

Understanding Cultural Differences in Hospitality Students' Acceptance of Service Robots: A Cross-National Study in Portugal, Brazil and Greece

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ABSTRACT

This study explores how cultural differences influence hospitality students' acceptance of service robots and their intention to work in partially robotized environments. Building on the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB) and Hofstede's cultural dimensions, this cross-national study compares the perceptions of 532 hospitality and tourism students from Portugal, Brazil, and Greece. Using multivariate analysis (MANOVA) and multi-group structural equation modelling (MGSEM), the findings reveal significant differences across countries. Greek students express the highest willingness to work with robots, while Portuguese students report stronger attachment to traditional hospitality values. Although culture significantly influences students' views on hospitality and robot use, it does not directly predict their intention to work in robotized environments—suggesting other factors mediate this relationship. The study highlights the importance of embedding technological competencies and emotional intelligence in hospitality education, while offering practical guidance for AI developers and human–robot interaction (HRI) designers. These findings contribute to cross-cultural research on service robot acceptance and provide actionable insights for preparing the future workforce in the context of hospitality automation.

Keywords: Service robots, Hospitality students, Cultural differences, Human–robot interaction, Technology Acceptance Model, Theory of Planned Behavior, Cross-national comparison.

INTRODUCTION

The tourism and hospitality sectors have become key drivers of the global economy, leading major hotel brands to prioritise both guest and employee well-being (Malheiro et al., 2020). To meet rising customer expectations and deliver distinctive service experiences, many hotels have adopted innovative solutions—including the integration of robots into operational tasks (Palrão et al., 2023).

Research on robotics in hospitality is expanding rapidly and is expected to grow even further (Ivanov et al., 2019). For hotel managers, robots offer several advantages: they reduce operational costs, improve service efficiency, minimise human error, and help address labour shortages (Belanche et al., 2020). Automated check-in and check-out processes are particularly valued for their speed and ability to reduce queues, enhancing the overall guest experience (Qiu et al., 2020).

Despite these benefits, integrating robots into service encounters poses significant challenges. One of the main difficulties lies in combining technological efficiency with the emotional dimension of hospitality (Carvalho et al., 2022; Rosete et al., 2020). Human interaction plays a central role in creating memorable guest experiences, and machines are not yet able to replicate empathy in spontaneous verbal and non-verbal exchanges (Bowen & Morosan, 2018; Lee et al., 2021).

The successful use of service robots also depends on contextual factors such as infrastructure, staff training, and user acceptance (Choi & Wan, 2021). Many hotel professionals are not adequately prepared to work with robotic systems, and guests may resist interactions that lack human warmth (Von Krogh, 2018; Motta & Sharma, 2019). Furthermore, employees may perceive robots as a threat to job security, especially in cultures where interpersonal relationships are central to service delivery (Yam et al., 2022; Yu, 2020).

Understanding how future professionals perceive robotisation is critical. Their expectations and attitudes will shape how the technology is implemented and accepted in the industry. This study builds on the work of Palrão et al. (2023) by examining students' willingness to work in partially robotized environments. It expands on previous research in three key ways: (1) by adopting a cross-cultural approach with samples from Portugal, Brazil, and Greece; (2) by testing a mediation model informed by the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and Cultural Intelligence Theory; and (3) by exploring practical implications for hospitality education, technological design, and workforce planning.

Cultural background is known to influence technology adoption. Studies have shown that acceptance of robotics in service contexts varies across regions, shaped by long-term orientation, tradition, and openness to change (Djekic, 2021; Ayyildiz et al., 2022). For example, East Asian cultures often value stability and future planning, while many Southern European and Latin American countries emphasise relational warmth and short-term satisfaction (The Culture Factor Group, 2024). These differences may affect how service robots are perceived by future professionals.

This study compares student perceptions in Portugal, Brazil, and Greece—three countries with shared hospitality values but distinct cultural dimensions. By investigating how culture shapes attitudes toward service robots and intention to work with them, the study contributes to a deeper understanding of cross-cultural dynamics in hospitality technology adoption. It also provides evidence to support more culturally sensitive approaches to education, workforce development, and HRI design.

Study Context

Cultural studies play a pivotal role in understanding how culture shapes individuals, organizations, and entire nations. Within this scope, Chun et al. (2021) assert that culture significantly influences various aspects of society. In this context, it is noteworthy that despite originating in the 1980s, Hofstede's cross-cultural model dimensions (power distance, uncertainty avoidance, individualism *versus* collectivism, and masculinity *versus* femininity) remain relevant and are the most widely used for studying cultural differences among nations (Gupta et al., 2018; Hofstede, 1980). Subsequently, Hofstede et al. (2020) incorporated Long-Term Orientation into their model as the fifth dimension. This dimension assesses the stance towards change and will serve as the basis for exploring how future professionals in the tourism and hospitality sector, originated from different countries, perceive the future. Although not the focus of this research, it is important to note that in 2010 (Heydari et al., 2021), the dimension of indulgence versus restraint also became part of the model. These dimensions were created along a continuum between two extremes, where individuals from different countries could be evaluated in relation to each other (Figure 1).

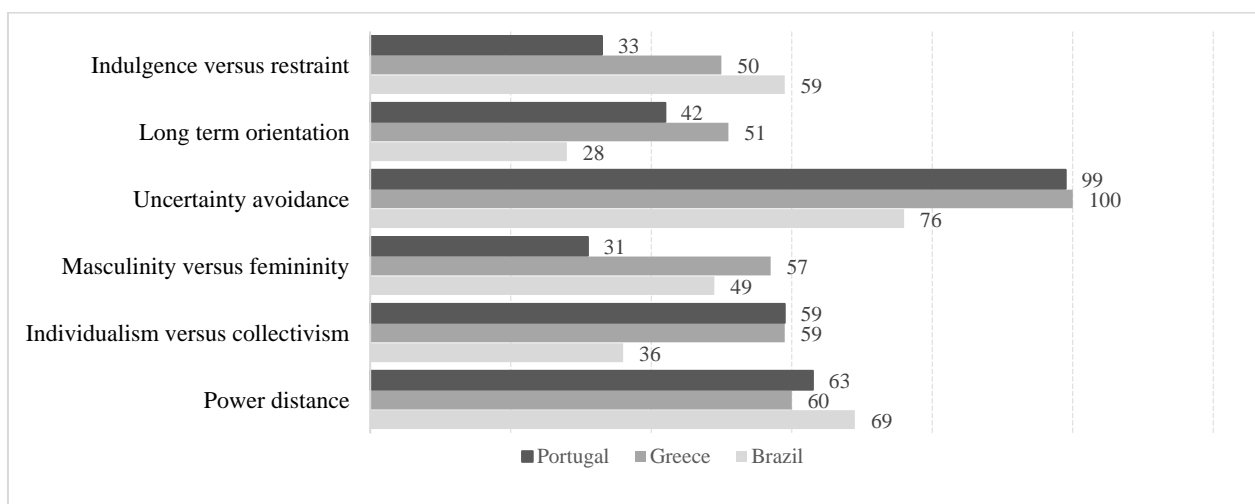


Figure 1. Comparison of the dimensions of Hofstede's cross-cultural model in the three countries under study.**Source:** *The Culture Factor Group, 2024.*

Hofstede et al. (2020) argue that cultures exhibit relative stability, with social values deeply rooted in historical contexts, thereby influencing the future. Comparing the cultures of Brazil, Greece, and Portugal in light of Hofstede's model is pertinent due to the particularities and similarities that these countries can share, which can be better understood through the six dimensions mentioned. The values of each culture have a unique past that typically prevails over time. Additionally, Djekic (2021) highlights that Brazil, Greece, and Portugal belong to a group characterized by low levels of the Term Orientation Index (TOI), indicating a strong respect for tradition. In these three countries, cultural backgrounds and hospitality in tourism play crucial roles in the visitor experience, offering an authentic connection to local traditions (Kastenholz & Carneiro, 2023). The Culture Factor Group's study (2024) further supports these findings. Brazil demonstrates a robust adherence to traditions and a relatively low inclination to save for the future. Greece, on the other hand, occupies an intermediate position in this dimension, reflecting a balanced approach. Portugal shares similarities with Brazil, emphasizing normative thinking and a focus on achieving immediate results. Table 1 delineates the principal similarities between the countries under study (Hofstede et al., 2020), elucidating the rationale for their selection. Analyzing the three cultures reveals that, despite shared characteristics, each country exhibits distinct particularities that influence the practice and perception of hospitality. Brazil, Greece, and Portugal demonstrate a collectivist orientation, which manifests in their engagement with guests. However, they diverge in their approach to life, with Brazilians exhibiting higher levels of indulgence compared to the Portuguese and Greeks (Kastenholz & Carneiro, 2023).

Hospitality holds paramount importance in all three countries, underscoring the value placed on interpersonal relationships. Nonetheless, the perceptions and practices of hospitality vary across cultures. Hofstede's model provides a framework for comprehending these subtleties. These cultural differences and similarities are crucial for a deeper, more culturally nuanced understanding of hospitality (The Culture Factor Group, 2024).

Table 1. Hofstede dimensions in Brazil, Greece and Portugal.

Hofstede dimensions	Brazil	Greece	Portugal
Power distance	<ul style="list-style-type: none"> ▪ High hierarchical distance ▪ Respect for hierarchies ▪ Acceptance of power inequalities 	<ul style="list-style-type: none"> ▪ High hierarchical distance ▪ Respect for hierarchies ▪ Acceptance of power inequalities 	<ul style="list-style-type: none"> ▪ High hierarchical distance ▪ Respect for hierarchies ▪ Acceptance of power inequalities
Individualism <i>versus</i> collectivism	<ul style="list-style-type: none"> ▪ Collectivist orientation ▪ Emphasis on interpersonal relationships 	<ul style="list-style-type: none"> ▪ Collectivist orientation ▪ Emphasis on interpersonal relationships 	<ul style="list-style-type: none"> ▪ Collectivist orientation ▪ Emphasis on interpersonal relationships
Masculinity <i>versus</i> femininity	<ul style="list-style-type: none"> ▪ Balance between masculine and feminine characteristics ▪ Success and quality of life have the same value 	<ul style="list-style-type: none"> ▪ Masculinity dominance ▪ Emphasizes success and competition 	<ul style="list-style-type: none"> ▪ Femininity dominance ▪ Emphasizes quality of life and social solidarity
Uncertainty avoidance	<ul style="list-style-type: none"> ▪ High uncertainty avoidance ▪ Valuing predictability and security 	<ul style="list-style-type: none"> ▪ High uncertainty avoidance ▪ Valuing predictability and security 	<ul style="list-style-type: none"> ▪ High uncertainty avoidance ▪ Valuing predictability and security
Long term orientation	<ul style="list-style-type: none"> ▪ Short-term orientation ▪ Valuing traditions ▪ Respect for social norms 	<ul style="list-style-type: none"> ▪ Short-term orientation ▪ Valuing traditions ▪ Respect for social norms 	<ul style="list-style-type: none"> ▪ Short-term orientation ▪ Valuing traditions ▪ Respect for social norms
Indulgence <i>versus</i> restraint	<ul style="list-style-type: none"> ▪ High indulgence ▪ Valuing happiness and fun 	<ul style="list-style-type: none"> ▪ High restraint ▪ Controlled needs and desires 	<ul style="list-style-type: none"> ▪ High restraint ▪ Controlled needs and desires

Source: The Culture Factor Group, 2024.

THEORETICAL BACKGROUND

Culture and Hospitality

In the field of tourism, delineating the influence of culture on the reception of tourists proves challenging, as the cultural values inherent to each nation profoundly shape perceptions of hospitality (Valduga, 2019). Hospitality, defined as the interaction between visitors and hosts, is often a pivotal factor in destination selection (Costa et al., 2020). Obrador (2020) posits that hospitality is a critical success factor in the tourism sector because the provision of authentic experiences enhances guest satisfaction, thereby bolstering the competitive advantage of hospitality establishments.

The interpretation of hospitality can vary significantly across cultural contexts. For instance, while some cultures may equate good hospitality with the provision of food and beverages, others may prioritize offering a comfortable and private space (Walters et al., 2021). Understanding these cultural nuances is essential for shaping richer and more meaningful guest experiences (Radojevic et al., 2019). Yet, despite its importance, the conceptualization of hospitality among future professionals remains underexplored (Palrão et al., 2023), especially in the context of ongoing technological disruptions.

In Brazil, hospitality is strongly associated with emotional expressiveness and interpersonal warmth, shaped by a blend of indigenous, African, and European traditions. Social interaction often involves physical proximity, affection, and festive engagement (Lourenção et al., 2019). These cultural traits emphasise personal connection and spontaneity, which may influence how future professionals perceive the integration of robots in service roles, particularly in service contexts where human interaction plays a central role in the guest experience (Valduga et al., 2022).

In Greece, the concept of *filoxenia*—a cultural norm of welcoming and caring for strangers—continues to shape hospitality practices, especially through traditions, celebrations and interpersonal warmth (Tiganis & Tsakiridou, 2022; Valeri, 2023). Similar values are observed in Portugal and Brazil, where emotional connection and generosity are central to guest experience.

Portuguese hospitality is similarly characterised by interpersonal warmth, authenticity, and cultural pride, often expressed through music, cuisine, and symbolic gestures of welcome (Carvalho et al., 2023). Although both countries offer distinct cultural experiences, they share an emphasis on emotional connection and personalised service – elements that may affect how technological automation, particularly through service robots, is perceived by future hospitality professionals (Baleiro, 2023).

The Relationship between Country's Culture and The Use of Robots in the Hospitality Industry

Robotic technology has made significant strides in the hospitality industry, with its initial adoption dating back to 2015 in Japan (Reis et al., 2020). The Henn-na hotel pioneered the introduction of humanoid multilingual robots, placing them at the reception to greet guests and assist with check-in and check-out procedures (Yang et al., 2020). Several authors (e.g., Ivanov & Webster, 2019; Palrão et al., 2023; Tuomi et al., 2020) argue that the integration of robots in tourism and hospitality is influenced by the cultural perceptions specific to each country and not all countries are prepared to accept this new way of interacting and providing services. For this type of service to be successful, robots must be culturally accepted by both guests and professionals in the hotel industry (Carvalho et al., 2022). Despite initial hesitations, robots are gaining popularity and finding their place in the hospitality and restaurant sectors (Choi et al., 2021). The hospitality sector's substantial reliance on human labor renders it particularly amenable to technological advancements, including artificial intelligence (AI). Consensus among experts suggests a continued expansion of robotic technologies within the industry (Pizam et al., 2022). Hwang (2024) posits that both restaurants and technology providers can enhance customer acceptance and willingness to utilize facial recognition payment systems. This advancement is anticipated to facilitate the broader development and commercialization of such payment methods not only within the restaurant industry but across various other sectors as well. Given these findings, the following hypothesis has been formulated.

Hypothesis 1: Students' opinions on the use of robots in the hospitality industry vary depending on the country where they study.

Partially Robotized Environment

Tourism is a "people business," making it challenging to fully automate a hotel unit while continuing to provide a service that satisfies customers (Ivanov et al., 2020). Partially robotized environments strike a balance, meeting guest needs while leveraging the advantages of robotic assistance (Paixão & Salazar, 2021).

Sharing tasks with robots can be advantageous for human staff, particularly in executing repetitive, tedious, and hazardous tasks. In addition to safeguarding the workers' health, it eliminates human errors resulting from the monotony associated with performing these tasks (Palrão et al., 2023). These routine tasks can be efficiently performed by robots (Blöcher & Alt, 2020). Thus, workers are freed up to perform tasks that require specific knowledge, experience, and creativity (Choi & Wan, 2021). By incorporating technology into services, hotels can

offer a differentiated set of services that enhance operational efficiency, personalize guest experiences, and introduce innovations that elevate the standard of quality and convenience (Nam et al., 2021).

Robots can provide services across different stages of the guest cycle: pre-arrival, check-in, stay, departure, and check-out. Following this premise, Zhong et al. (2021) suggest that robots are increasingly accepted by consumers because they believe that robotics will enhance the services provided. However, more than half of the guests participating in Soares et al. (2021) study would only accept robots in the hotel industry if their services were complemented by humans. Students, in turn, recognize the importance of strengthening the business and believe that the integration of robots allows for more accurate and consistent service, enabling them to gain a competitive advantage over competitors (Ivkov et al., 2020; Palrão et al., 2023). Based on these assumptions, the second study hypothesis was formulated.

Hypothesis 2: The intention of students to work in a partially robotic environment varies depending on the country where they live.

The Relationship between National Culture and the Intention to Work in a Partially Robotized Environment

The integration of AI and robotic technology in the hotel industry has been increasing across different countries, yet opinions on this phenomenon remain diverse and far from unanimous (Palrão et al., 2023). The relationship between national culture and the intention to work in a partially robotized environment is a complex issue. This complexity stems not only from the uneven integration of robots in hospitality services, but also from the influence of traditional cultural frameworks that often exhibit greater resistance to change (Tuomi et al., 2019). In countries where work is closely linked to individual and collective identity, the introduction of robots may be perceived as a threat to job security and personal fulfilment. Conversely, cultures that value efficiency and innovation tend to regard robots as an opportunity to enhance productivity (Choi et al., 2020). Differences between robot and human employees in terms of brand experience and behavioural intentions have already been studied in the restaurant context by Hwang et al. (2023).

Governmental policies and educational initiatives also play a significant role in shaping how cultures transition into partially robotized environments (Tuomi et al., 2020). Palrão et al. (2023) suggest that countries investing in education programmes aimed at preparing students for the digital age are more likely to experience smoother transitions and broader acceptance of automation. Consequently, students' intentions to work in robotized environments tend to be more favourable.

This study tests a mediation hypothesis to explore whether cultural orientation indirectly influences students' career intentions. Specifically, we analyse whether attitudes toward service robots serve as a mediating factor. The conceptual model draws on the TAM, the TPB, and Cultural Intelligence Theory.

While Hofstede's dimensions provide a foundational understanding of cultural values, additional theoretical lenses were incorporated to substantiate the behavioural mechanism assumed. According to the TAM, attitudes toward technology act as a key mediator between external variables (e.g., perceived usefulness, social context) and behavioural intentions (Davis, 1989). Cultural values, as expressed through Hofstede's framework, shape how individuals interpret and evaluate new technologies, which in turn influences their intention to adopt them (Straub et al., 1997). Complementarily, the Cultural Intelligence Theory (Ang et al., 2007) suggests that individuals' ability to function in culturally diverse settings also affects how they respond to emerging technologies. Ivanov and Webster (2019) further argue that cultural context determines service expectations, particularly in hospitality, and modulates how technology is perceived as enhancing or replacing human interaction. In line with Sun et al. (2020), cultural moderation can impact not only the acceptance of robots but also the pathways through which such acceptance translates into behavioural intentions. Based on these theoretical foundations, we posited a mediation pathway in which cultural orientation influences attitudes toward service robots, which in turn affect students' intention to work with them in the future.

In addition to the TAM, the TPB (Ajzen, 1991) offers a robust framework for understanding how individuals form intentions to engage with emerging technologies. According to TPB, behavioural intention is shaped by three core determinants: attitudes toward the behaviour, subjective norms, and perceived behavioural control. In the present study, students' attitudes toward robots, their perception of social acceptance within their educational or professional context, and their sense of control over working in a robotized environment all play a role in shaping their intention to accept technological integration in hospitality. Integrating TPB enhances the explanatory power of our model by accounting for both personal and social influences on intention formation.

Complementing the TPB and TAM frameworks, the Diffusion of Innovations theory (Rogers, 2003) helps contextualize how different cultures and societies adopt new technologies over time, based on perceived advantages, compatibility with existing values, and social communication dynamics. In this sense, the pace and manner of robot adoption in hospitality are not merely individual choices, but are embedded within broader cultural and structural patterns. Furthermore, recent approaches such as Digital Behaviorism (Young, 2020) have

emphasized the role of algorithmically mediated environments in shaping human responses, suggesting that behavioural intention is not only socially influenced but also conditioned by interactions with digital agents and platforms. From a capability perspective, Leßmann and Masson (2015) argue that sustainable systems must expand individuals’ real freedoms and not merely optimize behavioural outcomes. In the context of hospitality, this implies that robot integration should enhance—not limit—the capacity of professionals to exercise agency, develop skills, and find meaningful engagement in their roles.

While these perspectives are not central to the tested model, they help frame robotization as part of a wider transformation in human–technology relations (Dobrosovetsnova et al., 2022).

Recent advances in the psychology of artificial intelligence have further contributed to understanding the affective and cognitive responses elicited by human–robot interaction and highlights how emotional readiness, perceived threat, trust, and social presence influence technology acceptance across different settings (Nomura et al., 2020; Rosén et al., 2024). These studies suggest that attitudes toward service robots are shaped not only by functional or cultural factors, but also by underlying psychological mechanisms, including automation-induced anxiety, anthropomorphism, and perceived empathy. These insights align with our attempt to analyse the role of attitudes as mediators in culturally grounded behavioural intentions.

While existing studies have explored cultural values and robot adoption separately, few have examined how national culture directly influences students’ attitudes toward service robots and their future career intentions. Moreover, cross-cultural research comparing Southern European and Latin American contexts remains scarce. This study addresses this gap by proposing and testing a mediation model across three culturally distinct countries –Portugal, Brazil, and Greece – focusing on hospitality students as future workforce actors.

Based on the above, the following study hypotheses are formulated.

Hypothesis 3: Students' opinions on the use of robots in the hotel industry mediate the relationship between a country's culture and their intention to work in a partially robotized environment.

Hypothesis 3a: Students' opinions on the use of robots in the hotel industry mediate the relationship between Portuguese culture and their intention to work in a partially robotized environment.

Hypothesis 3b: Students' opinions on the use of robots in the hotel industry mediate the relationship between Brazilian culture and their intention to work in a partially robotized environment.

Hypothesis 3c: Students' opinions on the use of robots in the hotel industry mediate the relationship between Greek culture and their intention to work in a partially robotized environment.

Figure 2 represents the relationship between the variables under study that led to the research hypotheses mentioned in the preceding paragraphs.

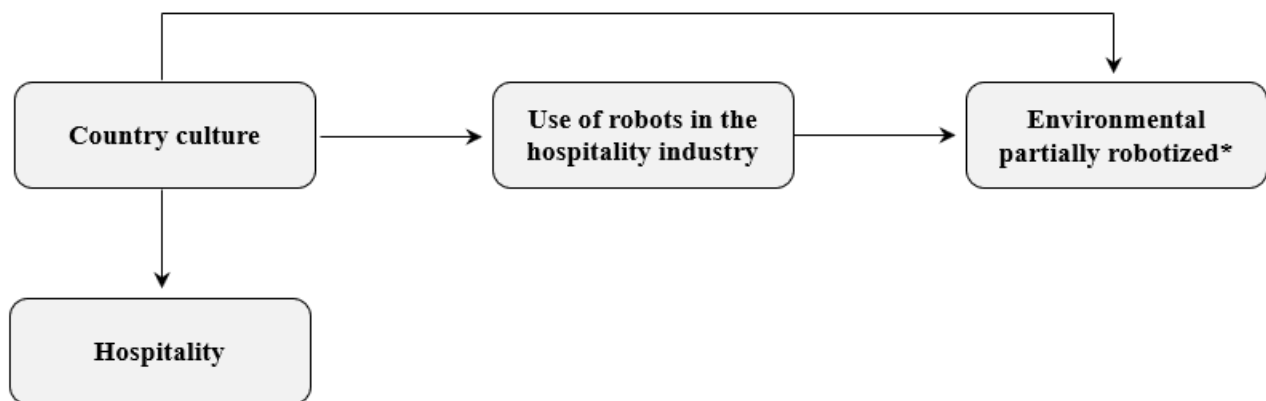


Figure 2. Research model.

Note: *Intention to work in a partially robotized environment in the future.

METHODOLOGY

In order to operationalize this comparative study, a quantitative methodology was employed, based on a deductive approach of a cross-sectional nature. The data were collected from a convenience sample. We consider that this sampling technique was the most appropriate to obtain the greatest number of responses (Mweshi & Sakyi, 2020). from students. Being in the classroom, they were available to answer the questionnaire immediately when their teachers asked them to do so.

Sample

The sample comprised 532 students, aged between 18 and 25 years, attending hospitality and tourism courses in Portugal, Brazil, and Greece. Table 2 presents the sociodemographic characteristics of the participants.

Table 2. Sociodemographic characterization of the participants.

Sociodemographic variables	Portugal (n = 188)	Brazil (n = 175)	Greece (n = 169)
Sex			
Male	89 (47.3%)	84 (48.0%)	87 (51.5%)
Female	99 (52.7%)	91 (52.0%)	82 (48.4%)
Age Range	[M = 20.23; SD = 1.66]	[M = 21.45; SD = 2.34]	[M = 21.18; SD = 2.19]
Between 18 and 19 years	77 (41.0%)	46 (26.3%)	43 (25.4%)
Between 20 and 21 years	73 (38.8%)	42 (38.8%)	48 (28.4%)
22 years or older	38 (20.2%)	87 (49.7%)	78(46.2%)
Year of Enrollment			
1 st Year	84 (44.7%)	75 (42.9%)	42 (24.9%)
2 nd Year	75 (39.9%)	46 (26.3%)	81 (47.9%)
3 rd Year	29 (15.4%)	54 (30.9%)	46 (27.2%)

Measure

For data collection, the questionnaire developed by Palrão et al. (2023) was employed. The instrument comprised 13 items assessing: hospitality (e.g., *Interaction with hotel staff is one of the aspects most valued by customers*); the country's culture (e.g., *The use of robots in the hotel sector is not culturally well-received*); the use of robots in the hotel industry (e.g., *In the near future, the use of robots in the hotel industry will be a reality*). Similar to the original study, the intention of future professionals in the hotel industry to work in a partially robotized environment was assessed through a single item (*I consider working in a partially robotized environment*). Although this type of measure has received some criticism due to the impossibility of calculating internal psychometric indicators, previous research supports its use in applied contexts. For instance, Alexandrov (2010) argues that single-item measures are more suitable when the goal is to obtain effective and easily interpretable results. Moreover, Allen et al. (2022) suggest that single-item responses may exhibit strong predictive power under certain conditions.

The intention to work in a partially robotized environment was assessed through a single-item measure. Although this approach may offer practical advantages in applied settings, it presents serious limitations when used in structural equation modelling (SEM), where latent constructs ideally require multiple observed indicators to ensure robust measurement. The lack of item redundancy restricts the ability to assess internal consistency and may compromise construct validity. Future research should adopt multi-item validated scales to capture the complexity of behavioural intention with greater psychometric rigour, particularly when aiming to test mediation or moderation pathways.

Additionally, although the items used in the questionnaire were adapted from previously validated instruments and translated using best practices in academic translation and back-translation, no full-scale revalidation procedures (e.g., exploratory or confirmatory factor analyses) were conducted independently within each national context. This limitation may affect the measurement equivalence of constructs across countries and should be addressed in future studies through rigorous cross-cultural validation protocols.

All items were presented as declarative statements and rated on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Although internal consistency coefficients were acceptable across countries (ranging from 0.68 to 0.90), a confirmatory factor analysis (CFA) was not conducted independently for each national sample. This may affect the validity of cross-group comparisons, especially in the context of measurement invariance testing. Future studies should adopt full CFA procedures prior to MGSEM to ensure that the factor structure holds across cultural contexts and to reinforce the robustness of the measurement model.

To overcome these limitations, future studies are encouraged to adopt comprehensive, psychometrically validated instruments specifically developed for assessing robot acceptance and intention. Examples include the multi-item scales proposed by Choi et al. (2020), which evaluate perceived safety, social presence, and trust in service robots, and Zhong et al. (2021), who offer robust measures of intention and emotional response to robot use in service settings. Employing such instruments will allow for greater precision and cross-contextual comparability in future behavioural studies.

Procedures

All participants provided informed consent, and since they were all adults, obtaining parental authorization was not required. The questionnaire items and the set of sociodemographic questions were integrated into Google Forms, and the link was disseminated among students enrolled at the universities where the researchers are

employed. Participants were informed about the objectives of the study. Additionally, anonymity and confidentiality of responses were assured. Statistical analyses were conducted using SPSS software, version 29 (Statistical Package for the Social Sciences).

RESULTS

In the initial phase, the objective was to determine whether the country's culture influences hospitality. To this end, a multiple linear regression was conducted using the Enter method. The results indicate that Portuguese culture has the greatest impact on how hotel staff interact with guests, which may be attributed to the high value placed on interpersonal relationships in Portugal.

Subsequently, the average values of the variables involved in the research were compared based on the country where participants studied. Significance was assessed with a MANOVA after validating the assumptions of multivariate validity and homogeneity of variances and covariances. The multivariate analysis of variance revealed that the country has a high and highly significant effect, and the power of the test is also very good (Pillai's Trace = 0.188; $F_{(4,529)} = 13.704$; $p < 0.001$; $\eta^2p = 0.471$; $\pi = 0.893$). Having observed the multivariate variance of the country factor, a univariate ANOVA was carried out for each of the dependent variables.

It was found that there are statistically significant differences in the intention to work in partially robotized environments [$F_{(2, 484)} = 16.152$, $p < 0.001$], opinions about the use of robots in the hotel industry [$F_{(2, 484)} = 16.269$, $p < 0.001$], hospitality [$F_{(2, 484)} = 40.952$, $p < 0.05$], and the culture of the country [$F_{(2, 484)} = 4.373$, $p < 0.001$]. These results enabled the confirmation of the first and second research hypotheses.

Examining Table 3, it is evident that Greek students show the highest intention to work in partially robotized environments and are more supportive of the use of robots in the hotel industry. On the other hand, Portuguese students have a more positive opinion about hospitality and the culture of their country. Brazilian students, in turn, fall at an intermediate level with respect to all analyzed variables.

Table 3. Comparison of the mean values of the study variables based on the country where students are enrolled.

	Portugal		Brazil		Greece		F	Sig.
	M	SD	M	SD	M	SD		
Partially Robotized Environments	3.17	1.29	3.17	1.17	3.88	1.06	16.152	0.001**
Utilization of Robots in the Hospitality Industry	2.53	0.70	2.67	0.67	2.92	0.58	16.269	0.001**
Hospitality	4.07	0.60	3.52	0.71	3.55	0.64	40.952	0.013*
Country's Culture	4.22	0.65	4.03	0.85	4.01	0.72	4.373	0.001**

Note: M = Mean; SD = Standard-deviation; * $p < 0.05$; ** $p < 0.001$

Multigroup Structural Equation Modeling (MGSEM) was also carried out to compare the statistical models in different groups and identify significant differences between them. By testing the equivalence of measurements and promoting a better understanding of the relationships studied. As recommended by Byrne and Matsumoto (2021), first a model fit test was performed separately for each group. The measurement model proved to be adjusted for the three countries [Portugal: $\chi^2_{(18)} = 2.36$, $p < 0.001$, CFI = 0.93, GFI = 0.93, RMSEA = 0.06, LO90 = 0.03, HI90 = 0.08, SRMR = 0.05; Brazil: $\chi^2_{(18)} = 1.97$, $p < 0.05$, CFI = 0.92, GFI = 0.96, RMSEA = 0.06, LO90 = 0.03, HI90 = 0.10, SRMR = 0.05; Greece: $\chi^2_{(18)} = 2.00$, $p < 0.05$, CFI = 0.93, GFI = 0.95, RMSEA = 0.07, LO90 = 0.03, HI90 = 0.11, SRMR = 0.06].

The configural invariance model was conducted to assess whether the model structure was the same across the three groups. Metric invariance was tested by constraining factor weights to be equal across countries. Strict invariance was tested by restricting error variances and covariances [$\Delta\chi^2_{\lambda(16)} = 108.892$, $p < 0.001$; $\Delta\chi^2_{i(14)} = 63.443$, $p < 0.001$; $\Delta\chi^2_{Cov(6)} = 33.058$, $p < 0.001$; Table 4].

Table 4. Measurement model structure.

Model	χ^2 (df)	CFI	GFI	RMSEA	SRMR	$\Delta\chi^2$	p
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Initial G1 (Portugal)	2.356 ₍₁₈₎	0.93	0.93	0.06	0.05	-	-
Initial G2 (Brazil)	1.970 ₍₁₈₎	0.92	0.96	0.06	0.05	-	-
G3 (Greece)	2.000 ₍₁₈₎	0.93	0.95	0.07	0.06	-	-
Configural invariance	108.892 ₍₁₆₎	0.93	0.87	0.05	0.05	-	-
Metric invariance	63.443 ₍₁₄₎	0.92	0.85	0.06	0.05	45.449	0.001
Strict invariance	33.058 ₍₆₎	0.93	0.88	0.08	0.06	30.385	0.001

These results support the validity of the measurement model across the countries analyzed, which revealed a significant comparison between them. MGSEM allowed us to understand how the perception of future professionals in the hotel industry regarding the existence of partially robotic environments, the use of robots in the hotel industry and hospitality may vary depending on the country to which they belong. Following a structured and rigorous procedure ensures that conclusions are robust and useful for both theory and practice (Sobaih & Elshaer, 2022).

The third hypothesis, however, could not be substantiated through data analysis. The findings indicate that students' opinions regarding the use of robots in the hotel industry do not mediate the relationship between the cultural context of the three countries and their intention to work in a partially robotized environment (Figure 3). However, it was observed that this opinion has a statistically significant positive effect ($\beta = -0.002$, $t = -0.066$, $p = 0.948$) on the intention to work in partially robotized environments upon completion of their studies.

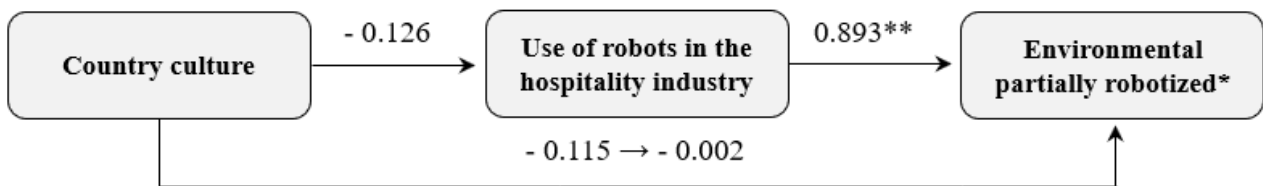


Figure 3. Portugal mediation model.

Note: *Intention to work in a partially robotized environment in the future.

The results pertaining to the sample of Brazilian students suggest that the country's culture negatively influences opinions regarding the use of robots in the hotel industry ($\beta = -0.166$, $t = -2.216$, $p < 0.05$). This suggests that as the importance attributed to culture increases, students' opinions about the use of robots tend to be less positive (Figure 4). These results may be attributed to Brazil being a country where people feel integrated into the community and, as such, are not willing to forego human presence in favor of robots. Nevertheless, these findings appear to indicate that the students' opinions about the use of robots in the hotel industry positively influence their intention to work in a partially robotized environment in the future ($\beta = 0.881$, $t = 23.752$, $p < 0.001$).

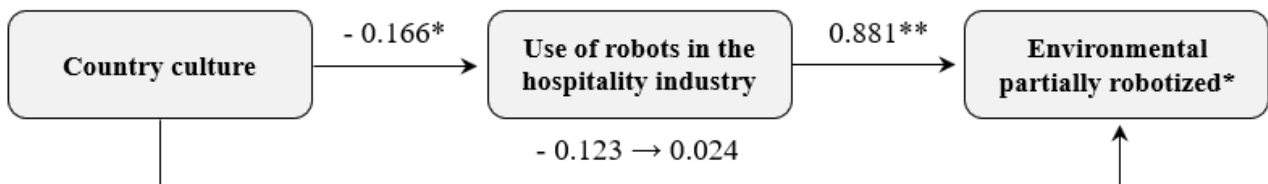


Figure 4. Brazil mediation model.

Note: *Intention to work in a partially robotized environment in the future.

Lastly, it was observed that, similar to Portuguese and Brazilian cultures, Greek culture also does not influence students' intention to work in a partially robotized environment (Figure 5). However, it was found that the opinion of Greek students regarding the use of robots in the hotel industry positively influences their intention to work in such an environment in the future ($\beta = 0.822$, $t = 18.292$, $p < 0.001$).

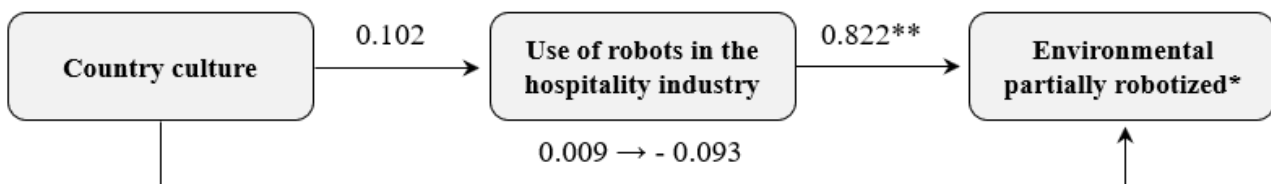


Figure 5. Greece mediation model.

Note: *Intention to work in a partially robotized environment in the future.

These results alert to the fact that students' intention to work in a partially robotized environment in the future is influenced by the importance attributed to the use of robots rather than the culture of the country. They are also relevant for understanding the opinions of future professionals in the hotel industry regarding the use of this type of technology in a professional context.

DISCUSSION

This exploratory study aimed to analyze the students' views from different countries – Brazil, Greece, and Portugal – regarding the use of robots in the hotel industry. As previously referred, these countries were chosen not only for their significant roles in the global tourism and hospitality sectors but also for their unique cultural heritage and economic characteristics. By conducting a comparative study across these nations, this research sought to uncover possible nuanced differences in attitudes toward robot utilization and the intention to work in a partially robotized environment.

Focusing on future professionals in the tourism and hospitality sector addresses the need for proactive strategies to prepare the workforce for the evolving landscape of hospitality work. This study not only offers insights into the global implications of robotization in hospitality but also provides practical implications for stakeholders seeking to navigate this technological shift effectively. Furthermore, this research aimed to offer tailored recommendations for industry practitioners and policymakers to optimize the integration of robots in hospitality operations while preserving the essence of hospitality experiences.

Thus, we sought to determine whether the culture of their countries influences their opinions about robots and their intention to work with them in the future. The data analysis revealed that the three countries show similar values in long-term orientation. This dimension allows assessing the countries' stance toward change, indicating that culture has a positive influence on hospitality. Similar results were found by Valduga (2019), who stated that the cultural values of each country significantly influence the perception of hospitality. In the same vein, Sun et al. (2020) mention that a country's culture has a significant impact on how hospitality is perceived and is often seen as a distinctive element when choosing a tourist destination. Kastenholz and Carneiro (2023) add that the way people are welcomed and treated is shaped by the values, traditions, and cultural practices of the region.

It was also found that the students' country of origin influences their opinion on the use of robots in the hotel industry, validating the second hypothesis and aligning with the works of Tuomi et al. (2020). In this context, Palrão et al. (2023) note that not all countries have the same stance toward change; they do not accept robotic technology in the same way. Nevertheless, robots continue to gain ground in the tourism and hospitality sector (Choi & Wan, 2021).

The second hypothesis postulating the existence of statistically significant differences in students' intention to work in a partially robotized environment based on their study country could also be confirmed. The results revealed that the more importance attributed to culture, the less positive students' opinions tend to be about the use of robots, aligning with the findings of Ivkov et al. (2020). These conclusions may be due to hospitality largely depending on the interaction between staff and guests, and the introduction of robots tends to diminish that connection (Dang & Liu, 2022). Additionally, Kastenholz and Carneiro (2023) suggest that Brazil, Greece, and Portugal demonstrate a profound respect for cultural heritage, considering hospitality fundamental to enriching guests' experiences.

With regard to the third hypothesis, it was observed that students' perspectives on the incorporation of robots in the hotel industry positively impact their willingness to work with them in the future. However, this opinion does not mediate the relationship between the country's culture and the intention to work in a partially robotized environment, preventing the validation of the mediation hypothesis. Although the third hypothesis posited a mediating effect of students' attitudes toward service robots on the relationship between national culture and intention to work in partially robotized environments, the data did not support this mediation pathway. This finding invites a critical reflection on the underlying mechanisms through which culture shapes behavioural intention.

One possible explanation is that national culture exerts a direct influence on career-related intentions, bypassing attitudinal constructs such as acceptance of service robots. In this interpretation, deeply rooted cultural values may act as structural determinants, influencing professional aspirations and risk tolerance in ways that are not fully captured by short-term attitudinal responses. Alternatively, the non-significant mediation effect may indicate that other psychological or contextual factors serve as more proximal mediators. Constructs such as emotional readiness for automation, perceived digital self-efficacy, social norms, or automation-related anxiety

have been shown in recent studies to influence intention formation in technology-rich environments (Yam et al., 2022; Rosén et al., 2024).

Another possibility lies in the measurement limitations. The use of a single-item measure to assess behavioural intention may have reduced the sensitivity of the model, limiting its capacity to detect indirect effects. Similarly, treating national culture as a categorical country-level variable may obscure intra-group cultural variation, especially in increasingly globalised and hybrid academic settings.

Future research should consider adopting moderated mediation models, integrating variables such as cultural intelligence, digital resilience or trust in AI systems, to better capture the complex pathways linking culture to technological acceptance. Using individual-level cultural measures and multi-item behavioural intention scales would also allow for more precise and theoretically grounded analyses.

This finding invites a deeper reflection on why mediation did not occur. One possible explanation is that cultural background may exert a direct influence on behavioural intention, bypassing attitudinal mechanisms altogether. Alternatively, it is possible that attitudes toward robots, as measured in this study, were not sufficiently strong or differentiated across cultural contexts to mediate the relationship effectively.

Methodologically, the limited number of items used to assess attitudes, and the reliance on a single-item measure for intention, may have reduced the sensitivity of the model to detect indirect effects. Although these decisions were grounded in pragmatic constraints, they may have constrained the statistical power needed to capture more subtle mediation pathways.

From a theoretical standpoint, the absence of mediation suggests the need to consider alternative mediating variables. Emotional readiness for automation, automation-related anxiety (Yam et al., 2022), perceived social pressure, or digital self-efficacy may be more proximal determinants of intention and should be explored in future research. The concept of automation-induced resilience may also be relevant when studying students preparing to enter technologically evolving service sectors.

In addition, treating culture as a country-level categorical variable may have obscured meaningful individual variation. Future studies should consider the use of individual-level Hofstede scores to capture more nuanced cultural differences. It may also be productive to apply latent profile analysis to identify subgroups of respondents with shared cultural and attitudinal patterns, independently of national affiliation.

Considering the complex interplay between cultural values, emotional responses, and social influences, future research would benefit from employing moderated mediation models. These approaches allow for the simultaneous testing of cultural dimensions, attitudinal constructs, and psychological readiness as interacting predictors of behavioural intention.

These reflections contribute to a more nuanced understanding of cultural dynamics in human–technology interaction and open relevant avenues for future interdisciplinary research in hospitality, behavioural sciences, and educational contexts.

Theoretical and Practical Implications

This study offers several theoretical and practical implications at the intersection of hospitality education, service innovation, and human–robot interaction (HRI).

From an educational perspective, the findings underscore the urgency of rethinking hospitality curricula. While emotional intelligence and interpersonal skills remain fundamental, there is a growing need to integrate technological literacy and digital adaptability as core components of training. Academic programs should embed dedicated modules on robotics, AI applications in service delivery, and automation management, enabling students to become active participants in the industry's digital transformation. Moreover, hands-on experiences with service robots, such as through simulation labs or partnerships with tech providers, could reduce psychological resistance and foster automation readiness among students.

For the hospitality industry, the results highlight the need to consider cultural sensitivity in the implementation of robotic solutions. Developers and HRI designers should account for users' cultural expectations by integrating affective interaction capabilities, contextual behavioural scripts, and adaptive interfaces that respond to varying comfort levels with automation. In culturally traditional environments, service robots should be positioned as collaborative tools rather than replacements, enhancing rather than replacing human interaction.

From a workforce development standpoint, the study illustrates how students' intentions are shaped not only by technological factors but also by cultural narratives surrounding work and innovation. As such, managers and policy-makers must anticipate cultural resistance and develop strategies to manage human–machine coexistence. This includes reskilling initiatives, ethical guidelines, and communication strategies that frame robotization as an opportunity for professional empowerment rather than displacement.

Finally, at the theoretical level, the study contributes to the emerging literature on service robot acceptance by showing that culture influences robot-related attitudes but not necessarily future behavioural intentions. This finding calls for more nuanced models of technological adoption that incorporate both emotional and contextual

variables. It also strengthens the case for cross-cultural HRI research that bridges hospitality studies with psychology, computer science, and organizational behaviour.

LIMITATIONS AND FUTURE RESEARCH

This study presents several limitations that should be considered when interpreting the findings. Firstly, the dependent variable—students' intention to work in a partially robotized environment—was assessed using a single-item measure. While previous literature has shown that single-item constructs can be acceptable in certain applied contexts, they pose limitations in the context of structural equation modelling (SEM), where multi-item scales are preferable to ensure construct validity and internal consistency. Future studies should adopt validated, multi-dimensional instruments to better capture the complexity of behavioural intention.

Secondly, although the measurement model showed acceptable internal consistency across countries, a full confirmatory factor analysis (CFA) was not performed separately for each national group prior to the multi-group SEM. This limits the robustness of cross-cultural comparisons and may affect the interpretation of group differences. Future research should incorporate CFA and measurement invariance testing as distinct stages to confirm structural equivalence before conducting cross-national path analyses.

The study also relied on convenience sampling within academic settings, which may introduce selection bias and limit the generalisability of the findings. Differences in educational systems, access to technology, and exposure to robotics may have influenced students' perceptions. Expanding the sample to include professionals already working in hospitality could provide a more comprehensive understanding of attitudes toward service robot adoption in real-world settings.

In addition, treating culture as a categorical country-level variable may overlook intra-cultural differences. Future studies are encouraged to use individual-level cultural measures—such as Hofstede-based self-assessment tools or cultural intelligence scales—to capture more nuanced cultural dynamics. It may also be valuable to explore additional mediating or moderating variables, including emotional readiness, digital self-efficacy, and trust in automation, which may better explain the pathways between culture and technology acceptance.

Lastly, longitudinal studies could help track how students' perceptions evolve over time, particularly as they transition into professional environments and gain direct experience with service technologies.

CONCLUSION

This study contributes to the growing body of research on service robotics in hospitality by examining how national culture influences students' attitudes toward robots and their intention to work in partially robotized environments. Drawing on a cross-national sample from Portugal, Brazil, and Greece, the findings reveal important cultural differences in the way hospitality students perceive the use of robots in hotels. Greek students reported the highest levels of acceptance, while Portuguese students placed greater value on traditional hospitality practices. Brazilian students generally occupied an intermediate position.

Although national culture significantly influenced attitudes toward robots and perceptions of hospitality, it did not directly predict students' future career intentions. This suggests that other factors—such as emotional readiness, perceived usefulness, or digital self-efficacy—may play a more central role in shaping willingness to engage with automation in professional contexts.

Importantly, the study shows that acceptance of service robots is not determined solely by technological functionality, but also by cultural norms, emotional expectations, and contextual readiness. These insights are critical for designing effective human–robot interaction (HRI) systems that are both operationally efficient and culturally sensitive. The findings also emphasise the need to integrate digital competencies, robotics training, and automation ethics into hospitality education, preparing students to navigate the evolving dynamics of human–machine collaboration.

Overall, this research offers theoretical insights into the interplay between culture and technology adoption and provides practical guidance for educators, managers, and developers aiming to implement service robots in hospitality settings. As the sector continues to evolve, understanding how future professionals perceive and adapt to technological change will be essential for shaping inclusive, sustainable, and human-centred innovation in hospitality.

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