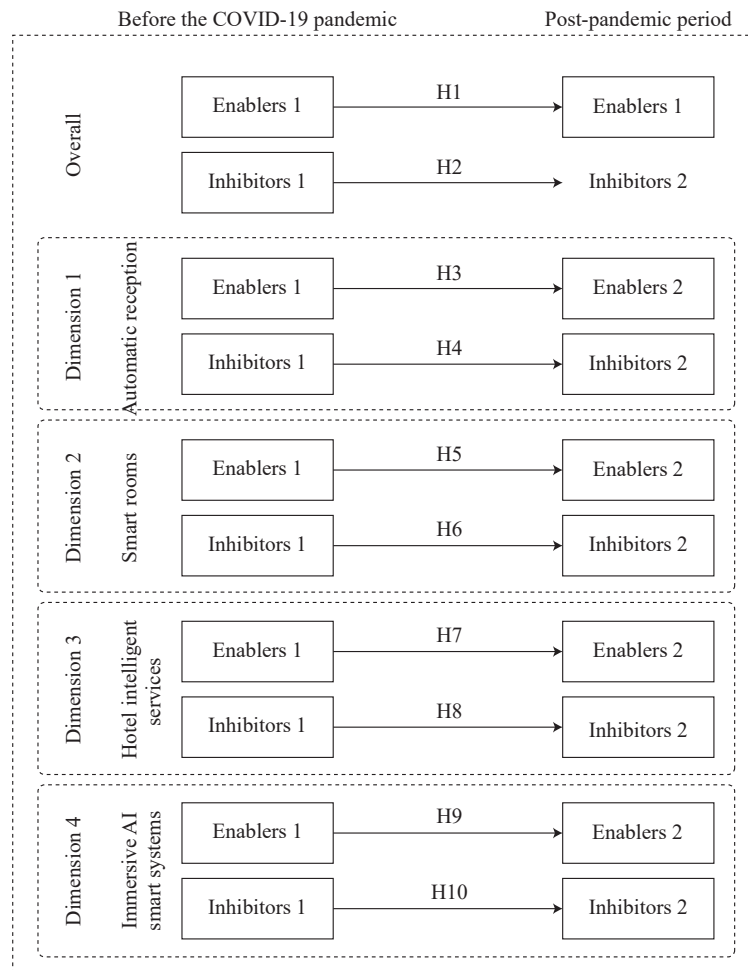


Figure 1: Research structure

Table 1: Cognitive differences between the enablers and inhibitors before the pandemic and in the post-pandemic period

Dimension	Item	Service indicator category	Service indicator content	Enabling cognition		Inhibiting cognition	
				Before the pandemic	Post-pandemic period	Before the pandemic	Post-pandemic period
Automatic reception	1	Self-service check-in and check-out	Self-service check-in/check-out machines	6.58	7.65	5.56	5.37
	2	Self-service check-in and check-out	Virtual robot receptionists	4.86	5.81	5.86	5.09
	3	Information service	Access to various information through self-service kiosks	7.49	7.96	4.51	4.16
	4	Information service	Asking for all kinds of information through a virtual robot receptionist	5.91	5.82	5.33	4.89
	5	Opening the door via intelligent identification	Mobile phone scanning through a mobile phone app	7.19	7.68	4.51	3.96
	6	Opening the door via intelligent identification	Biometric identification: face scanning, finger (palm) striae, iris, identification through lens and read head	5.6	6.58	5.51	4.56
Smart rooms	7	Intelligent housekeeping (voice command)	Controlling the room TV's mute switch, channel, and volume, etc. by voice	6.33	6.75	4.56	3.86
	8	Intelligent housekeeping (voice command)	Controlling the room lighting, brightness, and situational lighting by voice	6.44	6.89	4.46	3.68
	9	Intelligent housekeeping (voice command)	Controlling the temperature setting of the heating and air conditioning by voice	6.37	6.77	4.4	3.63
	10	Intelligent housekeeping (voice command)	Controlling the room curtains by voice	6.16	6.53	4.4	3.6
	11	Intelligent housekeeping (voice command)	Setting a morning call and wake-up call by voice	6.77	7	4.49	3.68
	12	Intelligent housekeeping (voice command)	Controlling room reminders by voice	6.05	6.51	4.72	3.84
	13	Intelligent housekeeping (voice command)	Smart TV: Internet access and information functions, as well as mobile phone and TV connections	7.25	7.51	4.81	4.53
	14	Wireless charging stations	Provision of desk with mobile phone wireless charging equipment	8.6	8.51	3.02	2.7
	15	Service robots	Luggage handling and storage, in-room dining, and a variety of deliveries	6.37	7.07	5.26	3.96
	16	Service robots	Information service	6.49	6.96	4.86	4.14
Hotel intelligent services	17	Service robots	Route guidance	6.16	6.65	4.75	3.81
	18	Smart ordering and shopping	Online shopping: hotel souvenirs, local specialties, etc.	6.65	7.21	4.39	3.37
	19	Smart ordering and shopping	Online ordering: in-room dining and in-hotel restaurant dining reservations	6.91	7.61	4.53	3.35
	20	Intelligent entertainment facilities	Augmented reality/virtual reality entertainment facilities: a variety of AR/VR game equipment	6.26	6.16	4.81	4.49
Immersive AI smart systems	21		Accounting confirmation of consumption	6.65	7.54	5.35	4.19
	22		Elevator floor settings	6.39	7.05	4.68	3.81
	23		Real-time guest location positioning	5.75	6.14	5.7	4.68
	24		A high degree of face recognition (face scanning) technology in the whole hotel. Judging guest behavior, verifying identities, and actively providing needed services	6.56	6.86	4.98	4.09
	25		Recording and learning the habits of guests as historical data for future service	7.19	7.75	4.74	3.6
	26		Opening the personal safe	6.19	6.6	5.35	4.46
	27		Recommending order content and entertainment according to the guests' psychological state	6.11	6.23	5.02	4.21
Mean				6.49	6.96	4.84	4.06

inhibitors before and after the outbreak of the pandemic in the hotel technological service questionnaire. Table 1 shows the average cognition of the enablers and inhibitors for each item of hotel technological services before and after the pandemic.

It can be seen from Table 1 that the difference between enablers and inhibitors of the consumers' attitudes before and after the pandemic period is explained by the scores across the four dimensions listed in the table.

In the dimension of automatic reception, Except for the item of "asking for information through a simulated robot receptionist", the others services of enablers showed improved, while all items of the inhibitors were significantly reduced.

In the dimension of the smart rooms, in addition to the "wireless charging stand" and "smart recognition to open the door", the other items of enablers showed improved, while all items of the inhibitors were largely reduced.

In the dimension of the enablers of hotel intelligent services, except for the "intelligent entertainment facilities", the rest items of the enablers showed an upward trend, while all items of the inhibitors showed a downward trend.

In the dimension of the immersive AI smart systems, all services of enablers were notably improved, while the inhibitors were significantly reduced.

Table 2 is the test of the reliability of the four dimensions, and the differences between the enablers and the inhibitors of technological services in the attitude towards smart hotels before the pandemic and in the post-pandemic period.

Table 2 shows that the Cronbach's  $\alpha$  of the four dimensions was above 0.9 before and after the pandemic, indicating good reliability of the study. In terms of the overall cognition of smart hotel technological services, the enabling attitudes of consumers were higher after the pandemic than those before the pandemic ( $p < 0.001^{***}$ ), while the inhibiting attitudes were lower after the pandemic than those before the pandemic ( $p < 0.001^{***}$ ). Both were consistent with H1 and H2.

As for the individual dimensions, there was no significant difference between the enabling and the inhibiting attitudes of dimension 1 (automatic reception) before and after the pandemic ( $p > 0.05$ ). Thus, H3 and H4 were invalid.

Regarding dimension 2 (smart rooms), the enabling attitudes of consumers were higher after the pandemic than those before the pandemic ( $p < 0.01^{***}$ ) and the inhibiting attitudes

were lower after the pandemic than those before the pandemic; therefore, hypotheses H5 and H6 were both valid ( $p < 0.01^{**}$ ).

Regarding dimension 3 (hotel intelligent services), the enabling attitudes of consumers were higher after the pandemic than those before the pandemic ( $p < 0.05^*$ ) and the inhibiting attitudes were lower after the pandemic than those before the pandemic ( $p < 0.05^*$ ); therefore, both H7 and H8 were valid.

Regarding dimension 4 (immersive AI smart systems), the enabling attitudes of consumers were higher after the pandemic than those before the pandemic ( $p < 0.05^*$ ) and the inhibiting attitudes were lower after the pandemic than those before the pandemic ( $p < 0.05^*$ ); therefore, both H9 and H10 were valid.

## 5. Conclusion and suggestions

### 5.1 Conclusion

#### 5.1.1 COVID-19 has boosted consumers' technology readiness for smart hotels

In the preliminary study of this study, the first sample survey started in June 2019, when there was no pandemic factor. After the large-scale pandemic broke out, there was a difference in the cognitive attitude toward smart hotels before and after the pandemic; therefore, an additional study was necessary to understand the impact of pandemic factors on the introduction of AI technological services in the hotel industry. The results indicated that the average enablers of the 27 technological services were higher in the post-pandemic period than those before the pandemic, while the inhibitors were lower than those before the pandemic (as shown in Table 1). Moreover, the cognitive attitudes of the four dimensions as a whole also showed significant differences (as shown in Table 2). The results showed that the COVID-19 pandemic had a positive effect on consumers' cognition (enablers), and a negative effect on consumers' cognition (inhibitors).

#### 5.1.2 Consumers have significantly increased demands for technological services related to smart rooms, intelligent services, and immersive AI smart systems

The differences between the four dimensions before the pandemic and in the post-pandemic period were respectively compared in this study. The enablers and inhibitors of the first dimension were not significant; however, those of the other three dimensions showed significant differences. The results

Table 2: Wilcoxon correlation test of nonparametric dependent samples

Dimension	Enabler		Inhibitor	
	$p$	Cronbach's $\alpha$	$p$	Cronbach's $\alpha$
Overall	0.000***	0.947	0.000***	0.928
Dimension 1. Automatic reception	0.144	0.943	0.068	0.948
Dimension 2. Smart room	0.007**	0.967	0.005**	0.958
Dimension 3. Hotel intelligent services	0.046*	0.842	0.028*	0.724
Dimension 4. Immersive AI smart system	0.018*	0.943	0.018*	0.963

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .



indicated that the pandemic factors had no influence on the enablers and inhibitors of the users' cognition related to the automatic reception dimension. The pandemic factors had significant impacts on the enablers and inhibitors of the three dimensions of smart rooms, hotel intelligent services, and immersive AI smart systems.

Regarding the possible reasons, the four technological services in the first dimension were developed earlier in the market and have a high degree of adoption in hotel industry, with relatively complete consumer familiarity and cognition. Moreover, as a higher degree of concept and use motivation was formed before the pandemic, consumers have developed higher enablers and lower inhibitors. Therefore, the impact of the pandemic has been low.

The other three service dimensions showed significant differences in both the increase of enablers and the decrease of inhibitors. It was also empirically demonstrated that consumers' technology readiness and demand for most hotel technological services significantly improved after the COVID-19 pandemic. It could be inferred that the COVID-19 pandemic promoted and catalyzed the introduction of technological services in the hotel industry. This result was consistent with previous research findings [Zeng et al., 2020; Xiong et al., 2021; Pillai et al., 2021; Su, 2022; Pizam et al., 2022].

## 5.2 Suggestions

Based on the above conclusions, the COVID-19 pandemic has promoted the demand for smart hotels and driven the industry to invest in their construction. The development trend of hotels in the future is to form a more intelligent and humane hotel model for the next generation.

### 5.2.1 The pandemic has increased consumers' acceptance of AI technology in the hotel industry, to promote the market development of smart hotels, operators should strengthen the construction of smart hotels

The research results showed that COVID-19 promoted innovation opportunities in the hotel industry, caused consumers' enablers for smart hotels to increase, and caused their inhibitors to decrease, which was consistent with recent research findings [Zeng et al., 2020; Xiong et al., 2021; Pillai et al., 2021; Su, 2022; Pizam et al., 2022]. This means that consumers have strong enablers and high acceptance, also producing benign interaction when consumers have positive beliefs about technology products and services from the perspective of the technology acceptance model [Davis, 1989]. After consumers use these new technologies, their consumption habits, behaviors, or use needs change, which affects their behavioral decisions to use them again [Chen et al., 2022; Yang et al., 2021].

Therefore, it could be understood that the pandemic has changed the operation of consumer digital technology and changed consumer behavior patterns. After hoteliers become familiar with technology tools, they should take consumers as the core to fully integrate digital technology tools in their

business thinking and strategy, and further create new business models to meet this market demand and expectation.

### 5.2.2 Hoteliers must enhance the privacy, convenience of operation, and real-time response of the technology

Hotel services, compared with other service industries, place more value on the privacy of customers. In this respect, some conflicts with the content of technological services and the perception of surveillance in smart accommodation may inhibit their emotional value [Papagiannidis and Davlembayeva, 2022].

The immersive AI smart system in dimension 4 of this study involved the concept of personal privacy, in which consumers' perceived inhibiting performance was higher. Most of the indicators were higher than the average (Table 1), indicating that consumers still have doubts about the privacy of intelligent technology. For example, the customer's consumption records, locations, and biological symbols (such as face and fingerprints) are necessary information for the operation of AI smart systems. Therefore, consumers' privacy concerns are an important key factor in the development of smart hotels, as well as issues related to legal norms, error detection, and rights and interests protection, which all affect consumers' real cognition [Leko, 2021; Papagiannidis and Davlembayeva, 2022].

Furthermore, the findings also suggested that hoteliers should carefully select and plan the content and equipment of their technological services, and should strive to maintain the appositeness and acceptance of technology services. For example, operations that are simple, function properly, and have accurate and real-time reactions can satisfy the consumer. Thus, the enabling attitude can be strengthened and situations of distrust and unadaptability can be avoided, so as to create a good foundation for the development of smart hotels.

## 5.3 Theoretical and practical implications

This study empirically demonstrated that COVID-19 had a practical impact on consumers' cognition and willingness to use hotel technological services, as well as on the enablers and inhibitors of consumers' technology readiness, providing a favorable reference value for academic theory and practice.

After the COVID-19 pandemic, this study continued to track consumers' cognition of the use of hotel AI smart technological services. Moreover, the differences in cognitive attitudes before and after the pandemic were empirically demonstrated. The results could provide useful information for future academic research and industry decision-making.

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