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Investigating Behavioural Intention Toward Adopting Artificial Intelligence Service Robots Technology in Hospitality in China

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Abstract

The pandemic accelerated the blooming of service robots in the hospitality industry in recent years in China. The researcher drew upon an extension of the original model Unified Theory of Acceptance and Use of Technology (UTAUT2) and satisfaction to construct the conceptual framework and spent time on smartphones as mediating and moderating roles. Besides, IBM SPSS and SmartPLS are conducted to analyse the collected data with 310 valid responses through questionnaires. The results of this study contribute practical insights for relevant governmental departments and hotel operators as well as restaurant managers in their decision-making on whether to adopt AI unmanned services in the hospitality industry in China.

Keywords: Hospitality Industry; Service Robots; Artificial Intelligence; Behavioural Intention.

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1.0 Introduction

With the COVID-19 pandemic continuously affecting people's lives, Artificial intelligence (AI) has been broadly adopted in hospitality from 2019 to 2023 to keep a safe distance when people wait in line. It profoundly changes and reshapes tourists' and businesses' behaviours and experiences (Li et al., 2022). Indeed, Adopting AI technologies enhances the quality of service while increasing management ability and efficiency, saving costs, and creating a competitive competence (Lukanova & Ilieva, 2019). Nonetheless, aligned with the economy of China entering a deflationary state and rising per capita wages make it difficult for the hospitality industry to maintain its current profitability. Therefore, this paper utilised UTAUT2 theory and satisfaction as the mediating variable, as well as the people spent time on their smartphone as the moderating variable to investigate the acceptance of consumers to AI technology in China and to investigate whether people's behavioural intention tendencies to AI services and to determine whether the hospitality industry should continue to invest the relevant equipment as well.

1.1 Problem of Study

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Despite that, Table 1 shows 72 previous research’s involvement in the scope of AI in the hospitality industry (Doborjeh et al., 2021). However, most of them have focused on investigating the impact of the widespread AI technologies on hospitality during the COVID-19 pandemic or paying more attention to the algorithms and performances associated with AI (Doborjeh et al., 2021). Limited studies involved time spent on smartphones and satisfaction as the moderating and mediating roles to reveal customers’ behavioural intentions in the AI hospitality industry.

Table 1. The relevant published papers from the top A* and related to AI in hospitality from 2010 to 2021

Journals	Publishers	Selected	Rating
Cornell Hospitality Quarterly	Sage Publications	2	A
International Journal of Contemporary Hospitality Management	Emerald Group Publishing	50	A
International Journal of Hospitality Management	Elsevier	6	A*
Journal of Hospitality and Tourism Research	Sage Publications	4	A
Journal of Hospitality and Tourism Technology	Emerald Insight	10	A*

1.2 Objectives of Study

Big data and artificial intelligence have become the most cutting-edge tools, guaranteeing the streamline of customer service and keeping the excellent quality of employees. This research investigates the factor of artificial intelligence influencing the customer’s intention to use AI in the hospitality industry in China. In addition, this study identifies the impact of satisfaction as a moderating variable to reveal customer’s intention to use AI devices. Moreover, according to Hus and Peng (2022), spending time on smartphones can represent a person’s acceptance of new technologies. Therefore, this study explores the effect of both time spent on smartphones as the moderating role of and the mediating role of satisfaction between the extended version of UTAUT2 theory and the intention to adopt AI robotic technology in the hospitality industry in China.

2.0 Literature Review

To avoid the virus spread between service staff and customers during COVID-19, many companies have conducted artificial intelligence (AI) robots to provide contactless services (Kim et al., 2021a; Pelau et al., 2021). The benefits of intelligent services for waiting in line to pay with the risk of COVID-19 can attract consumers and guarantee employee safety (Hongye, 2020). Therefore, in March 2020, the Standing Committee of the Political Bureau of the Central Committee of the Communist Party of China (CPC) held a meeting to propose that developing new infrastructure centred on big data and artificial intelligence will help the hotel industry transform and upgrade. After the pandemic, the hotel industry will pay more attention to integrating and developing multiple business modes to enhance the hotel industry’s anti-risk (State Administration of Market Supervision and Administration (SACMA), 2019). Under this policy support, AI devices have widely combined the big data run in an increasing number of luxury Chinese hotels, such as Hilton Flyzoo (Jia, 2020., Qingyun, 2021).

2.1 The Unified Theory of Acceptance and Use of Technology (UTAUT2)

As mentioned in the study objectives, the extended version theory of UTAUT2 is adopted. Venkatesh et al. (2016) claim UTAUT with the combination of eight influential constructs for individual adaptation of newly developed IT tools, which has been widely used to explain technological adoption from the customers’ perspective in the tourism and hospitality industry. There are four primary constructs, including performance expectations, effort expectation, social influence, and facilitating conditions for acceptance of new technology behaviour from the UTAUT theory, which is based on the theory of the technology acceptance model (TAM). Except for the variables mentioned above, two new constructs, price-saving orientation and time-saving orientation, were mentioned in the extended version of UTAUT2 to disclose the relationship between customer satisfaction and intention to use AI technology (Yeo et al., 2017) since there are limited relevant theses in the context of the hospitality industry through the smartphone.

2.2 Performance Expectancy

Venkatesh et al. (2003) argue that performance expectancy is customers’ expectation to help them improve their job performance. Therefore, individuals would like to attempt to use new technologies when they consider it is beneficial to their job performance, which is consistent with previous literature by (Shaikh et al., 2018), where the performance expectancy of the hospitality field anticipated a significant effect on satisfaction and intention to use. This study uses performance expectancy to explore consumers’ intention in artificial intelligence technology in hospitality. Therefore, the hypothesis was proposed that:

H1: Performance expectancy significantly influences behaviour intention toward the AI-adopting hospitality industry in China.

2.3 Effort Expectancy

Venkatesh et al. (2003) posit that anticipated workload refers to the usability of a system during its utilisation. In the given context, it pertains to the usability of artificial intelligence within the hotel industry. While interacting with AI-based hotel services, the end-user's Effort Expectancy (EE) appears to be implied in most instances. If these expectations are met at a different level than consumers anticipate (Wirtz et al., 2019), or if a substantial amount of effort is required, it can pose a barrier. Consequently, the objective is to cultivate an optimistic perception of the "ease of use" among users (Venkatesh et al., 2003). Prior research has indicated that confidence in one's ability to navigate technological systems significantly influences the intention to use such systems, directly impacting technology adoption (Fridin & Belokopytov, 2014). Therefore, based on this, it is hypothesised that:

H2: Effort expectancy significantly influences behaviour intention toward the AI-adopting hospitality industry in China.

2.4 Facilitating Conditions

Facilitating conditions can be defined as an individual's degree of belief in the availability of organisational support and technological infrastructure to assist system uses, which are referred to as educational, training, infrastructure, and service platform support for the use of new technology and other resources for technology users (Venkatesh et al., 2003, 2012). Resources such as equipment, software, Internet access, and skills are needed to use new technology. For example, customers of the Internet who want to order online need smartphones, subscriptions to online data services, and phone operation skills. A hypothesis supporting the relationship is as follows.

H3: Facilitating conditions significantly influence behaviour intention toward the AI-adopting hospitality industry in China.

2.5 Social influences

Social influence refers to the extent to which individuals perceive the opinions of others as necessary to influence their behaviour in adopting a new system (Venkatesh et al., 2003). Furthermore, social influence reflects how peers' viewpoints might impact individuals' perceptions of a program or technology, for example the local community towards smart cities (Chong et al., 2022; Tan et al., 2021). The higher the perceived value of adopting emerging technologies, systems, or facilities among peers, the more likely they are to embrace it (Lee et al., 2017). Given the limited research on AI robots in hospitality, the researcher proposed that:

H4: Social influence significantly influences behaviour intention toward the AI-adopting hospitality industry in China.

2.6 Price-Saving Orientation

Price-saving orientation refers to the economic benefits of technology, as it allows individuals to acquire goods or services at lower prices. People use various applications and websites to compare prices. Enterprises capable of offering lower prices are considered more efficient platforms (Yeo et al., 2017). Such discounts or promotions attract price-sensitive customers who prefer avenues that offer the most value for their money. Customers' cost-saving practices are evaluated based on service quality; buyers and sellers actively engage in agreements utilising artificial intelligence technology. Hence, the hypothesis in this study is that:

H5: Price-saving orientation significantly influences behaviour intention toward the AI-adopting hospitality industry in China.

2.7 Time-saving orientation

The time-saving orientation indicates that individuals consistently aim to save time for online shopping. A previous study found that people find shopping in physical stores more challenging due to changes in customer lifestyles. Therefore, the research establishes a connection between time-saving orientation and customers' attitudes and intentions to use artificial intelligence systems (Yeo et al., 2017). This study defines time-saving orientation as individuals perceiving technological infrastructure that enables using AI service robots as supportive services. Hence, this study hypothesises that time-saving orientation is defined as individuals perceiving technological infrastructure that enables using AI service robots as supportive services. Hence, the hypothesis in this study is that:

H6: Time-saving orientation significantly influences behaviour intention toward the AI-adopting hospitality industry in China.

2.8 The moderating role of spent time on smartphones

According to Taiwanese Research, highly technically skilled people have few technology-related worries. In Taiwan, a considerable portion of senior people, or 96%, have been using mobile phones for an average of 11 years, according to research by Hsu and Peng (2022). This research shows that people in Taiwan have a generally optimistic perspective and solid technological aptitude. This underlines how crucial it is to consider the distinct views and capacities of the population when developing and putting into practice projects and services involving AI technology. Hence, the following hypothesis in this study is that:

H7a: There is a moderating role of spent time on smartphones between performance expectancy and behaviour intention toward the AI-adopting hospitality industry in China.

H7b: There is a moderating role of spent time on smartphones between effort expectancy and behaviour intention toward the AI-adopting hospitality industry in China.

H7c: There is a moderating role of spent time on smartphones between social influence and behaviour intention toward the AI-adopting hospitality industry in China.

H7d: There is a moderating role of spent time on smartphones between price-saving and behaviour intention toward the AI-adopting hospitality industry in China.

H7e: There is a moderating role of spent time on smartphones between time-saving orientation and behaviour intention toward the AI-adopting hospitality industry in China.

H7f: There is a moderating role of spent time on smartphones between facilitating conditions and behaviour intention toward the AI-adopting hospitality industry in China.

2.9 Customer Satisfaction Theory (CST)

In addition, customer satisfaction theory (CST) can be defined as the extent to which a client’s wants, expectations, and wishes are met through their interactions with a product, service, or organisation; AI-adopting robot service is also a crucial factor in the famous hotel, and it has been wide-ranging studied and discussed in many of years due to its increasing importance to operators (Volles, & Ferrari, 2017;). In conclusion, the theory of UTAUT2 and the customer satisfaction theory were integrated to develop this study’s hypotheses and research model.

2.10 The mediator role of satisfaction

According to Chotigo and Kadono (2022), high customer satisfaction theory is crucial in reducing a company’s operating costs in the long run. When customers are satisfied with a company’s products or services, they are likelier to remain loyal and continue doing business with it. This loyalty eliminates the need for additional efforts and resources to acquire new customers, which can be expensive and time-consuming. Therefore, the hypothesis in this study is that:

H8: Satisfaction significantly influences behaviour intention in the AI-adopting hospitality industry in China.

H8a: There is a mediating role of satisfaction between performance expectancy and behaviour intention toward the AI-adopting hospitality industry in China.

H8b: There is a mediating role of satisfaction between effort expectancy and behaviour intention toward the AI-adopting hospitality industry in China.

H8c: There is a mediating role of satisfaction between social influence and behaviour intention toward the AI-adopting hospitality industry in China.

H8d: There is a mediating role of satisfaction between price-saving and behaviour intention toward the AI-adopting hospitality industry in China.

H8e: There is a mediating role of satisfaction between time-saving orientation and behaviour intention toward the AI-adopting hospitality industry in China.

H8f: There is a mediating role of satisfaction between facilitating conditions and behaviour intention toward the AI-adopting hospitality industry in China.

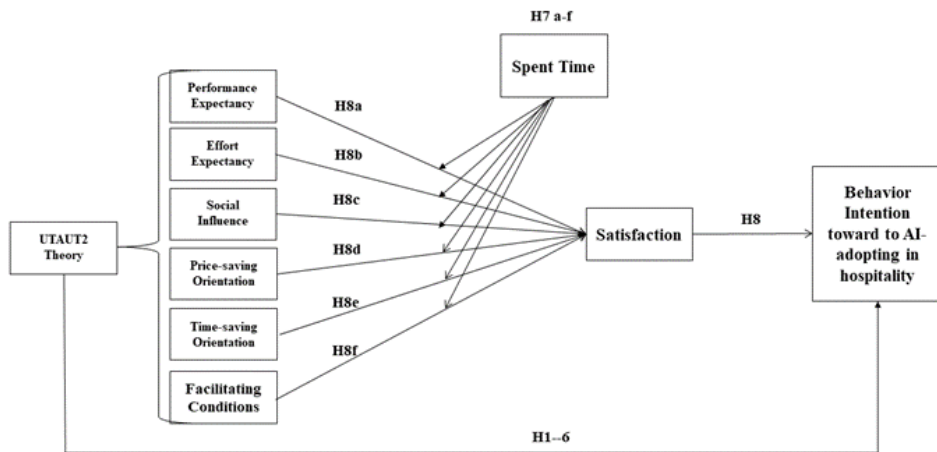


Fig. 1: Research Framework (Source: Author)

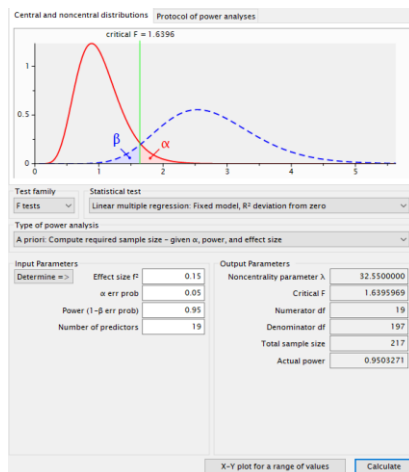


Fig. 2: The result of G-power (Source: Author)

Building upon the academic review, guided by existing theories and empirical evidence, this study proposes the following research framework and its direct causal pathways (Figure 1).

3.0 Methodology

The sample size derived from applying the G-power analysis was 217, as illustrated in Figure 2. Theoretically, a sample size exceeding 217 respondents is justifiable. Subsequently, an online questionnaire was administered to 349 respondents through sojump.com, resulting in 310 valid responses, all Chinese participants. Furthermore, a pilot test was conducted, with Cronbach’s Alpha indicating the acceptability of all instruments, ranging from [specific range not provided]. Data was analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). As depicted in Table 2, nine constructs were identified: performance expectancy, effort expectancy, social influence, facilitating conditions, price-saving orientation, time-saving orientation, spent time on smartphones, satisfaction, and behaviour intention toward AI advertising in the hospitality industry.

Table 2. Constructs and their related studies

Constructs	Studies
i) Performance Expectancy	Venkatesh et al., (2003); Palau-Saumell et al. (2019); Suk Won et al. (2019)
ii) Effort Expectancy	Venkatesh et al., (2003); Palau-Saumell et al.(2019):
iii) Social Influence	Venkatesh et al., (2003); Palau-Saumell et al.(2019):
iv) Facilitating Conditions	Venkatesh et al., (2003);
v) Price-saving orientation	Escobar-Rodriguez and Carvajal-Trujillo, (2013)
vi) Time-saving orientation	Alreck and Settle, (2002);
VII) Spent time on a smartphone	Hsu & Peng, (2021);
VIII) Satisfaction	Anderson and Srinivasan (2003); Wang, Tseng et al. (2019); Lee and Chung (2009)
IX) Behaviour Intention Toward AI-adopting in the hospitality industry	Venkatesh et al.,(2003)

(Source: Author)

3.1 Demographic Profile

As Table 3 illustrates, the proportion of respondents of different genders is similar, with the majority being employed white-collar professionals. Most of the respondents’ income falls within the range of 4000 to 5000 yuan. Eventually, the majority number of respondents are from a degree education level.

Table 3. Constructs and their related studies

Variables	Frequency(%)
Male	162 (52.3)
Female	148 (47.7)
2) Occupational status:	
Student	65 (21.0)
White collar	230 (74.2)
Self-employed	15 (4.8)
3) Income Level:	
RMB 1000-2000	25 (8.1)
RMB 2000-3000	40 (12.9)
RMB 3000-4000	79 (25.5)
RMB 4000-5000	92 (29.7)
RMB 5000-6000	64 (20.6)
above 6000	10 (3.2)
4) What is your education level?	
College diploma	84 (27.1)
Degree	145 (46.8)
Master	61 (19.7)
Doctor	20 (6.5)

(Source: Author)

4.0 Findings

In Figure 3, the results of the path analysis for performance expectancy (PE1-PE4), effort expectancy (EE1-EE4), social influence (SI1-SI5), price-saving orientation (PSO1-PSO3), time-saving orientation (TSO1-4), facilitating conditions (FC1-5) towards behaviour intention towards to AI-adopting in hospitality (BITAH1-6) is 0.902 whereas satisfaction (SAT1-4) is 0.907 which is similar the BITAH effect. The model can explain 90.7% satisfaction in China with 90.2% of the BITAH effect.

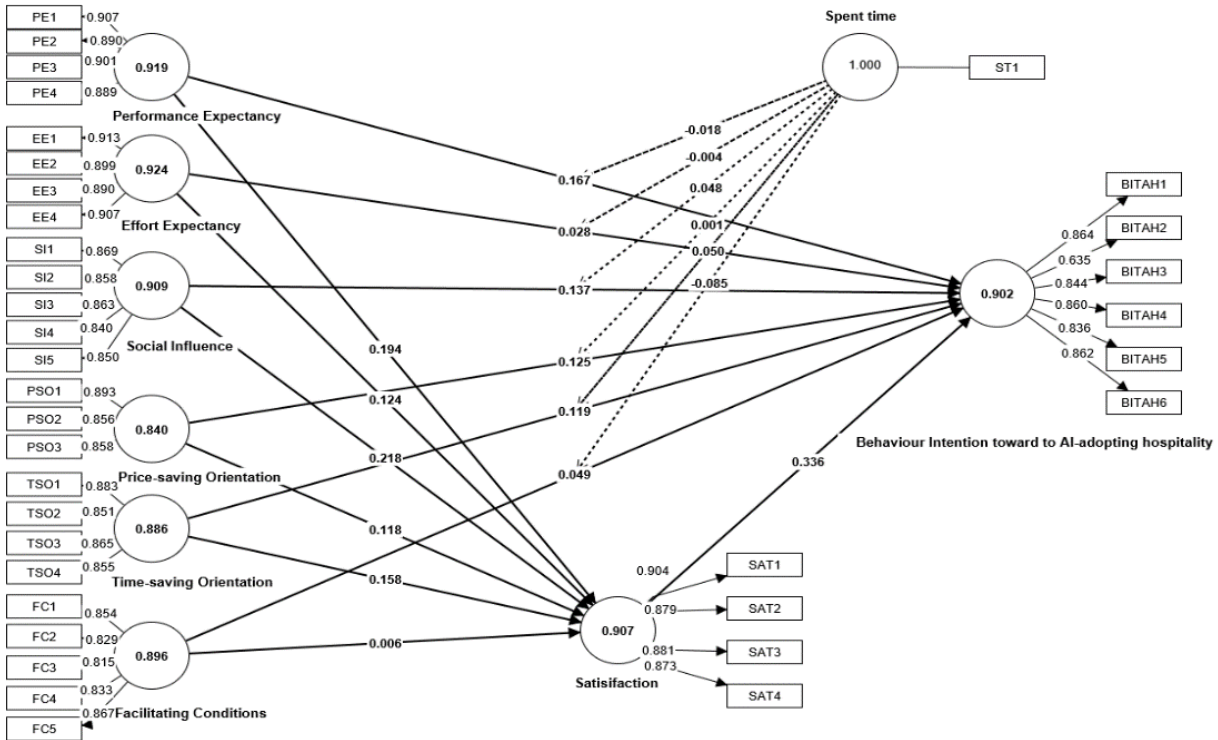


Fig.3: Results of the path analysis (Source: Author)

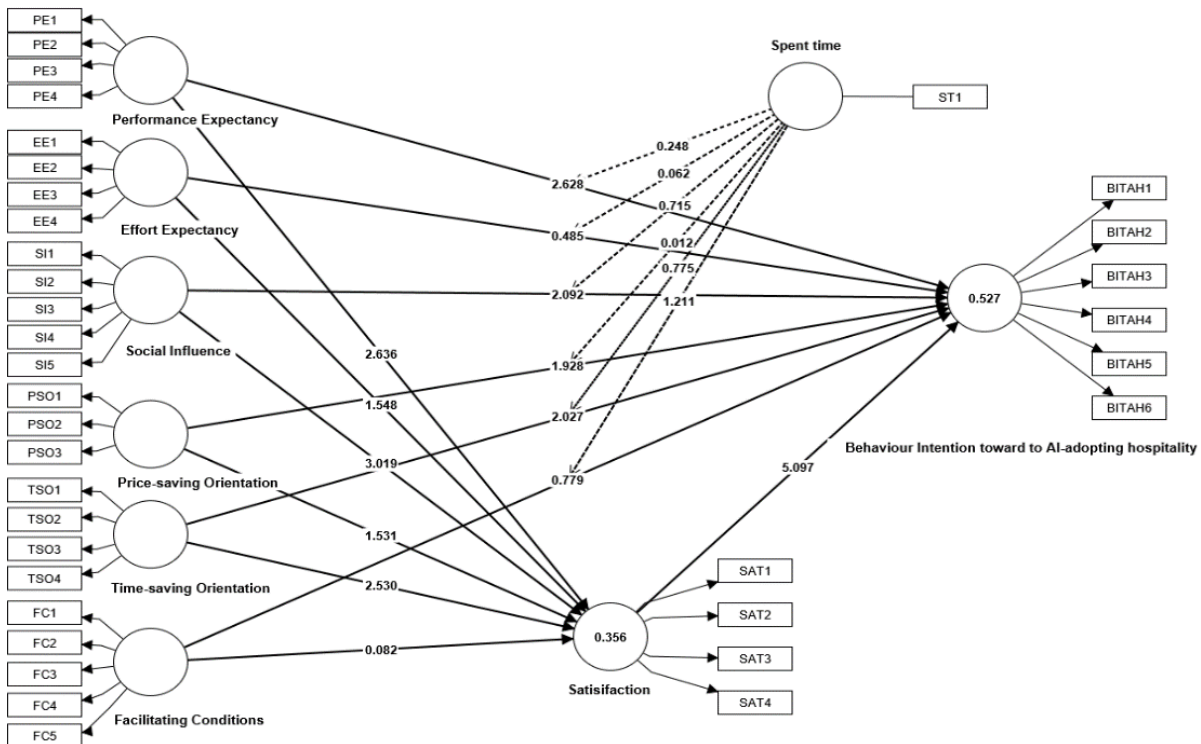


Fig.4: Results of the bootstrapping (T-values) (Source: Author)

As Figure 4 illustrates that the bootstrapping results show the T-values of the moderating effect of spent time, performance expectancy (PE1-PE4), effort expectancy (EE1-EE4), social influence (SI1-SI5), price-saving orientation (PSO1-PSO3), time-saving orientation (TSO1-4), facilitating conditions (FC1-5) towards behaviour intention towards AI-adopting in hospitality (BITAH1-6) and the mediating effect of satisfaction (SAT 1-4) towards BITAH in China.

As depicted in Table 4, the data showed that without the item of spent time, all other items except one have good loadings ranging from 0.645 to 0.915 with composite reliability of 0.634 to 0.917 for the constructs. The constructs' average extracted (AVE) is higher than 0.75, showing an acceptable validity for the constructs.

Table 4: Results of measurement items

Model Construct	Measurement Item	Loading	CR	AVE
Performance Expectancy	1. I find that AI and robotics technology in the hotel are helpful when ordering food and beverages.	0.907	0.919	0.804
	2. I believe using AI and robotics technology in the hospitality industry can help me order food and beverage more quickly.	0.890		
	3. I believe that using AI and robotics technology in hotel improve my productivity when ordering food.	0.901		
	4. Using AI and robotics technology enables me to purchase food and beverage more quickly.	0.889		
Effort Expectancy	1. Learning how to use AI and robotics technology in the hotel is easy.	0.913	0.924	0.814
	2. My interaction with AI and robotics technology is clear and understandable.	0.899		
	3. I find AI and robotics technology in the hotel easy to use.	0.890		
	4. I can quickly become skilful at using AI and robotics in the hotel.	0.907		
Social Influence	1. Many people use AI and robotic technology in the hotel.	0.869	0.909	0.733
	2. I believe that many people express their desire to use AI and robotic technology in the hotel.	0.858		
	3. many people search or order services using AI and robotic technology in the hospitality industry.	0.863		
	4. People who influence my behaviour think I should use AI and robotic technology to purchase hospitality food.	0.840		
	5. People whose opinions I value prefer that I use AI and robots can install the AI and robotic technology app on my smartphone or tablet technology for purchasing food in a hotel.	0.850		
Price-saving Orientation	1: AI and robotic technology offer better value for my money in a hotel.	0.893	0.840	0.756
	2: I would like to search for cheap food deals using unmanned AI or robotic technology service in the hotel restaurant.	0.856		
	3: Using AI and robotic technology is reasonably priced to order.	0.858		
Time-saving Orientation	1. I believe using AI and robotic technology is helpful in hospitality.	0.883	0.886	0.746
	2. I believe using AI and robotic technology helps me accomplish things more quickly in purchasing.	0.851		
	3. I believe I can save time by using AI and robotic technology in purchasing.	0.865		
	4. it is important for me that the purchase process is done as quickly as possible using AI and robotic technology.	0.855		
Facilitating Conditions	1. I can install the AI and robotic technology app on my smartphone or tablet.	0.854	0.896	0.705
	2. I can quickly get knowledge about using the AI and robotic technology app	0.829		
	3. I got technology technical support for AI and robotic technology apps.	0.815		
	4. When I have a problem using the AI and robotic technology app in a hotel, it is easy to find someone to help me.	0.833		
	5. it is crucial for me that the purchase process is done as quickly as possible using AI and robotic technology.	0.867		
Spent time	1. Daily smartphone or tablet use	1.000	1.000	1.000
Satisfaction	1. My overall experience of AI and robotic technology use was delighted	0.904	0.907	0.782
	2. My overall experience of AI and robotic technology was enjoyable.	0.879		
	3. My overall experience of AI and robotic technology use was delighted.	0.881		
	4. My overall experience of AI and robotic technology use was very contented.	0.873		

(Source: Author)

Table 5 Results of hypothesis testing

Hypothesis	Relationship	T-statistics	P-values	Results
H1	Performance expectancy -> (Behaviour Intention towards AI-adopting Hospitality) BITAH	2.628	0.009	Accepted
H2	Effort expectancy -> BITAH	0.485	0.628	Rejected
H3	Facilitating conditions -> BITAH	0.779	0.436	Rejected
H4	Social influence -> BITAH	2.092	0.036	Accepted
H5	Price-saving orientation -> BITAH	1.928	0.054	Rejected
H6	Time-saving orientation -> BITAH	2.027	0.043	Accepted
H7	Spent time on smartphone -> BITAH	0.053	0.197	Rejected
H7a	Performance expectancy -> Spent time on smartphone -> BITAH	0.248	0.804	Rejected

H7b	Effort expectancy ->Spent time on smartphone -> BITAH	0.062	0.951	Rejected
H7c	Social influences->Spent time on smartphone -> BITAH	0.715	0.475	Rejected
H7d	Time-saving orientation->Spent time on smartphone -> BITAH	0.775	0.438	Rejected
H7e	Price-saving orientation->Spent time on smartphone -> BITAH	0.012	0.990	Rejected
H7f	Facilitating conditions->Spent time on smartphone -> BITAH	1.211	0.226	Rejected
H8	Satisfaction -> BITAH	5.097	0.000	Accepted
H8a	Performance expectancy -> Satisfaction -> BITAH	2.383	0.017	Accepted
H8b	Effort expectancy -> Satisfaction -> BITAH	1.451	1.451	Rejected
H8c	Social influences->Satisfaction -> BITAH	2.652	0.008	Accepted
H8d	Price-saving orientation->Satisfaction -> BITAH	1.413	0.158	Accepted
H8e	Time-saving orientation->Satisfaction -> BITAH	2.271	0.023	Accepted
H8f	Facilitating conditions->Satisfaction -> BITAH	0.081	0.936	Rejected

(Source: Author)

5.0 Discussion & Recommendations

In conclusion, nine hypotheses were valid, three of which belong to the UTAUT2 theory (Performance Expectancy, Social Influence, Time-saving Orientation), and the remaining five came from the effect of satisfaction as a mediating variable between the UTAUT2 and the Behavioural Intentions. The findings show that performance expectancy, social influence, and time-saving orientation are significantly related to behaviour intention towards AI adoption in hospitality. However, when these dimensions are moderated by spent time on a smartphone, the dependent variable, Behaviour intention toward AI-adopting Hospitality (BITAH), does not show a significant relationship with these constructs. This implies that people will choose to stay in smart robot hotels when they think that robots are helpful for them to stay in hotels. For example, in smart hotels, robots can quickly help them to check in and save time queuing up, and they can make the invited customers feel technologically advanced when they are in business reception. Such findings do not align with Hsu and Peng's (2022) claim that spending time on smartphones can significantly moderate the relationship between PE, SI, FC and intention to adopt AI technology.

Moreover, the findings support Alalwan's (2020) assertions that satisfaction as a mediating role can affect the relationship between PE, PSO, FC and behaviour intention toward AI-adopting technology in hospitality. This study proves the importance of customer satisfaction. The result shows that people would like to go to a cost-effective AI hotel that is well-publicised, and they can easily use the well-equipment AI-robotic technology.

6.0 Conclusion & Recommendations

The findings show that performance expectancy, social influence, and time-saving orientation are significantly related to behaviour intention towards AI adoption in hospitality. However, when these dimensions are moderated by spent time on a smartphone, the dependent variable (BITAH) does not show a significant relationship with these constructs. This implies that smartphone time usage for customers is irrelevant to their behaviour and intention to use AI devices in the research field. Such findings do not align with Hsu and Peng's (2022) claim that spending time on smartphones moderates the relationship between PE, SI, FC and intention to adopt AI technology. Moreover, the findings support Alalwan's (2020) assertion that satisfaction as a mediating role can affect the relationship between performance expectancy, price-saving orientation, facilitating conditions and behaviour intention to AI-adopting hospitality. In conclusion, this study achieved the study's research objectives: investigating the level of significant satisfaction between customers' performance expectancy, price-saving orientation, and facilitation conditions on behavioural Intention of Artificial Intelligence Service Robots in Hospitality in China. Policy-makers and hospitality managers should focus on upgrading devices and robotic technology and invest more funds in relevant advertising.

7.0 Suggestions for Future Research

The limitation of this study is the limited time to collect the demographic factors only in the metropolises of provinces in China, which might influence the outcome of the research. Furthermore, the quantitative data collection in this study is limited, requiring greater explanatory power to unveil the outcomes. Additionally, due to resource constraints, this study does not encompass control variables, and the reliability of the findings cannot be guaranteed in multiple circumstances. It is recommended that future research should consider more variables mentioned in other theories, such as Technology Readiness Theories.

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Paper Contribution to related Field of study

Operators within the hotel industry should implement artificial intelligence-driven robotic services in guests' accommodations, a critical factor for achieving profitability in the context of Industry 4.0's sustainable development. This investigation into the behavioural intention of the hotel industry to adopt AI services and customer satisfaction regarding their time spent in China serves as a valuable study for academic scholars. Eventually, these findings contribute to discovering the significant relationship between UTAUT2 variables and the moderating role spent time towards the BITAH in China.

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