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Unraveling the Factors Affecting Behavioral Intentions Towards Service Robots in the Hotel Industry: A Technology Acceptance Model Approach

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Abstract:- In the hotel industry, service robots have become more popular over time as a frontline automation tool. This research uses the technology acceptance model (TAM) to investigate the antecedents of behavioral intention to use robotic devices in hotel services. The data was collected from 475 hotel customers in the United States and evaluated using structure equation modeling. The findings show that subjective norms and robot self-efficacy have a significant positive influence on playfulness of robots, perceived usefulness (PUS) of robots, and perceived ease of use (PEU) of robots. Moreover, the results also confirm that the playfulness of robots, PUS of robots, and PEU of robots are positively and significantly connected with behavioral intentions to use robots. These findings have important research and practical implications for hotel management and the tourism sector.

Keywords: Subjective norms, robot self-efficacy, technology acceptance model, behavioral intentions to use robots

I. INTRODUCTION

Our lives are increasingly dominated by robots due to technological advances, particularly in robotics and artificial intelligence (AI). A robot is a machine that could be trained.to do a complicated set of tasks autonomously; it can mimic and replace human operations. Additionally, social robots have made their way into the education and healthcare sectors [1]. The tourism and hospitality sectors are not an exception [2]. Numerous global hospitality and tourist establishments have already included applications for robots in different environments [3]. The implementation of service robotics in the hotel industry has increased at the rising trend of 25.5 percent, per Analytics (2021). This trend is expected to continue, and by 2030, service robots will account for around 25% of the labor in the hotel sector [5]. According to Antonucci et al.,[6] , the service robot industry is expected to reach a valuation of USD 41.49 billion by 2027, more than double the pre-pandemic level. The McKinsey Global Institute's research indicates that labor robotics will need 375 million people to get training for new roles and responsibilities over the next several decades [7]. This will affect the working climate and well-being of workers as well as the service delivery landscape.

The investment in technology is made by organizations to stay competitive, but it does not guarantee that users will adopt it on their own [8], [9]. There is a dearth of studies on the acceptability differences between autonomous and non-autonomous robots since autonomous robots are still a relatively fresh topic. Yet, robot varieties more comparable to the conventional devices that have been used in industrial automation for many years can be more popular [10]. For instance, earlier research has shown that humans find human robots to be more frightening than mechanical ones. Additionally, jobs requiring a lot of human contact, such as nursing, are not well suited to robots [10]. There is a risk that human adoption of autonomous robots will be hampered by the fact that these machines often interact with humans at work and may even resist their orders.

The first market acceptance model, known as the TAM, was developed by [11] to define how customers would then accept and utilize information technology systems.. In TAM, rational behavior theory assumes that people behave rationally and that no unconscious forces or incentives influence their behavior [12]. It's possible that

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customers view robots favorably if they enhance the quality of services. Robots are outfitted with cutting-edge technology such as AI technologies and machine learning, which enable them to provide visitors with precise information and individualized support, resulting in a more positive experience. In a similar vein, visitors' behavioral intentions are significantly influenced by how convenient it is to use robots. If users find interacting with robot-assisted services simple, they are more inclined to accept them. The user experience of a website should be characterized by elements such as simple instructions, easy-to-use interfaces, and little effort required. In previous research, [13] articulated that customers see the emergence of robots in the hotel industry favorably because they have the potential to improve service efficiency. In order to save time for both visitors and staff, robots may automate a variety of chores including cleaning, room service delivery, and concierge services.

Our current research seeks to broaden the technological acceptance model to make important contributions. *Firstly*, we intend to determine if the quality of user-technology interaction is a predecessor that influences perceptions of its usefulness and ease of use. *Secondly*, we contribute to the literature on service robots by demonstrating how consumers' cognitive assessments of a robot might affect their behavioral intention to use it differently in in hotel service contexts. *Thirdly*, the results of our research offer valuable perspectives for service providers seeking to encourage positive experiences for customers using robotic services. To further improve customer experiences, we advise developing personalized robotic service environments appropriate in hotel context.

There are mainly five sections in this paper. In the second section, literature review follows the introductory section, which discusses theories and establishes connections between hypotheses. The third section discusses the research approach. The fourth section discusses the results and findings of the study. Finally, the final section presents a conclusion and implications for future research.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

A. Subjective Norms, Playfulness, Perceived Usefulness, and Perceived Ease of Use

Subjective norm was shown to be a significant predictor of intents and behavior in TRA, TAM's referent theory; however, TAM disregarded subjective norm because of several theoretical issues and empirical difficulties [14], [15]. It tells about the individual's assumptions about the opinions of others in close proximity to them on the behavior they exhibit. A group that considers playful interactions with robots to be desirable or socially acceptable is more likely to participate in such interactions [16], [17]. It is a positive feedback loop that is created by this acceptance which normalizes and encourages interacting with playful robots. When it comes to activities that are somewhat novel or unknown, like communicating with robots, people have a tendency to follow perceived social norms [18]. Similarly, individuals are more inclined to adopt and display such behavior themselves if the general subjective norm is that having fun with robots is useful or joyful. In earlier research, [19] proposed that when system usage is voluntary, the incorporation and identification effect—which represents a consumer reaction to social influence by changing his or her thoughts about using the system to get a social status—seems to occur. In certain circumstances, people often seek advice from their peers on appropriate behavior. Therefore, based on the argument above, we suggest the following hypothesis.

H1a: Subjective norms will have a positive influence on playfulness of robots

There has been extensive research on PUS across a wide range of disciplines [12], [20]. It is shown to have a greater impact on people's plans to use a system. Prior studies on PUS are quite subjective because of personal bias [21], [22]. When individuals believe that their friends, family members, or society as a whole approve of the employment of robots, they are more willing to see them as useful tools. In a setting where utilizing robots is accepted as the norm rather than something strange or criticized, subjective norms are established [23]. In prior literature,[24] suggest that subjective norms established by consumers might also lessen the perceived dangers of using new technology, such as robots. Individuals are more likely to believe that robots are beneficial when they see others embracing and supporting their usage. This increases people's confidence in experimenting with robots. A positive subjective norm can enlighten people about the advantages and uses of robots [23]. Due to social interactions and observations, individuals can form opinions about robots' usefulness based on many scenarios in which they could help with chores, increase efficiency, or enhance quality of life. Therefore, based on the argument above, we postulate the following hypothesis.

H1b: Subjective norms will have a positive influence on PUS

According to TAM, a person's desire to use a certain system is simultaneously affected by their attitude towards the system and PEU [25]. In addition, a person's perception of ease of use can be improved when they believe that others, particularly those they respect or identify with, are able to use robots easily. When robots are used with positive subjective norms, it is easier to make use of them and the perception of barriers to doing so is lessened [23], [25]. Usually, individuals follow social standards so that they can be accepted by others or to stay out of trouble. When people believe that using robots is convenient and beneficial, they are more inclined to accept this assumption [26]. Their opinions about how simple robots are to use may be influenced by their compliance to subjective norms. When people have positive subjective norms, they are less likely to be afraid of or anxious about using new technology, such as robots. It helps ease worries about possible obstacles or hurdles to know that others find robots useful and easy to operate, which makes the experience seem simpler. Drawing from the preceding discourse, we postulate that consumer-driven subjective norms are pivotal in molding attitudes towards, and perceptions of the ease of use of robots by reducing perceived obstacles and providing social approval.

H1c: Subjective norms will have a positive influence on PEU

Robot self-efficacy, playfulness, perceived usefulness, and perceived ease of use

In prior literature,[27] defined self-efficacy as "people's judgements of their capabilities to organize and implement strategies required for achieving specified types of performances" conceptually. A robot with a high level of self-efficacy is more likely to perform lighthearted activities or engage in lighthearted exchanges with hotel visitors [13]. This may result in a more pleasurable and unforgettable visiting experience, enhancing general contentment and allegiance. The robots will likely captivate hotel customers by being able to do things on their own, resulting in amusing interactions between our guests and them [28]. This might lead to a lively and enjoyable environment at the hotel, encouraging good relationships between visitors and employees. Previous studies on robot self-efficacy have shown that, depending on the robot and focused task, regular exposure to various robot behaviors and across numerous examinations may lead to higher self-efficacy scores for robot usage [29]. Similarly, scholars have revealed that playful robots with a high degree of self-efficacy might be used to encourage and support leisure activities inside the hotel, such guided tours or interactive games [13], [30]. Their exciting and engaging qualities may attract visitors to participate in these events, enhancing their stay and promoting subsequent trips. Therefore, based on the argument above, we postulate the following hypothesis.

H2a: Robot self-efficacy will have a positive influence on robot playfulness

According to [11], PU is "the degree to which a person believes that using a specific method will improve his or her job performance". When guests stay at a hotel, they expect efficient and reliable services. It is believed that effectively operating robots that possess high self-efficacy may carry out jobs like room service, amenity delivery, and information sharing about nearby attractions and hotel amenities [31]. The impression of the robot's skill in these duties contributes to its PUS by providing visitors with prompt and trustworthy service. According to Robinson *et al* [30], a high level of robot self-efficacy suggests that people see the robot as dependable and efficient at doing tasks. When users have confidence in a robot's ability to do tasks precisely, promptly, and without faults or malfunctions, they are more likely to consider it helpful [32]. It is likely to take less work and entail less complexity to engage with a robot that is seen as having strong self-efficacy. The robot's features may seem more obvious and user-friendly to users, which might boost their opinion of its value in streamlining procedures or jobs. In addition, a robot with high self-efficacy may offer users a positive user experience that includes feelings of competence, happiness, and accomplishment. These satisfied encounters help to create a positive view of the robot's usefulness, as users are more inclined to respect and appreciate the advantages it offers. Therefore, based on the argument above, we suggest the following hypothesis.

H2b: Robot self-efficacy will have a positive influence on PUS

PEU is an important aspect of technology adoption and actual usage. The full definition of PEU is given in Table 1. Davis *et al.* [11] characterized PEU as the extent to which an individual perceives that utilizing a specific system would entail minimal effort, indicating ease of comprehension and usability. When visitors at hotels feel that robots are very competent and skilled at what they do, they are more likely to believe that engaging with these machines would be simple and easy [34]. Similarly, they are more likely to interact with the robots because of the feeling of ease of use that the robot provides. A consistent and efficient level of service is expected throughout a guest's stay. The concept of ease of use is enhanced by the belief that robots with strong self-efficacy can do tasks with speed and accuracy. These robots are believed to offer quick and hassle-free assistance to guests. In recent research, Lestari *et al.* [29] suggest that robots with high self-efficacy are more likely to interact well with customers, offering clear instructions and direction. This precise communication decreases any misunderstanding or ambiguity among the visitors, increasing the perceived ease of usage of the robots. In addition, positive encounters with robots that demonstrate strong self-efficacy might influence visitors' expectations for further interactions [30]. If visitors have previously encountered robots that effectively met their demands, they are more likely to expect comparable ease of use in future interactions, indicating their favorable opinion of robot usability. Thus, based on the argument presented above, we theorize the research hypotheses.

H2c: Robot self-efficacy will have a positive influence on PUS

B. Playfulness of Robots And Behavioral Intention To Use Robots

Previous research has shown that playful robots may captivate visitors' attention and provide memorable experiences [35]. When visitors view robots as lively and interesting, they are more inclined to interact with them, interact more often, and understand their abilities[36]. This greater involvement promotes a good attitude toward robots and increases visitors' willingness to use them during their stay. Playfulness may humanize robots and generate favorable feelings among visitors. If visitors see robots as pleasant, accessible, and enjoyable to engage with, they are more likely to form emotional bonds and attachments [37]. This emotional connection motivates visitors to utilize robots as friends or aides, which improves their entire experience and increases their desire to interact with them more. Despite the growing role that new technologies play in the hospitality industry, not everyone prefers a high-tech hotel experience. It can make a big difference to employee satisfaction at a time when labor shortages are still an issue in the hospitality sector, and it can make hotel management sleep better, too. In previous research, [38] discovered that if visitors see robots as sources of pleasure, excitement, or curiosity, they are more inclined to seek out interactions with them to improve their stay. The novelty and entertainment appeal of playful robots add to customers' desire to utilize them as part of their hotel experience, whether they are delivering a package or playing games with a robot butler. So, based on the debate earlier, we theorize the underlying hypothesis:.

H3: Playfulness will have a positive influence on intention to use robots

Table 1: *Operational definitions of key variables*

Variables	Operational definition	Source
Subjective Norms	It tells about the individual's assumptions about the opinions of others in close proximity to them on the behavior they exhibit.	[39]Kaushik et al. (2015)

Robot Self-Efficacy	In prior literature, it defined as "people's judgements of their capabilities to organize and implement strategies required for achieving specified types of performances" conceptually.	[40]Liao et al. (2022)
Playfulness of Robots	It is this familiarity that normalizes and promotes interaction with playful robots, creating a positive feedback loop.	[41]Hussain et al. (2019)
Perceived Usefulness	The perceived utility of robots in the hotel sector corresponds to visitors' subjective assessments of how helpful, practical, and successful robotic technologies are in improving different areas of their hotel experience.	[8]Parvez et al. (2022)
Perceived Ease of Use	PEU is the degree to which an user believes that using a system will require marginal effort, indicating ease of comprehension and usability.	[11]Davis et al. (1989)
Behavioral Intention to use Robots	The intention to use robots in hotels is guests' willingness to engage with robotic technologies for tasks like assistance, information, or service	[42]Cha (2020)

C. Perceived Usefulness And Behavioral Intention To Use Robots

A number of studies have been conducted based on intentions to predict behavior in the interaction with technology in the tradition of technology acceptance models. The TAM has become the most prominent theory on the use of information technology, as well as the best approach to measure people's intentions to utilize it [9]. According to TAM, one of the key determinants of technology acceptance is PUS. In the context of robots, individuals are likely to consider the extent to which robots can enhance efficiency, productivity, or convenience in their tasks or daily lives [32].

It is important for hotel guests to have ease and efficiency during their stay. If customers believe robots can expedite services like room service delivery, concierge services, or check-in/out procedures, they are more likely to value them as practical tools that save them time and effort [43]. This notion of convenience and efficiency enhances the possibility that customers can use robots throughout their stay. When it comes to service delivery, customers want precision and consistency. Customers are more inclined to trust and depend on robots when they believe they can deliver accurate and trustworthy advice without human mistake [35]. As a result, customers are more likely to use robots, whether they're bringing amenities to their rooms or providing information about hotel services [35]. The customer is more likely to find robots helpful and relevant if they believe that they can provide customized suggestions or services based on their interests. For example, robots equipped with artificial intelligence might evaluate visitor information to provide customized eating suggestions or advise local attractions based on individual preferences, increasing robots' PUS. Therefore, we based on the above suggestion we suggest the following hypothesis.

H4: PUS will have a positive influence on intention to use robots

D. Perceived Ease of Use And Behavioral Intention To Use Robots

Another component in TAM is PEU, which relates to how much people feel that utilizing technology would be easy or simple to use [38], [44]. When it comes to robots, people are more likely to use them if they believe they are simple to operate, engage with, or integrate into current processes. A user's perception of usability may be influenced by intuitive interfaces, clear instructions, and few technological obstacles. In the hotel environment, PEU implies that dealing with robots in a hotel setting is simple and obvious [45]. If visitors believe robots are simple to use and navigate, with clear instructions and user-friendly interactions, they are more likely to feel comfortable utilizing them. This shorter learning curve reduces obstacles to adoption and boosts visitors' intention to use robots throughout their stay. Several academic researchers have noted that guests appreciate the quick and easy help provided by robots [37], [46]. If visitors believe that engaging with robots involves no effort and produces rapid and consistent results, they are more inclined to use them for a variety of tasks, such as seeking information, ordering amenities, or accessing services. The perceived ease of receiving help from robots improves the entire experience and encourages visitors to utilize them as handy resources. Therefore, based on the argument above we postulate the following hypothesis.

H5: PEU will have a positive influence on intention to use robots

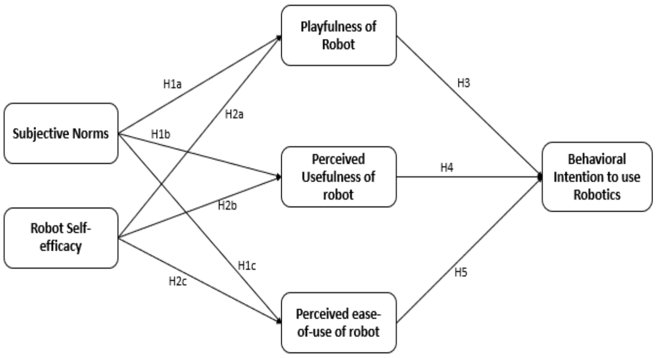

Fig. 1. Conceptual Model

III. METHOD

A. Sampling and Data Collection

We utilized an electronic survey to gather information from hotel guests in the United States. The use of online survey methods has several advantages over conventional offline survey methods, including cheaper costs, higher efficiency, and no geographic restrictions [47]. The content's veracity was validated by three experts. These experts provided input, and it was determined that the questionnaire's design and substance were appropriate. In light of this, we changed the questionnaire's phrasing and language in accordance with the advice of experts in order to guarantee content validity. A premier online survey platform, Amazon Mechanical-Turk (www.mturk.com), was used for sending and collecting questionnaires. During the study, we asked respondents to share memories about their most recent experience with robot service at a hotel. The study was only open to guests who have used robot services while staying at a hotel during the previous year.

The data was gathered between December 2023 and January 2024, with surveys distributed across two periods. The first period (December 1 to December 21, 2023) focused on subjective norms, robot self-efficacy, and behavioral intention to use robots; the second period (Time 2), which was collected two weeks later (January 8 to January 31, 2023) to avoid common method variance, focused on robot playfulness, PUS of robots, and PEU of robots. For Time 1, 564 questionnaires were circulated, and 475 replies were gathered. During Time 2, all prior participants were contacted again. All information was collected anonymously online, and the two sets of responses were compared using participant IDs created at random by the survey's web-based system. A response rate of 84.2% was achieved after removing incomplete and invalid data.

The total sample included 386 males (81.3%) and 89 females (18.7%). The majority of respondents (26.0%) were between the ages of 26 and 30, as this demographic represents the majority of travel and technology customers (Shin and Jeong 2020). The majority of participants (60.4%) have bachelor's degree (See Table 2).

Table 2 Sample Characteristics

Feature	Classification	Number	Percentage
Gender	Male	386	81.3
	Female	89	18.7
Age	Aged 40 and above	85	17.9
	36–39	79	16.6
	31–35	97	20.4
	26–30	125	26.3
	Aged 25 and below	89	18.7
Marital Status	Married	287	60.4

	Single	188	39.6
Education	Junior college or below	102	21.5
	Bachelor's degree	286	60.2
	Master's degree or above	87	18.3
Job Experience	0–3 years	187	39.4
	4–10 years	191	40.2
	More than 11 years	99	20.8

B. Measurements

The questionnaire items used in this study were adapted from previous research. Participants responded to each item using a 7-point Likert scale, with 1 representing "strongly disagree" and 7 representing "strongly agree" [48]. We adjusted the measurement items' meaning and in line them with hotel visitor context. Subjective norm is measured using three-point multi-item scales adapted from Kaushik *et al.* [39]. Similarly, a three-item scale was used to assess robot self-efficacy and adapted from the study of Liao *et al.* [40]. In addition, PUS scale consists of four items and PEU scale consists of four items and both were adapted from Parvez *et al.*[8]. Moreover, playfulness was assessed through a five-item scale adapted from Hussain *et al.*[41] . In last, intention to use robots scales were adapted from previous literature [42] and consist of four items scale.

IV. RESULTS

A. Measurement Model Validation

To examine the link among each factor, we performed a correlational inquiry. Table 3 displays the findings, which indicate a substantial association between the variables. Every component has a standard regression score of higher than 0.75 in Table 3 and Figure 2, suggesting that the estimations are more reliable [49]. We used the square measure of average variance extracted (AVE) to study discriminant validity. Since AVE has a greater square root value than its connection with other variables, the findings provide proof of discriminant validity [50]. The MSV value can be used as an alternative method of evaluating discriminant validity by comparing the AVE value with each of the factors. If AVE exceeds MSV, discriminant validity can be achieved [51]. The factors with AVE values higher than MSV values are confirmed by the findings. The possible relationship among these items was then examined using a convergent validity analysis utilizing item loadings and AVE [52]. The AVE values for each variable are significantly higher than 0.5, according to the results, indicating that these factors meet the standard and have 50% greater variation. The Kaiser-Meyer-Olkin test (see Table 6) revealed that the values at 0.917 were higher than 0.6. (Kaiser, 1974). As a result, this sample was suitable for conducting all factorial analyses. Furthermore, BTS produced an impressive value of 9,299.87, meeting the EFA requirement.

Table 3 Discriminant Validity

S.N	Constructs	CR	AVE	1	2	3	4	5	6
1	Intention to Use Robots	0.910	0.716	**0.846**					
2	Perceived Usefulness of Robots	0.918	0.736	0.750	**0.858**				
3	Perceived Ease of Use of Robots	0.906	0.707	0.528	0.471	**0.841**			
4	Playfulness of Robots	0.926	0.715	0.591	0.534	0.547	**0.846**		
5	Robot Self-Efficacy	0.916	0.785	0.228	0.197	0.608	0.211	**0.886**	
6	Subjective Norms	0.933	0.822	0.389	0.297	0.678	0.606	0.340	**0.907**

Note: N= 475; CR = composite reliability; AVE = average variance extract;

B. Reliability Analysis

The Cronbach-alpha method was employed to evaluate each factor's reliability. Table 4 shows that all factors' Cronbach values were higher than the recommended cutoff value of 0.70 [53], indicating that the data is reliable. Using a composite reliability (CR) calculation, the uniformity of all the indicators was examined. According to Hair Jr. et al. [54]F, the study's findings indicate that the CR values are higher than the 0.70 threshold value.

Table 4: *Results of factor loadings and reliability of latent constructs*

Constructs	SFL	VIF	α
Intention to use			0.867
If I had the opportunity, I would use a robot to obtain services instead of a customer service employee	0.796	3.454	
I would like to continue using robots for services in the future	0.761	1.671	
Perceived Ease of Use			0.861
I think that dealing and using robots is clear and understandable	0.870	2.850	
It doesn't take a lot of mental effort to work with a robot	0.814	1.903	
I find robots easy to use	0.743	1.778	
I find it easy to get the robot to do what I want it to do	0.791	2.113	
Playfulness			0.900
I find myself creative in dealing with robots	0.790	3.169	
I have fun with a robot	0.857	3.315	
I find using robots very fun	0.834	2.281	
PUS			0.881
I believe that the use of robots helps improve customer service in the government sector	0.859	2.589	
I believe that the use of robots contributes to improving the efficiency of work tasks in the government sector	0.841	3.275	
Robot Self-Efficacy			0.864
I could utilize the robot if nobody was there to inform me how to do it.	0.786	2.469	
I would use a robot if it had the option to get outside help when needed	0.907	2.245	
Subjective Norms			0.892
I am encouraged to experiment with the robot by people who influence my behavior.	0.856	3.454	
People who use the robot have more prestige than those who do not	0.869	1.671	

C. Multicollinearity

To determine the coefficients of the variance inflation factor (VIF) and fairness, a regression test is carried out to look for multicollinearity problems. The scores of the VIF shouldn't be higher than 0.1 [55]. The findings indicate that there are no multicollinearity problems in this framework as the weights of VIF and Tolerance are in accordance with and lie within the overall recommended range [56]. Table 5 presents the findings.

Table 5 Collinearity diagnostics

Variables	**Collinearity Statistics**	
	Tolerance	VIF
Intention to Use Robots	0.752	1.335
PUS of Robots	0.458	1.558
Perceived Ease of Use of Robots	0.711	1.958
Playfulness of Robots	0.965	1.365
Robot Self-Efficacy	0.778	1.225
Subjective Norms	0.805	1.788

Notes: Dependent variable: Intention to Use Robots

D. Common Method Variance

A range of analytical and scientific techniques were employed to calculate the common method variance (CMV). First, in order to maintain the items' clarity, precision, and succinctness, a pilot research trial was conducted to confirm the instruments' applicability [57]. Second, if one component accounts for at least 50% of the total variation, Harman's model [57], [58] indicates that CMV effects. According to the study's results, the most important component described 39.44% of the data, which is less than the 50% criterion and confirms that there was no CMV in the dataset. Thirdly, in order to examine the CMV, Bagozzi et al.[59] looked into the association between latent variables. Every variable has a coefficient of less than 0.90. Based on our data analysis, there appears to be no CMV.

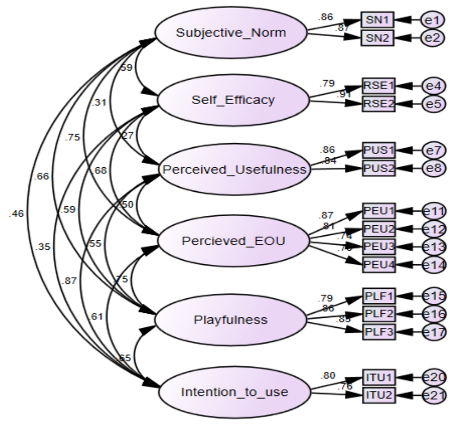

Fig. 2. Measurement Model

Table 6 *Kaiser–Meyer–Olkin (KMO) and Bartlett's test.*

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.917**
Bartlett's Test of Sphericity	**Approx. Chi-Square**	9,299.87
	df	**426**
	Sig.	**0.000**

Notes: df: Degree of freedom, **Sig:** Significance.

E. Structural Path Model

Additionally, we evaluated goodness-of-fit indices using the classificatory method described by Hooper et al [60]. The framework showed excellent fitness with X2= 1025.12, Df = 645, RMSEA = 0.028, GFI = 0.865, and AGFI = 0.845, according to the IBM Amos 24.0 output. The absolute fit indices were compared to predetermined criteria, taking into account RMSEA below 0.07 and CMIN/DF below 3.0 [61]. The MacCallum and Hong (1997) proposed 0.90 level was exceeded by the GFI and AGFI. With NFI = 0.945, RFI = 0.901, TLI = 0.912, and CFI = 0.985, the incremental fit indices satisfied the requirement of being larger than 0.90 [61]. Finally, parsimonious fit indices (PCFI = 0.845, PNFI = 0.874, and PGFI = 0.701) that show model fit above the 0.50 barrier [61]. In conclusion, the outcomes confirm the established model's effectiveness.

F. Structural Model and Hypothesis Outcomes

In Table 7, an examination of the findings revealed a considerable positive impact of subjective norms on playfulness of robots (H1a–β = 0.563, p < 0.001), PUS of robots (H1b–β = 0.387, p < 0.001), and PEU (H1c–β = 0.611, p < 0.001). Similarly, robot self-efficacy is also significantly and positively related to playfulness of robots (H2a–β = 0.248, p < 0.05), PUS of robots (H2b–β = 0.074, p < 0.001), and PEU (H1c–β = 0.310, p < 0.001). As a result, it supports both the first and second hypotheses. Furthermore, the direct influence of the third hypothesis revealed that playfulness of robots has a positive and significant association with intention to use robots (H3–β = 0.169, p < 0.01); therefore, the third hypothesis is supported. Further, findings indicated that PUS of robots had a positive and significant relationship with intention to use robots (H4–β = 0.632, p < 0.001). According to our results, PEU is also positively related to intention to use robots (H5–β= 0.125, p < 0.001).

Table 7: *Results of direct paths.*

Hypothetical paths		β	S.E.	*t*-value	*p*-value	Confidence interval 95%		Results
						LLCI	ULCI	
H1a	SN→PLF	0.563	0.091	6.196	0.000	[0.459, 0.728]		Supported
H1b	SN→PUS	0.387	0.110	3.510	0.000	[0.114, 0.433]		Supported
H1c	SN→PEU	0.611	0.082	7.435	0.000	[0.412, 0.667]		Supported
H2a	RSE→PLF	0.248	0.085	2.910	0.004	[0.047, 0.458]		Supported
H2b	RSE→PUS	0.074	0.030	2.426	0.001	[0.091, 0.256]		Supported
H2c	RSE→PEU	0.310	0.078	3.985	0.000	[0.114, 0.433]		Supported
H3	PLF→ITU	0.169	0.080	2.121	0.034	[0.266, 0.613]		Supported
H4	PUS→ITU	0.632	0.072	8.806	0.000	[0.322, 0.725]		Supported
H5	PEU→ ITU	0.125	0.045	2.777	0.010	[0.143, 0.484]		Supported

Note: *N*= 475; SN = subjective norms; RSE = robot self-efficacy; PLF = playfulness of robot; PUS = perceived usefulness of robot; PEU = perceived ease of use; ITU = intention to use of robots

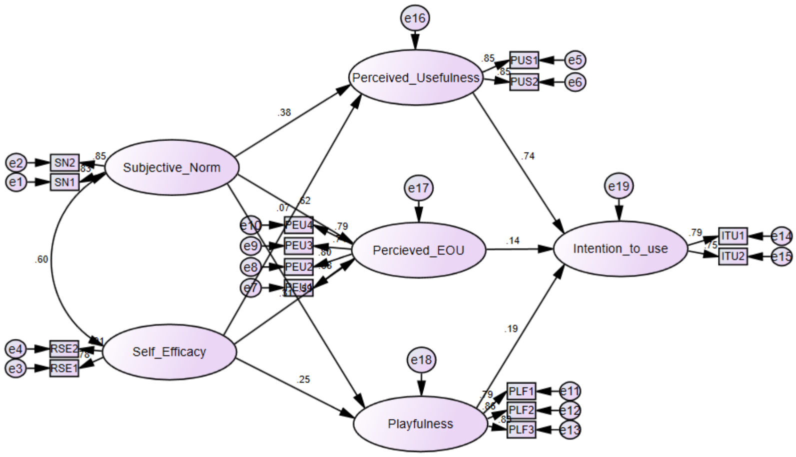

Fig 3. Results of hypotheses

V. DISCUSSION

A. Major Findings

The present study endeavors to verify the applicability of the technology acceptance theory for evaluating the drivers of intention to use robots in hotel industry. The original model was modified and extended by incorporating subjective norms, self-efficacy, playfulness of robots, PUS of robots, PEU of robots, and intention to use robots.

Firstly, based on the findings of the first hypothesis, subjective norms positively correlate with playfulness of robots. These findings are in line with Asif *et al.* [18], who suggest that people tend to follow social norms deemed to be acceptable when engaging in unknown or novel activities, like communicating with robots. Similarly, individuals are more inclined to adopt and display such behavior themselves if the general subjective norm is that having fun with robots is useful or joyful. Moreover, the findings also reveal that subjective norms have a significant and positive influence on PUS. When individuals believe that their friends, family members, or society as a whole approve of the employment of robots, they are more willing to see them as useful tools. In a setting where utilizing robots is accepted as the norm rather than something strange or criticized, subjective norms are established [23]. Also, our results showed to be a positive influence on subjective norms and PEU. Additionally, the findings are consistent with Lei *et al.*[63] indicating that subjective norms may influence their opinions about how simple robots should be handled. When people have positive subjective norms, they are less likely to be afraid of or anxious about using new technology, such as robots. It helps ease worries about possible obstacles or hurdles to know that others find robots useful and easy to operate, which makes the experience seem simpler.

Secondly, the findings of our research articulate that robot self-efficacy has a positive connection with playfulness of robots, PUS, and PEU. The findings are consistent with the prior scholars [13], [31] suggesting that a robot with a high level of self-efficacy is more likely to perform lighthearted activities or engage in lighthearted exchanges with hotel visitors. This may result in a more pleasurable and unforgettable visiting experience, enhancing general contentment and allegiance. Moreover, based on the findings of self-efficacy ad PUS scholars have claimed that the impression of the robot's skill in these duties contributes to its PUS by providing visitors with prompt and trustworthy service [30]. Additionally, a consistent and efficient level of service is expected throughout a guest's stay. The concept of ease of use is enhanced by the belief that robots with strong self-efficacy can do tasks with speed and accuracy. These robots are believed to offer quick and hassle-free assistance to guests. In recent research, Lestari *et al.* [29] suggest that robots with high self-efficacy are more likely to interact well with customers, offering clear instructions and direction.

Lastly, the findings reveal that playfulness of robots, PUS, and PEU has a significant positive influence on behavioral intention use robots. First of all, previous research has shown that playful robots may captivate visitors' attention and provide memorable experiences [35]. When visitors view robots as lively and interesting, they are more inclined to interact with them, interact more often, and understand their abilities [36]. This greater involvement promotes a good attitude toward robots and increases visitors' willingness to use them during their stay. In addition, according to TAM, one of the key determinants of technology acceptance is PUS. In the context of robots, individuals are likely to consider the extent to which robots can enhance efficiency, productivity, or convenience in their tasks or daily lives [32]. It is important for hotel guests to have ease and efficiency during their stay. If customers believe robots can expedite services like room service delivery, concierge services, or check-in/out procedures, they are more likely to value them as practical tools that save them time and effort [43]. Based on the results of PEU and intention to use robots, scholars support our findings that a user's perception of usability may be influenced by intuitive interfaces, clear instructions, and few technological obstacles. In the hotel environment, PEU implies that dealing with robots in a hotel setting is simple and obvious [45]. If visitors believe robots are simple to use and navigate, with clear instructions and user-friendly interactions, they are more likely to feel comfortable utilizing them.

B. Theoretical Implication

This work contributes to the literature in various ways. First, using the technology acceptance model framework, this study contributes to our knowledge of service robot acceptance by evaluating a holistic model that takes into account the factors that impact hotel visitors' behavioral intention. In the last decade, several research have concentrated on advanced technology applications in the hotel business, such as artificial intelligence, robotics, and the automation of services . However, there is limited understanding regarding the impact of guests' knowledge level and previous experiences on their adoption behavior toward advanced technology applications in hotels (e.g., robots). Additionally, the influence of prior literature on the relationship between the PUS of advanced hotel technologies and guests' behavioral intentions remains unclear. Based on Davis [11] TAM idea, this study directly contributes to our current knowledge of how one's PUS and PEU of capable hotel technologies influence overall behavioral intention to embrace technology. This study produces noteworthy results that support the applicability of the theoretical idea on hotel consumers' technology adoption intentions toward such robotic technologies. The study of playfulness toward new technology in hotels, such as AI, robots, and service automation, is unusual and relatively new [64]. This work adds to existing knowledge of robot playfulness toward modern hotel technology in the United States, which is useful for pursuing a new strategic position for future sustainable tourism. The suggested research approach can be adapted and used in other regions or countries that participate in a similar endeavor.

C. Managerial Implication

There are important implications for service robot design and deployment in the hotel and tourist industries from this research. In light of the possible relationship between customer intentions toward robots in hospitality services [37], business managers and robot designers may be able to put strategies in practice based on the affective responses and cognitive assessments found in this study. The goal of these approaches is to increase customer acceptance of service robots. When assessing hotel technological features and services, inexperienced tourists could run into problems. Employees at hotels may help beginner or inexperienced travelers get acquainted with the user-friendly features of hotel technological services, such as check-in/check-out stands, self-service payment options, and in-room facilities.

A cost-benefit analysis of investing in robots may be necessary for managers to evaluate. It could be worthwhile to invest in this technology, as it could increase customer satisfaction and loyalty, making it initial investment worthwhile, if customer find robots to really helpful for activities like room service delivery, personal assistants, or cleaning. In addition, management must evaluate how the hotel's humorous interactions with robots fit into the larger brand image and guest experience plan. The novelty and entertainment value of playful robots for visitors—particularly families and younger audiences—may be increased, but they must enhance rather than take away from the hotel's intended ambiance of refinement and expertise. It is recommended that management regularly assess input from guests in order to assess the efficacy of fun robot deployments and make any required modifications to maximize client pleasure and loyalty.

D. Limitation And Future Research

There are various limitations on this research. *Firstly*, the conceptual model's scope was constrained, and a limited number of TAM constructs were employed in this study. Future studies might corroborate the usage of TAM and hotel technology adoption by including all relevant conceptual types. The validity of the TAM concept might be tested by extending the demographic components further. *Secondly*, the convenience sampling strategy was used by collecting targeted samples from an offline survey method. Consequently, different hotel markets may not be able to use the generalization. To reduce sample bias and generalize the outcome, the sampling selection and collection might be broadened. *Third*, the robotics industry is evolving rapidly. As a result, in the near future, customer beliefs about robotic technology are probably going to shift substantially. As a result, the research's theoretical framework and conclusions are restricted to the present era. Future research should look again at how customers embrace robotic or artificial intelligence machines, and new theoretical frameworks should be developed to account for this behavior as artificial intelligence advances. *Lastly*, the research only examined hotel chains that have used a single kind of service robot: robots with human faces. A variety of non-human robot types may be used in hotels, including mechanical, hybrid, and zoomorphic robots. Further research may examine the relationships within this framework and compare them across diverse robot varieties in order to suggest hotel robot designs that are optimal.

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