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## Article

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## HUMAN-ROBOT INTERACTION: THE HOSPITALITY EXPERIENCE OF YOUNG PEOPLE IN HOTELS THAT USE ROBOTS

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### Abstract

The past years have brought an accelerated use of robots in the hospitality industry to perform several tasks (i.e., front-desk, cleaning, and check-in, among others). In addition to advantages such as better productivity or lower labour shortages, the use of robots in hotels can enhance the tourist experiences. In this context, this study aims to examine some important antecedents of experience of hospitality in hotels that use robots and of behavioural intention to visit these hotels. We extended a framework used in hospitality to include the use of technology (i.e., robots) and describe the human-robot interaction. The data was collected through an online survey and analysed through structural equation modelling (SEM). The findings show that, when hotels use robots, their perceived ability to be experienced as inviting, careful, and comfortable influence the overall experience of hospitality. These antecedents explain 84% in the variance of the overall experience of hospitality in such hotels. Furthermore, the hospitality experience determines to a very high degree the intention behavioural to visit these hotels. Last but not least, robot anxiety negatively affects the perceived ability of hotels to be perceived as inviting, careful, and comfortable. Tourists who are robot anxious think hotels that use robots are less capable of offering positive experiences. These findings bring new theoretical and practical insights that can be employed to adapt the activities of hotels that use robots to appropriately deliver

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their service. The model confirms the influence of the aforementioned factors on the experience of hospitality in the technological context, developing the literature related to the use of robots in hotels. Furthermore, managers interested in investing in the use of these devices to improve the guest experience can become more knowledgeable about the opportunities (developing the ability to be perceived as inviting, careful, and comfortable) and challenges (reducing robot anxiety).

**Keywords:** human-robot interaction, robots used in hotels, robot anxiety, experience of hospitality, intention to visit hotels that use robots

**JEL Classification:** O33, Z30

## Introduction

The use of professional service robots has been experiencing a growing trend in recent years, the development of artificial intelligence (AI), and the COVID-19 pandemics represent two important factors that shaped this evolution. In 2022, global sales increased by 48% (an increase of 158,000 units), the main industries where robot solutions are implemented being transportation and logistics, with an increase of 44%, and hospitality, where the number of robots used increased by 125%. Furthermore, the perspectives of this market are bright, since more than 950 service robot suppliers are active worldwide, 81% being SMEs (International Federation of Robotics, 2023).

The accelerated trend of using robots in hospitality is confirmed by the evolution of the hospitality robot market, whose value is expected to grow from \$295.5 million in 2020 to \$3,083 million by 2030, with a 25.5% CAGR from 2021 to 2030 (Kamble and Deshmukh, 2021). According to the same authors, a robot is any device or system designed to perform a specific set of tasks with unparalleled efficiency and accuracy. Segmented by type, the robots are classified into front desk robots, delivery robots, cleaning robots, and others. Hotels leverage all these types of robot to enhance guest experiences, offering services such as greeting, guiding, and late-night snacks without affecting availability. Robots handle information, front-desk, storage, and check-in/out tasks using technologies such as voice and facial recognition. Their deployment improves service quality, cleanliness, and quick response times. Robots increase productivity, have the potential to cover labour shortages, and increase customer engagement and experience by allowing units to provide personalised guest services (Kamble and Deshmukh, 2021).

The use of robots in hospitality significantly affects customer satisfaction. Research by Kang, Koo, and Chung (2023) underscores how customers' perceptions of robot creepiness or coolness affect their satisfaction levels. Hotels with 'cool' robot receptionists tend to receive higher satisfaction ratings, while those with 'creepy' ones get lower ratings, regardless of service quality. Similarly, Rasheed et al. (2023) note that AI services enhance overall service quality, contributing to higher levels of customer satisfaction. Perceived enjoyment derived from robot interactions further drives customer satisfaction, particularly in restaurants. Furthermore, Liu et al. (2024) highlight how familiarity with technology influences satisfaction, particularly among digital immigrants. Overall, the integration of robots and AI technologies into hospitality not only streamlines operations and improves

service quality, but also improves customer experiences, leading to increased satisfaction and loyalty.

However, due to robot anxiety, customers may show resistance to service robots in the hospitality industry. Wang et al. (2023) examined various negative responses (including safety and privacy concerns, disappointment in robots' abilities) leading to passive and active innovation resistance. Furthermore, human-like robots (compared to machine-like robots) can induce anxiety and discomfort, especially when their appearance and behaviour are too human (Kang, Koo and Chung, 2023). Furthermore, consumers may feel uncomfortable about interacting with machines, fearing the implications of AI/robots, and feeling overwhelmed by technology (Rasheed et al., 2023). The complex interplay of emotions and perceptions surrounding service robots indicates that factors such as perceived warmth and anthropomorphism significantly influence consumer resistance and acceptance of service robots in the hospitality sector.

Thus, factors influencing customers' intention to book hotels using service robots include perceptions of creepiness versus coolness, trust in robot functionality, emotional attachment to robots, value-seeking behaviours, and reactions to social crowding. The perception of coolness for the services provided by robots encourages consumption (Kang, Koo, and Chung, 2023), while negative attitudes toward robots hinder trust, reducing the likelihood to use service robots (Tussyadiah, Zach and Wang, 2020). Functional aspects have a critical role in choosing hotels that use robots (Lee, Lee and Kim, 2021), while technological complexity, technological anxiety, perceived safety, and privacy concerns may reduce the desire of customers to use service robots (Rasheed et al., 2023). Regarding technological challenges, Wang et al. (2022) conclude that individuals with varying levels of tech-savviness exhibit different behaviours and attitudes toward hotels using robots. Tech-savvy individuals are less deterred by barriers associated with robot hotels, they even may perceive barriers as enjoyable challenges and may not be particularly concerned with the difficulty of use, being more likely to stay in a hotel using robots. Hou et al. (2021) suggest that social crowding can improve tourists' willingness to adopt service robots not only during pandemics, representing a flexible solution for service providers also during peak periods.

In this study, we examine the important antecedents of the hospitality experience in hotels that use robots and the behavioural intention to visit these hotels. We extend an existing framework used in hospitality to include the use of technology (i.e., robots) and describe the human-robot interaction. Data were collected through an online survey and analysed using structural equation modelling (SEM). The results are consistent with previous findings that confirm that hotels perceived as inviting, careful, and comfortable significantly enhance the overall hospitality experience (Kim et al., 2021; Choi et al., 2020), which has a positive influence on the customers' behavioural intentions to visit these hotels, adding novelty to the studies carried out by Sugathan and Ranjan (2019), Kim, Lee, and Preis (2020) and Molina-Collado et al. (2024). Furthermore, the negative influence of robot anxiety on the perceived ability of hotels to offer inviting, careful, and comfortable experiences is consistent with Leung (2022) and Savela et al. (2024). Although previous studies have explored the relationship between experience and intention to visit in various tourism contexts, this study is novel in examining this relationship specifically within the context of hotels that use robots to provide services. This adds a new dimension to understanding how technology integration affects hospitality experiences. This approach is

innovative and provides a comprehensive framework for future research and practical/managerial applications in the hospitality industry. Thus, to enhance the experience of tourists and their intention to visit robot-enabled hotels, the units should consider the risks of robot implementation, address robot anxiety, prioritise robot design, and associate human employees with robots in the task-solving process.

## **1. Literature review and hypotheses development**

### **1.1. Experience of hospitality in hotels that use robots**

Competition in the tourism market, changes in tourism consumption behaviour, and the transition to an experience economy in the context of digitalisation have led to a greater preoccupation of the service providers to enhance consumer experience. Furthermore, the use of robots contributes to improving economic performance by reducing costs and increasing the quality of services (Mingotto et al., 2021). The literature is not unanimous on the attitude towards robots, and research shows different conclusions (Mende et al., 2019). Some studies emphasise the benefits (Ivanov, Webster and Berezina, 2017; Tussyadiah and Park, 2018; Wu et al., 2024; Pitardi et al., 2024), while others show the negative effects of implementing robots and of the interaction between humans and robots (Lu et al., 2020; Li et al., 2023). Starting from the economic and social impact of using robots in services, some studies have explored the acceptance or, on the contrary, resistance towards the use of robots (Pelau et al., 2021; Song and Kim, 2022). By exploring the experience of customers, Rasheed et al. (2023) have shown the factors that influence consumer behaviour to accept or reject robots.

Presently, increasingly more travel companies use robots pursuing as main elements functionality, capacity utilisation, and user experience (McNamara and Kirakowski, 2006), yet some more recent studies provide a broader framework for determining components in this process (Rasheed et al., 2023; Ma et al., 2024). Under these conditions, the exploration of factors that influence robot-related experience in tourism is current and necessary (Manthiou and Klaus, 2022; Rasheed et al., 2023). Some studies show that the use of robots in tourism is pertinent when their functions refer to reservations and payments or informing tourists (Ivanov and Webster, 2017). The success of robots in tourism, especially social robots is influenced by the capacity to interact with humans and their usefulness (Breazeal, 2003), but also the feelings of comfort, security, trust robots can induce in consumers (Tung and Au, 2018). In the hospitality industry, anthropomorphic robots, which are associated with a better quality of services, are preferred (Christou, Simillidou and Stylianou, 2020). An important factor that influences the attitude towards robots is age; therefore, tourists from generations Y and Z are more interested in this experience than generation X tourists (Ayyildiz, Baykal and Koc, 2022).

Research conducted on the experience in hotels that use robots has proven the importance of creating new connections between humans and robots, since this co-creation process leads to a generally favourable experience (Tung and Au, 2018). In fact, experience is an important factor in assessing the interaction between humans and robots. To create a favourable experience, Weiss et al. (2009) have developed a set of 5 indicators to monitor this interaction: feelings of security and comfort, which entails removing dangers that may occur (feeling of Security), robots' ability to interpret human reactions (Human-Orientated Perception), surprise and joy (Emotion), a highly intuitive interface of the humanoid robot

(Embodiment) and a close human-robot collaboration, considering the robot's personality (Co-Experience with Robots). In hospitality, Pijls et al. (2017) have performed a broad study and identified three experiential factors of hospitality: the experience of inviting, the experience of care, and the experience of comfort. The experience of inviting has had the most significant effect on the overall experience of hospitality, while the contribution of the three satisfaction-related factors was virtually equal (Pijls et al., 2017). Considering that these factors shape the hospitality experience and the use of robots in hotels could improve the experience of tourists, we hypothesise:

*H1. The perceived ability of hotels that use robots to be perceived as inviting has a positive effect on the overall hospitality experience;*

*H2. The perceived ability of hotels that use robots to be experienced as being careful has a positive effect on the overall hospitality experience;*

*H3. The perceived ability of hotels that use robots to be comfortable has a positive effect on the overall hospitality experience.*

As shown above, the use of robots in hotels could improve the overall experience (Tung and Au, 2018; Mariani and Borghi, 2021). When robots replace the interaction directly, the travel experience is totally transformed (Tussyadiah, 2020). Furthermore, the adoption of technology when it comes to endowments and services in the hotel sphere influences the intentions of consumers to visit (Yang et al., 2021; Kim et al., 2024; Soliman et al., 2024). Then, we hypothesise that:

*H4. The overall hospitality experience in hotels that use robots has a positive effect on the intention to visit such hotels.*

## **1.2. Effect of robot anxiety on the experience of hospitality**

Anxiety, generally defined as a state of uneasiness, worry, and fear, ranging from low to high levels (Erebak and Turgut, 2021), takes upon a different form when correlated with digital advancements, i.e., technophobia, an intense dislike or deep fear towards digitalisation, computers or use of advanced devices (Leung, 2022). The accommodation sector is traditionally a human labour-intensive area, where little to no technology advancement seemed to be possible. However, technology has increasingly made its presence apparent in recent years, with the introduction of check-in kiosks, vending machines, automated systems for room access, the emergence of humanoid and android robots to Yobot, the robot bellboy or Hilton Hotels' concierge robot (Yang et al., 2021). Hotels perceive robots as a new type of employee, an improvement in terms of effectiveness of operations and an efficient cost-cutting strategy. Despite all of these benefits, the use of service robots in hotels can bring substantial changes in how guests perceive the overall experience of their hotel stay (Tussyadiah et al., 2020; Liu et al., 2024; Jin, 2024; Soliman et al., 2024).

One of the main features that a hotel relies on in order to attract and keep a loyal clientele is its ability to be perceived as inviting, so that guests feel welcome and have a pleasant stay (Kim et al., 2021). Furthermore, perceived risks and disadvantages, such as effort expectancy and trust in robot use, linked to privacy and performance, have been shown to

negatively influence the preference for a hotel that uses robots (Choi et al., 2020). Based on these, we hypothesise:

*H5. Robot anxiety has a negative effect on the perceived ability of hotels that use robots to be perceived as inviting.*

Another aspect that shapes hotel clientele refers to the ability of hotels to be perceived and experienced as being careful toward their clientele (Lee et al., 2021). This feature gained a prominent importance during the Covid-19 pandemic, as studies show that during two years, hotels that used service robots were perceived as safer and were therefore preferred to those that employed only human staff. These findings differed from studies conducted before the pandemic period (Kim et al., 2021). Other perceived benefits of robot usage in hotels include saving money and time, flexibility, enhanced safety, a one-of-a-kind experience (Ivanov et al., 2018), thus introducing the idea that hotels that use robots for their operations are careful towards the guests' experience (Lin and Matila, 2021). However, a study by Tussyadiah et al. (2020) revealed that it all eventually comes down to the mere question of trust in technology and, as it was shown, the level of reluctance towards novel technology usage in hotels is still high. Therefore, we hypothesise:

*H6. Robotic anxiety has a negative effect on the perceived ability of hotels that use robots to be as careful.*

The perceived ability of hotels that use service robots to create a comfortable environment is of great importance and has been studied by Choi et al. (2020), Erebak and Turgut (2021), and Yang et al. (2021). The findings of Erebak and Turgut (2021) revealed that the interaction experience made guests feel uncomfortable from the very first contact, as guests showed a reluctance towards getting closer to the reception robots. Once they did, the scarce communication abilities of those robots left the guests disappointed. Furthermore, some studies (Chan and Tung, 2019; Yu, 2020) revealed that hotel guests feel more comfortable in the presence of human staff, describing the experience as involving a higher degree of service quality, as opposed to robot interaction, for the same service. Other sources of uneasiness stem from the facial features of robots, as stated by Fu et al. (2022). Humanoid robots make hotel guests uncomfortable, especially if their facial features are not perfect; according to the 'uncanny valley effect', they remind guests of deceased people, thus creating a very uncomfortable environment. Consequently, we hypothesise:

*H7. Robot anxiety has a negative effect on the perceived ability of hotels that use robots to feel comfortable.*

## 2. Methodology

### 2.1. Design and measurement

This paper is based on quantitative data, respectively, a survey organised in Romania in order to test the hypotheses involved by the proposed conceptual model. As recommended, we opted to use constructs and items from previous studies to measure our variables, adapted and translated from different sources. That is, Pijls et al. (2017) for perceived ability of hotels to be experienced as inviting, careful and comfortable and overall experience, Yang et al. (2021) for behavioural intention to visit hotels and Saari et al. (2022) for robot anxiety. Some constructs have never been used before by other researchers

for the use of robots in hotels, so we borrowed the constructs from the hospitality literature and adapted them to correspond to the research context (i.e., for the use of robots in hotels). For example, in the case of perceived ability of hotels to be experienced as inviting, the original item proposed by Pijls et al. (2017) is 'Organisation X feels inviting' and we adapted it to 'I perceive a hotel that uses robots as inviting'. By doing this, we could create appropriate items to measure variables that describe the experience created based on the use of robots in hotels. In the questionnaire these items were evaluated on a seven-point Likert scale from "strongly disagree" (1) to "strongly agree" (7). Additional questions were included to rate sociodemographic variables: age, gender, income, residency. Google Forms were used to distribute the questionnaire, using a convenience / purpose sampling technique to reach a high number of responses.

The data collected were transferred to IBM SPSS 29 and IBM AMOS 29 software to analyse them and test the hypotheses implied by the conceptual model. Specifically, structural equation modelling (SEM) techniques were employed to test the associations between the variables in conjunction with confirmatory factor analysis (CFA) to evaluate the measurement model. The use of covariance-based SEM techniques is considered appropriate considering the intention to test hypotheses based on reflective indicators and verify an existing theory in hospitality studies. Therefore, our aim is to validate a general model of hospitality experience proposed by Pijls et al. (2017) and described by constructs such as the ability of hotels to be perceived as inviting, careful, and comfortable in the new context of robots' use in these establishments; furthermore, we aimed to test the influence of robot anxiety on these abilities and of guest experience on their intention to visit these hotels.

## 2.2. Sample

The aim of the study was to collect relevant data about the use of technology in hospitality. As such, we chose to apply the questionnaire within a young sample, since young people have a higher propensity for technology use and a natural interest in it. To understand people's reactions to new technological solutions, a first step is to make sure that they use those technologies. Therefore, the choice of young people was considered auspicious. Furthermore, to guarantee a correct understanding of the use of robots in hospitality, the young people included in the survey were represented by students related to these subjects (respectively, technology, and tourism). Given the fact that not too many hospitality operators actually use robots to serve customers at the moment, we used a video that portrays a hotel that implemented robots in different areas such as reception, lobby, or bar. Respondents were asked to view a video titled "Alibaba's keyless and cashless hotel is straight out of the future" (CNBC International, 2020) and imagine themselves as customers of this hotel while watching it; then they filled in the questionnaire. This enabled us to measure their perception regarding the constructs included in the study, the anticipated hospitality experience, and behavioural intention to visit hotels that use robots.

415 respondents filled in the questionnaire; after cleaning the data based on response engagement and elimination according to Mahalanobis distance (D2), a number of 345 responses were deemed appropriate for analysis. This sample size is considered to be more than suitable according to Marsh, Balla, and MacDonald (1988), who recommended a minimum size of 200 for SEM in AMOS. Moreover, to avoid problems with deviations from normality, Hair et al. (2010) suggested 15 responses for each parameter included in



the model. Since our model is based on 23 items, the number implied by Hair et al. (2010) is 345. Of this sample, 5% are 18 and 19 years old, 61% are 20 years old, 22% are 21 years and the rest older. In terms of gender, 39% are male and 61% female; moreover, approximately 79% live in urban areas and 21% in rural ones. Even though this is a nonrepresentative sample and the results might be more relevant to these age groups that live in cities, the findings represent a first step in understanding how customers relate to robots implemented in hotels.

### 3. Results

#### 3.1. The measurement model

In order to evaluate our measurement model, we applied the confirmatory factor analysis (CFA) in AMOS and used the Cronbach's alpha coefficients in SPSS ( $\alpha$ ). As the information in Table no. 1 shows that the validity and reliability of the model are very good. First, all factor loadings are above 0.7, proving an adequate convergent validity. Having these values above the threshold of 0.7 is considered excellent (Hair et al., 2010).

**Table no. 1. Summary of validity and reliability measures**

Variable	Abbrev.	Item	Factor loading	Composite reliability (CR)	Average variance extracted (AVE)	Cronbach alpha ( $\alpha$ )
Perceived ability of hotels to be experienced as inviting	INV	INV1	0.918	0.923	0.751	0.892
		INV2	0.907			
		INV3	0.767			
Perceived ability of hotels to be experienced as careful	CARE	CARE1	0.815	0.875	0.686	0.912
		CARE2	0.855			
		CARE3	0.861			
		CARE4	0.800			
		CARE5	0.810			
Perceived ability of hotels to be experienced as comfortable	COM	COM1	0.932	0.989	0.902	0.964
		COM2	0.975			
		COM3	0.942			
Overall experience in hotels using robots	AER	AER1	0.937	0.952	0.799	0.936
		AER2	0.921			
		AER3	0.863			
		AER4	0.853			
Behavioural intention to visit hotels that use robots	BI	BI1	0.866	0.887	0.702	0.878
		BI2	0.822			
		BI3	0.824			
Robot anxiety	RA	RA1	0.818	0.971	0.844	0.939
		RA2	0.972			
		RA3	0.958			

Additionally, the average variance extracted (AVE) ratings for all constructs exceed the 0.5 recommended limit (Hair et al., 2010), showcasing very good convergent validity. The values are much above the limit, ranging from 0.686 for the perceived ability of hotels to be

experienced as careful to 0.902 for the perceived ability of hotels to be perceived as comfortable. In terms of reliability, all Cronbach alpha ( $\alpha$ ) and all composite reliability (CR) coefficients are above the suggested limit (Hair et al., 2010; Hu and Bentler, 1999) that shows that all constructs included in the conceptual model are highly reliable, generating precision and consistency. Since Cronbach's alpha ranges from 0.878 to 0.964 and CRs from 0.875 to 0.989 (Table no. 1), we can derive that the measurement model has optimal reliability.

Moreover, as presented in Table no. 2, the Fornell-Larcker criterion proves that the model has very good discriminant validity. This norm assumes that all square roots of AVE have to exceed the correlation with any other variable in the matrix (Fornell and Larcker, 1981). Table no. 2 contains the square root of AVE on the diagonal (bolded) and the correlations with all other constructs in the rest of the table. As we can notice, the Fornell-Larcker criterion holds for all constructs. For example, in the case of the perceived ability of hotels to be experienced as inviting (INV), the square root of AVE (0.867) is greater than the correlations with all other variables (from -0.439 for robot anxiety to maximum 0.845 for anticipating general experience in hotels using robots). Taking into account all of this, we can conclude that the findings of the hypotheses based on this model can be considered reliable and valid, the results being generalisable.

**Table no. 2. Discriminant validity using the Fornell-Larcker criterion**

	INV	CARE	COM	AER	BI	RA
INV	<b>0.867</b>					
CARE	0.799	<b>0.828</b>				
COM	0.766	0.788	<b>0.949</b>			
AER	0.845	0.826	0.801	<b>0.893</b>		
BI	0.805	0.786	0.813	0.828	<b>0.837</b>	
RA	-0.439	-0.399	-0.519	-0.446	-0.555	<b>0.918</b>

Last but not least, we verified the fit of the model and all parameters demonstrate adequacy. The fit indices that describe the goodness-of-fit are: chi-square =360.405 with 172 degrees of freedom and  $p < 0.001$ , chi-square /d.f. = 2.0955, NFI = 0.954, IFI =0.975, TLI = 0.970, CFI = 0.975, RMSEA =0.056 and SRMR = 0.0313. Bearing in mind the suggestions of Hair et al. (2010), we conclude that the model fit is appropriate. Moreover, we derive that our measurement instrument adequately assesses the theoretical constructs and can be used to verify the hypotheses.

### 3.2. The structural model

Our findings regarding the structural model and the implied relationships are presented in Figure no.1 and Table no. 3 (path coefficients and  $R^2$ ). First, as seen in Figure no. 1, the robot anxiety variation explains around 19% of the variance in perceived ability of hotels that use robots to be experienced as inviting, about 16% in perceived ability of hotels to be experienced as careful, and about 27% in the perceived ability of hotels to be experienced as comfortable, which imply a small to medium association. It is clear why we obtain such results given the fact that the ability of hotels with robots to be experiences as inviting, careful, or comfortable is explained by other factors besides robot anxiety. However, such anxiety modification describing 19%, 16%, respectively 27% of the variance of the aforementioned capabilities of hotels using robots is an important factor given the negative

influence of this feeling on the dependent variables. If people feel robot anxious, they will evaluate the hotels using robots less capable to be experienced as inviting, careful, and comfortable. More importantly, the variance in the perceived ability of hotels that use robots to be experienced as inviting, careful, and comfortable explains 84% in the variance of the overall experience of hospitality in such hotels, which is extremely good. Furthermore, the variance in the overall experience of hospitality represents 80% of the variance in the intention to visit hotels that use robots. These high levels of  $R^2$  show that our model fits the observations and well explains the variation in the dependent variables.

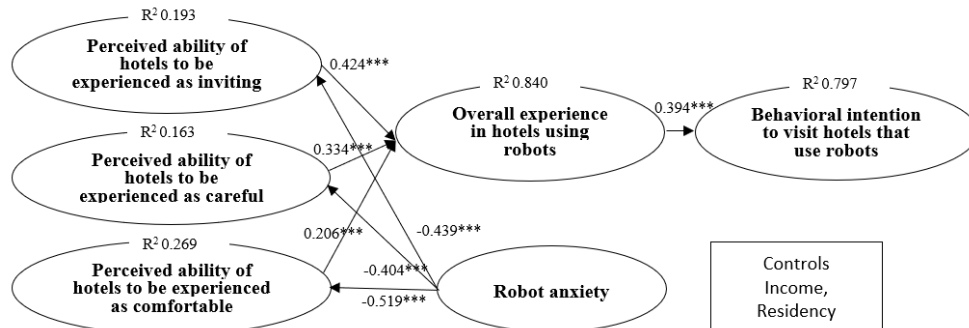


Figure no. 1. Estimates of parameters of the conceptual model

Note: Significant at \*\*\* $p < 0.001$ .

Furthermore, the fit of the model in AMOS is still very good with: chi-square = 381.000 with 213 degrees of freedom and  $p < 0.001$ , chi-square / df = 1.789, NFI = 0.952, IFI = 0.978, TLI = 0.974, CFI = 0.978, RMSEA = 0.048 and SRMR = 0.0325. These values of good model fit prompt us to continue with testing the hypotheses, as seen in Table no. 3, looking at the standardised beta ( $\beta$ ) coefficients and their associated p-value.

Table no. 3. Direct effects and hypotheses testing

Path	Standardised $\beta$	p-value	Hypothesis (H)	Result
INV $\rightarrow$ AER	0.424	***	H1	Supported
CARE $\rightarrow$ AER	0.334	***	H2	Supported
COM $\rightarrow$ AER	0.206	***	H3	Supported
AER $\rightarrow$ BI	0.394	***	H4	Supported
RA $\rightarrow$ INV	-0.439	***	H5	Supported
RA $\rightarrow$ CARE	-0.404	***	H6	Supported
RA $\rightarrow$ COM	-0.519	***	H7	Supported

Note: \*\*\*  $p < 0.001$ .

First, we looked at the effect of perceived ability of hotels that use robots to be perceived as inviting, careful, and comfortable on the anticipated experience of hospitality in such hotels. Given the p-values below the significance limit, we accept hypotheses H1, H2, and H3. The perceived ability of robot-equipped hotels to be perceived as inviting ( $\beta = 0.424$ ,  $p < 0.001$ ), as careful ( $\beta = 0.334$ ,  $p < 0.001$ ) and comfortable ( $\beta = 0.206$ ,  $p < 0.001$ ) have a direct significant effect on the overall experience in robot-equipped hotels. The first independent variable (INV) has the strongest effect on the overall experience, influencing the dependent variable more than the other two perceived abilities. Also, the expected general experience in hotels with robots has a direct significant effect on the behavioural

intention to visit such hotels ( $\beta = 0.394$ ,  $p < 0.001$ ), motivating us to accept H4. We can notice that these standardised path coefficients indicate a medium-to-large effect for two variables and a medium-to-small effect for the other (the perceived ability to be perceived as comfortable).

Second, using the same procedure, hypotheses H5, H6, and H7 are supported since the p-values are below the threshold. Specifically, robot anxiety has a significant negative effect on the perceived ability of hotels that use robots to be perceived as inviting ( $\beta = -0.439$ ,  $p < 0.001$ ), careful ( $\beta = -0.404$ ,  $p < 0.001$ ) and comfortable ( $\beta = -0.519$ ,  $p < 0.001$ ). This means that the individuals with a high anxiety around robots will perceive hotels that use robots less inviting, less careful, and less comfortable. All effects are medium or large, indicating a strong impact on the dependent variables. Since we know that these variables significantly influence the overall experience of hospitality which determines the intention to visit this type of hotels, it is important for hotel managers that want to implement robots in their establishments to segment clients and attract those with lower levels of robot anxiety or to reduce this fear through familiarisation.

#### 4. Discussion and conclusions

This research examined the impact of robot use on the hospitality experience and behavioural intentions among young people in the hospitality industry. We retrieved the model created by Pijls et al. (2017) to describe the experience of hospitality and extended it to include the human-robot interaction. Following, we will describe how our results relate to existing studies and contribute to the expansion of the specialised literature.

First, our study confirmed that the perceived ability of hotels using robots to offer inviting, careful, and comfortable experiences significantly affects the overall hospitality experience, directly influences customers' behavioural intention to visit these hotels. Hotels that are perceived as inviting, meaning open and allowing guests to feel a sense of freedom, strongly enhance the overall hospitality experience. Hotels perceived as careful in their service, such as responding to customer needs and relieve guests of tasks or worries, contribute positively to the overall hospitality experience, reinforcing previous findings by Kim et al. (2021). Similarly, guests who feel comfortable and at ease in hotels using robots have a more positive hospitality experience. Although this factor had a slightly smaller effect than the inviting and careful factors, it remains a significant aspect, consistent with Choi et al. (2020). Overall, the inviting factor had the strongest impact on the overall hospitality experience, followed by the carefully and comfortably factors. The study of the effect of robots on the guest experience in hotels has been carried out sporadically in the literature. For example, Wang and Fu (2024) conducted qualitative research in smart hotels to study the experience between humans and robots, but did not test the antecedents of the hospitality experience in the robotic context. Therefore, our study compensates and contributes to the literature by using the hospitality experience model with the three factors to describe the robotic experience. We concluded that the experience in hotels using robots can be explained and influenced by their ability to be perceived as inviting, careful, and comfortable, an aspect that has not been previously mentioned in the literature.

Second, the hospitality experience created by hotels that use robots to provide services directly influences customers' behavioural intentions to visit these hotels. The relation between experience and visitor intention was studied in tourism (Sugathan and Ranjan,

2019), in food tourism (Molina-Collado et al., 2024), and in VR tourism (Kim, Lee, and Preis, 2020), but not within a context in which hotels use robots to deliver the service. Furthermore, Shin et al. (2022) created a model in which technology experience determines technology use. Combining these two types of experience (i.e., hospitality and technology), we create a novel way to understand the experience of hospitality adapted to the situation in which technology is used, specifically where robots are implemented to substitute some of the human actions. This element of novelty brought to the literature by our article is extremely important considering the current technological evolution and the ongoing trend toward the use of robots by hotels.

Third, robot anxiety was found to negatively influence the perceived ability of hotels to offer inviting, careful, and comfortable hospitality experiences. Higher levels of robot anxiety were associated with lower perceptions of hotels as inviting, careful, and comfortable. Those who are uncomfortable or fearful of robots tend to believe that robot-enabled hotels are less attentive to their requirements, creating barriers to feeling welcome and at ease in these hotels. These findings are consistent with research by Leung (2022), who evaluated robot-related anxiety in hotels, focussing on spatial distance and communication, and Savela et al. (2024), who highlighted the role of anxiety in influencing perceptions of urban spaces. Furthermore, these findings are consistent with research by Tussyadiah et al. (2020), which highlighted that trust in technology is essential for a positive perception of robot-enabled hotels. Soliman et al. (2024) studied the effect of anxiety on attitudes towards robots and expectations regarding the positive and negative emotions of their use, but not on the perceived experience. Thus, the present study contributes theoretically by marking for the first time the negative influence of robot anxiety on the three factors that describe the experience of hospitality, respectively, the abilities of hotels to be perceived as inviting, careful, and comfortable.

Additionally, the structural model demonstrated strong reliability and validity. Robot anxiety explained 19% of the variance in the inviting factor, 16% in the careful factor, and 27% in the comfortable factor. Despite other contributing factors, robot anxiety remains a significant determinant of these perceived hospitality qualities. The perceived ability of hotels that use robots to offer inviting, careful, and comfortable experiences explained 84% of the variance in the overall hospitality experience, which explained 80% of the variance in customer behavioural intentions to visit robot-enabled hotels. These findings support the research by Shin et al. (2022), which highlighted the importance of technology experiences in driving technology use, and Tussyadiah et al. (2020), who demonstrated the strong link between a positive hospitality experience and behavioural intentions.

Cultural and demographic factors influencing robot anxiety can inform segmentation strategies and tailored marketing approaches. Examining the effects of robot design and interaction quality on customer perceptions can provide practical insight into improving the guest experience. Understanding how robots and humans can co-create positive hospitality experiences is crucial for effective service delivery. Furthermore, more research is needed to understand the broader economic and social implications of integrating robots into hospitality services.

Although the present study makes multiple contributions to the literature, we can mention some of its limitations. First, the results are based only on quantitative data obtained in a single country and within a certain age group. Therefore, it is recommended in the future to expand the sampling to include other geographical areas and other age groups.

Furthermore, future studies based on other research methods could refine the influence of robots on hotels, developing the explanation of the advantages and disadvantages related to their use. Second, another limitation of this study is the testing of the model that describes the hospitality experience based on watching a video. Thus, another future research direction involves validating the model based on direct interaction between humans and robots, since perceptions may differ in the case of an imagined experience and a real one. Last but not least, the proposed model does not include antecedents of robot anxiety. Consequently, the model can be extended to include some factors that influence anxiety.

### Managerial implications

Some practical implications can be derived from the results of this research. The fast and constant evolution of technologies requires considering the risks of implementing a specific technology. In this sense, this study emphasises some obstacles that could help companies justify future investments in technology, and adopt these devices with greater awareness about the opportunities and challenges. For that, this article can help practitioners think about the potential to offer different services more efficiently, once they know some disadvantages of using them, as one of the main drawbacks is the anxiety they generate. For example, this anxiety is coloured by cultural perceptions and age. Therefore, companies need to discover which segments have less technological anxiety and which variables influence this anxiety. For that, the proposed article emphasises the need for more research to investigate the antecedents of anxiety.

Furthermore, some studies suggest the influence of robot design characteristics on the quality of interaction (Ivanov et al., 2019). In this sense, companies need to give priority to the functional and physical aspects of robots. Our study highlights the need to coordinate the opinions of manufacturers and tourism managers to design user-friendly robots that focus on tourists' needs to improve perceptions and eliminate anxiety. Our findings show that robots must be manufactured to offer an inviting, careful, and comfortable experience, as these are the antecedents of the overall tourist experience, which later on determines tourists' intention to visit robot-based hotels. Lastly, since social interaction is an important variable for tourists to have a nice tourism experience, it is necessary to think about the possibility of combining robots and employees with the idea of increasing the service experience through co-creation (Ivanov et al., 2019). This means that hotel managers need to coordinate robots with humans to overcome the disadvantages of the first. Additionally, both have to offer distinct and unique service features to create a satisfactory hospitality experience.

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