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FACTORS AFFECTING HOTEL MANAGERS' INTENTIONS TO ADOPT ROBOTIC TECHNOLOGIES: A GLOBAL STUDY

Abstract

The objective of this study that was conducted with 1077 hotel managers in 11 countries in North and South America, Europe, Asia and the Middle East, was to identify the effects of technological, organizational, and environmental (TOE) factors on hotel managers' intentions to adopt robotic technologies in their hotels. Structural equation modeling (SEM) was utilized to test the study hypotheses. The results indicated that hotel managers' intention to adopt robotic technologies were positively influenced by their perceived relative advantage, competitive pressure and top management support and negatively influenced by their perceived complexity of the technology. The study results further demonstrated that the impacts of relative advantage, complexity, top management support, and competitive advantage on intention to adopt were moderated by innovativeness. The current study also addressed the theoretical and practical implications to existing knowledge and practice in the hotel industry.

Keywords: Technology adoption; robotics; TOE framework; robots in hotels; hotel industry

1. INTRODUCTION

With the advancements in technology and more specifically robotics and artificial intelligence (AI), robots are penetrating our lives unremittingly. A robot can be defined as a programmable machine capable of carrying out a complex series of actions automatically that can substitute for humans and replicate human actions. Industrial robots have been around for over three decades now and are currently being used in various industries, including manufacturing (Belk, 2017), transportation (Bae & Chung, 2019; Maurer, Christian Gerdes, Lenz, & Winner, 2016), agriculture (De Koning & Rodenburg, 2004), healthcare and medicine (Hung, 2020), and logistics (Min, 2010).

Social robots have also penetrated the senior care industry (Čaić, Odekerken-Schröder, & Mahr, 2018) and education (de Kervenoael, Hasan, Schwob, & Goh, 2020). The hospitality and tourism industries are no exception (Cha, 2020). Many hospitality and tourism organizations around the world, have already implemented robotic applications across various contexts (Collins, 2020). **AI increasingly gives the capability of decision making to machines, bringing a range of disruptions in tourism and hospitality industries (Buhalis, 2020; Buhalis et al., 2019). For example, Henn-na Hotel in Japan introduced the first robotic hotel with fully automated customer services (Buhalis & Leung, 2018).**

A recent report by PricewaterhouseCoopers predicts that, by 2030, AI's contribution to the world's economy will be around $15.7 trillion, $6.6 trillion coming from productivity expansion, $9.1 trillion attributed to consumption-side implications (PwC2017). According to an estimate by the Economist (2018), AI mergers were 26 times larger in 2017 compared to 2015. This merger boom has been caused by and also conduced to the advancements in AI technology (Furman & Seamans, 2019). The rapid increase of investment in the information technology (IT) by organizations around the world, parallels IT’s contribution to companies’ profitability, which in return sustains countries’ economies. This contribution, however, can only be maintained and amplified through wider technology acceptance and ongoing investments, which is only possible through the effective recognition of the technology acceptance determinants and theoretical models (Oliveira & Martins, 2011).

Implementation and adoption of robotic technologies both by the relevant industries and users are still hot topics in the academic domain (Makridakis, 2017). **However, few studies focused on what operators and decision makers think.** Traditional technology adoption models, e.g., theory of reasoned action [TRA] (Ajzen & Fishbein, 1980), technology acceptance model [TAM] (Davis, 1989), innovation of diffusion theory [IDT] (Rogers, 2003), are primarily technocentric as they deal with users' adoption of technology (Awa, Ojiabo, & Orokor, 2017). Technology-organization-environment [TOE] framework, which was introduced by Tornatzky and Fleischer (1990), focuses on the organizational level factors by identifying three dimensions that influence the adoption and implementation of technological innovation. Accordingly, the purpose of this study was to examine managers' adoption behavior in the context of robots and robotic technologies in the hotel industry. More specifically, based on the TOE framework, the current study investigated the impacts of: (a) technological (i.e., compatibility, complexity, relative advantage, and perceived cost), (b) organizational (i.e., top management support, organizational readiness), and (c) environmental (i.e., competitive pressure) factors, on hotel managers' intention to adopt robotic technologies. **Based on the above discussions, the following research questions were explored:**

1. **What are the technological factors that influence hotel mangers' intention to adopt robotic technologies?**
2. **What are the organizational factors that influence hotel mangers' intention to adopt robotic technologies?**
3. **What are the environmental factors that influence hotel mangers' intention to adopt robotic technologies?**
4. **Does innovativeness moderate the relationships between technological, organizational, and environmental factors and hotel managers' intention to adopt robotic technologies?**

This study presents very significant revelations based on the data collected from hotel managers across eleven countries- a major undertaking on an unparalleled scale. This is exactly why this study is pivotal as a first step in providing implications for technology operators and decision makers. In addition, the present study makes a significant theoretical contribution to the extant literature regarding the adoption of robots in the hospitality context. Furthermore, the present study offers practical implications by providing an overarching framework for hotel managers and other hotel decision-makers to evaluate their organizations' methods and processes with regards to adoption of robots and facilitate well-informed decisions. Last, but not least the study findings provide valuable insights for hospitality technology vendors by way of a seven-dimensional framework to examine organizational robotic technology acceptance.

2. LITERATURE REVIEW

2.1 Robotic Technologies in the Hospitality Industry

A synthesis of tangible and intangible products and services, a hospitality product is premised on the notion that customer loyalty can be achieved by delivering memorable experiences (Kim, 2014; Lu, Cai, & Gursoy, 2019; Pizam, 2010). Given the dynamic nature of customer expectations, identification and adoption of new technologies are of paramount importance (Ozturk & Hancer, 2014). The hospitality industry has been a forerunner in incorporating technology into service delivery (Kuo, Chen, & Tseng, 2017) and for this reason the technological advances in AI and robotics create unique possibilities for the hospitality industry organizations to increase efficiency (Ivanov, Webster, & Garenko, 2018) and save on costs associated with labor (Collier & Kimes, 2013; Ivanov, Seyitoğlu, & Markova, 2020). Substantiating this phenomenon, the results of Kervenoael, Hasan, Schwob, and Goh (2019) study about human-robot interaction in hospitality services, indicated that the need for service evolution and service excellence is a powerful force in the hotel business, which requires the hotel operators to be open-minded and courageous about robots and robotic technologies. As a multidisciplinary area, HRI is dedicated to explicating people's attitudes and behavioral intentions towards social robots, e.g., service robots (Collins, 2020; Murphy, Gretzel, & Pesonen, 2019; Pillai & Sivathanu, 2020). According to Zeng, Chen, and Lew (2020), Covid-19 pandemic has been a major drive in the adoption of service robots, catalyzing a shift from high-touch to high-tech.

Robotic technologies now offer a wide array of application options to hospitality operators. Robotic chefs have been introduced in Spyce Restaurant in Boston and Jingdong X Future Restaurant in Tianjin, China (Zhu & Chang, 2020), Quantum of the Seas, a Royal Caribbean cruise ship, introduced a robotic bartender in its Bionic Bar (Papathanassis, 2017). The world's first hotel with robot staff opened near Nagasaki, Japan, in 2015 (Ivanov et al., 2018). Hilton Hotels & Resort and IBM launched Connie, a robot concierge, to assist guests with their dining reservations and inform them about the hotel features and amenities as well as nearby attractions (Tussyadiah & Park, 2018). Similar hotel-specific service

robots, e.g., Wally, Cleo, Yolanda, Jeno, Relay, and Yolanda, have been introduced by Aloft Hotels, Residence inn by Marriott, InterContinental Hotels Group's Holiday Inn Express, Autograph Collection by Marriott, and other hospitality organizations (Vatan & Dogan, 2021).

2.2. TOE Framework

In their work titled "The Processes of Technological Innovation" Tornatzky and Fleischer (1990) went into expounding the innovation process in its entirety- beginning with the development phase of innovations in the hands of engineers and industrialists to adaptation and implementation of users in an organizational context. As evidenced, TOE (Technology-Organization- Environment) framework deals with the organizational aspect of technology acceptance (Baker, 2012). The working theory of Tornatzky and Fleischer's study was that characteristics of the perceived innovation could be utilized to estimate the adoption and implementation of many different innovations, which in return provided some degree of consistency. Referring to the innovation studies, Tornatzky and Klein (1982) suggested that research in this area should focus on organizations, not the individuals. Their work contributed to technology acceptance and implementation literature by establishing three contexts consisting of technological, organizational, and environmental dimensions (Baker, 2012). With its sound theoretical framework, unvarying empirical foundation and replicability, and prospective application to various technological innovations, TOE has been able to stand the test of time (Oliveira & Martins, 2011).

Among the plethora of technology adoption theories, Rogers (1995) DOI and Tornatzky and Fleischer (1990) TOE framework have been widely recognized as theoretically sound and replicable framework (Awa, Ukoha, & Igwe, 2017; Oliveira & Martins, 2011). Although Tornatzky and Fleischer's TOE framework is in agreement with Rogers (1995) DOI, they were able to expand the scope of their framework by, for example, adding the environmental context, which was not a part of DOI (Tornatzky & Fleischer, 1990). Extant literature provides compelling evidence regarding TOE framework's broad applicability, descriptive power across numerous technological, industrial, and cultural contexts (Baker, 2012).

TOE framework has been extensively used in organizational technology adoption studies, including broadband mobile application adoption in Taiwan (Chiu, Chen, & Chen, 2017); radio frequency identification (RFID) systems in hospitality (Ozturk & Hancer, 2014); **social media use with global e-commerce adoption (Adam & Alhassan, 2021), and adoption of AI and robots by manufacturing and construction companies (Chatterjee, Rana, Dwivedi, & Baabdullah, 2021; Pan & Pan, 2020; Simoes, Soares, & Barros, 2020)**. The present study analyzed TOE's technological context, by elaborating on perceived cost, relative advantage, compatibility, and complexity. Top management support and organizational readiness constructs were at the core of the organizational context. The environmental context was addressed by analyzing the competitive pressure construct. Last, but not least, personal innovativeness was evaluated as the moderating construct in organizational adoption.

2.2.1. Technological Dimension

A range of disruptive innovations drive technology-driven disruptions for service industry structures and marketplaces. Robots are disruptive in nature as they change market conditions, industry structures and behavior of actors radically (Buhalis et al., 2019). As robots change operating processes and procedures, cost structures, and service protocols, they redesign the essence of hospitality service. Travel and hospitality structures are disrupted as customers will interact with service provision in different ways. The IoT is now paving the way toward smart ecosystems in tourism because of the connectivity of devices and systems that travelers can in turn customize (Gretzel, Sigala, Xiang, & Koo, 2015). These changes are not evolutionary but revolutionary, implying that smart hospitality will integrate all internal and external processes (Buhalis & Leung, 2018) based on an Ambient Intelligence tourism framework.

All the technologies that are employed by the organization and the technologies that are currently being utilized in the organization's competitive markets, constitute the technological context of the TOE framework. According to Rogers (2003), innovation-diffusion process was "an uncertainty reduction process" (p. 232). Accordingly, he delineated the attributes of innovations, which comprised five characteristics of innovations: relative advantage, compatibility, complexity, trialability, and observability (Moore & Benbasat, 1991). **In addition to these five characteristics, Tornatzky and Klein (1982) identified five more characteristics; cost, communicability, divisibility, profitability, and social approval (Moore & Benbasat, 1991). These additional characteristics were derived from the frequency of their usage in the 105**

articles Tornatzky and Klein (1982) reviewed and meta-analyzed (Moore & Benbasat, 1991). Tornatzky and Klein (1982) maintained that, ultimately, the relative advantage, compatibility, and complexity were "the most consistent significant relationships to innovation adoption".

A new technology's perceived superiority to the existing technology or innovation can be characterized by the term relative advantage (Cobos, Mejia, Ozturk, & Wang, 2016). According to Oliveira, Thomas, and Espadanal (2014), when the "benefits of the technology exceed existing practices and processes, the merits will positively influence its adoption" (p. 501). Relative advantage has been previously studied in a customer-based IOS context by Grover (1993), information systems (IS) context by Thong (1999), **mobile marketing adoption context by Maduku (2021), blockchain adoption context by Lustenberger, Malesevic, and Spychiger (2021), and AI and robotics context by Nam, Dutt, Chathoth, Daghfous, and Khan (2020).** Yadegaridehkordi et al. (2020) utilized TOE and human-organization-environment (HOT) frameworks to assess the impact of big data on firm performance in the hospitality industry. The findings of the study indicated that the relative advantage and management support were two of the most important factors in the technological, organizational, and environmental dimensions (Yadegaridehkordi et al., 2020). **Awa, Ojiabo, et al. (2017) combined organizational-level technology adoption and user-level adoption by complimenting TOE with UTAUT in an effort to elevate applicability.**

Compatibility, which Rogers (1983) described as one of the five characteristics of an innovation affecting the diffusion of an innovation, is the innovation's perceived conformity with the present values, needs, and previous experiences of potential adopters (Moore & Benbasat, 1991). In the process of removal of barriers to use, Venkatesh, Morris, Davis, and Davis (2003) defined compatibility as a construct that is operationalized to encompass the features of the technological and/or organizational environment. Utilizing a dataset of 1415 companies from six European countries, Zhu, Dong, Xu, and Kraemer (2006) conducted a study on innovation diffusion in global contexts and found that compatibility was the most important component affecting the post-adoption in European companies' adoption of digital information. Extant literature provides evidence for the positive association between the compatibility and innovation adoption (Ozturk, Palakurthi, & Hancer, 2012). Deploying TOE framework, Wang, Wang, and

Yang (2010) conducted a study on the adoption of RFID systems in the Taiwanese manufacturing industry and induced that compatibility had a positive impact on RFID adoption.

Within the technological context, complexity explains how the new technology is perceived in terms of its use and comprehension by the users (Cobos et al., 2016). It is often negatively associated with technology adoption as it is considered an inhibitor for successful implementation of a new system or technology (Wang et al., 2010). In instances where the newly introduced technology has complex features and it takes the users long time to comprehend and implement the technology, complexity usually stands in the way of successful technology adoption (Premkumar & Roberts, 1999). It is, therefore, imperative that the complexity aspect of any robotic technology is addressed before any new robotic technology can be successfully implemented in a hospitality setting.

Extant literature underlines a negative relation between the perceived cost associated with the new technology and the users' intention to adopt a new technology (Maduku, Mpinganjira, & Duh, 2016). Perceived cost can be defined as the user's opinion concerning the costs involved in adopting a new technology (Lai, Lin, & Tseng, 2014). Mutlu and Forlizzi (2008) used ethnographic data collected at a hospital using an autonomous delivery robot to evaluate how organizational factors affected the users' acceptance of the robotic technology. They discovered that when the cost of utilizing a robot outweighed the benefits gained by integrating the robot into the workflow, people grew less inclined toward using the robot (Mutlu & Forlizzi, 2008). **In the context of robotics, Wang, Cai, Xu, and Li (2021) assessed perceived cost in analyzing the relationship between customers' perceived value and willingness to use service robots.** Accordingly, for the present study, the perceived cost is hypothesized to have a negative influence in an organization's decision to adopt a robotic technology in the hotel industry. Based on this theoretical background, this study suggests the following hypotheses:

H_1: *Relative advantage has a significant positive impact on intention to adopt a robotic technology.*

H_2: *Compatibility has a significant positive impact on intention to adopt a robotic technology.*

H_3: *Complexity has a significant negative impact on intention to adopt a robotic technology.*

***H_4:** Perceived cost has a significant negative impact on intention to adopt a robotic technology.*

2.2.2. Organizational Dimension

Second context of the TOE framework, organizational context, pertains to the expository assessments about the organization, such as operational scale, size, and management, as well as the distinguished features and resources it possesses. Organizations that are organic and not top-to-bottom, have been observed to respond well to technology adaptation thanks to their fluid and team-oriented constitution (Baker, 2012). While these decentralized organizations seem to provide an ideal structural environment for the adaptation of technology, top-to-bottom organizations with more formal communication and clearly defined roles are more suitable for the implementation phase of new technologies (Zhu, Kraemer, & Xu, 2003).

Previous research showed that top management support was critical in the adoption and implementation of a technology, as some of these technologies or new products may require long term commitment and top-level communication to achieve success (Grover, 1993; Premkumar & Ramamurthy, 1995). Top management support influences the organizational perception regarding the perceived use of the technology and its actual usage (Lin, 2010). Previous studies suggest that top management support - senior management's commitment and belief in the implementation of the technology - plays a crucial role in technology adoption, implementation and revenue generation (Law & Ngai, 2007). **In the context of robotics and AI, Chen (2019) highlighted the significance of top management support in the adoption process as it reduces the interdepartmental conflict and helps build an organization-wide consensus.**

A study conducted by Alshamaila, Papagiannidis, and Li (2013) analyzed 15 SMEs and service providers in the UK to assess their technology adoption process through the lens of TOE framework. Findings of the study identified top management support, as one of the main factors that dictated the technology adoption. **Similarly, leadership was most critical for technological adoption by travel agencies in Jamaica (Spencer, Buhalis, & Moital, 2012).** In the hospitality context, Pateli, Mylonas, and Spyrou (2020) investigated the factors that influenced the hospitality organizations' decision to adopt social media through DIT and TOE frameworks. The results of the study pointed to top management support, as one of the seven factors that influenced organizations' technology adoption. As the previous studies have identified, top management support is a key variable in determining a firms' behavioral intention to adopt a new technology. On the basis of the preceding argument, it is proposed that:

H_5*: *Top management support has a significant positive impact on intention to adopt a robotic technology.

Some technology acceptance or innovation adoption endeavors require the organizations to have a certain infrastructure or technology standards in place for the integration of the new technology to be successful (Sharma, 2007). Previous literature identified organizational readiness as one of the factors that influenced the adoption of new technology (Molinillo & Japutra, 2017). In a technology adoption context, organizational readiness has two dimensions: (1) financial resources, and (2) technological resources of the organization (Iacovou, Benbasat, & Dexter, 1995). Financial resources refer to the organization's financial capability to meet the costs associated with the procurement, implementation, and upkeep of a new technology (Iacovou et al., 1995). Technological resources refer to organization's technological capability and level of sophistication (Iacovou et al., 1995). Mehrtens, Cragg, and Mills (2001) study on small firms concluded that organizational readiness was one of the three factors that significantly influenced technology adoption (Molinillo & Japutra, 2017). Systematically reviewing 280 publications, Wang and Wang (2021) conducted a literature survey that focused on robotic technologies during the pandemic. The study provided a technology readiness level (TRL) index for real robotic devices that were deployed by organizations during the Covid-19 pandemic, further demonstrating the importance of organizational readiness, both financially and technologically, in the adoption and implementation of robots and robotic technologies. Based on these theoretical underpinnings and empirical evidence, we hypothesize that,

H_6*: *Organizational readiness has a significant positive impact on intention to adopt a robotic technology.

2.2.3. Environmental Dimension

TOE's third component, the environmental dimension, is "the arena in which a firm conducts its business—its industry, competitors, access to resource supplied by others, and dealings with government" (Tornatzky & Fleischer, 1990, p. 153). Environmental dimension of TOE encompasses the market structure, regulatory environment, subsistence of service providers in the technology sectors, and competition levels. Interaction of these variables have an impact on the technology adoption decisions (Baker, 2012). Competition levels are often associated with the competitive pressure, which usually stems from an imbalance between the competing firms, e.g., market share, technological sophistication, financial capital, etc. Competitive pressure can be defined as the pressure that is caused by the threat of losing competitive advantage in a business environment (Maduku et al., 2016). As a form of external pressure, competitive pressure has been previously found to be an antecedent to organizations' intention to adopt technology (Chwelos, Benbasat, & Dexter, 2001).

Cruz-Jesus, Pinheiro, and Oliveira (2019) developed a conceptual model deploying TOE framework to investigate the antecedents of customer relation management (CRM) adoption stages. Their findings revealed that competitive pressure was one of the critical elements in CRM adoption (Gutierrez, Boukrami, & Lumsden, 2015) adopted TOE framework to determine the factors influencing managers' decision to adopt cloud competing in the UK. Their findings revealed that competitive pressure was one of the four factors that had a significant influence on the adoption decision of the managers (Gutierrez et al., 2015). **In the robotics and AI context, Li, Yin, Qiu, and Bai (2021) identified competitive pressure as a factor that drove service interactions with new technologies in the hospitality industry.** As the previous literature suggests, competitive pressure may lead to change in attitudes toward new technology in an organizational setting. Accordingly, present study adopts competitive pressure as one of the determinants of robotic technology acceptance in the hospitality industry. Based on this existing literature, this study suggests the following hypothesis:

H_7: *Competitive pressure has a significant positive impact on intention to adopt a robotic technology*.

2.3. Personal Innovativeness

In previous studies, Bruner and Tajfel (1961), Jacoby (1971), and Kirton and Mulligan (1973) established a substantial link between innovativeness and other personality traits. Building upon this notion, Hurt et al. (1977) described innovativeness as a "willingness to change". There have been numerous studies to investigate personal innovativeness as a moderator in the technology acceptance context (Cheng, 2014; Jang & Lee, 2018; Moore, 2012). A recent study by Abubakre et al. (2020) explored the impact of personal innovativeness and information technology culture on digital entrepreneurship and found that entrepreneur's innovativeness in IT had moderating effects on the relationship between the IT culture and becoming a successful digital entrepreneur. **In an academic teaching context, Aldholay, Isaac, Jalal, Anor, and Mutahar (2021) analyzed the factors that accelerated the acceptance of big data platforms, discovered that personal innovativeness moderated the relationship between perceived enjoyment and the acceptance of the big data platforms. In a tourism context, Xian (2021) studied the pattern of technology in tourism leisure economy, exploring the moderating role of personal innovativeness. The results of his study verified personal innovativeness as a moderator in the proposed research model**. Based on this theoretical background, the present study suggests the following hypotheses:

> ***H_8:*** *Innovativeness positively moderates the relationship between intention to adopt and relative advantage (a), compatibility (b), complexity (c), cost (d), top management support (e), organizational readiness (f), and competitive pressure (g).*

The conceptual framework below concisely illustrates the hypotheses.

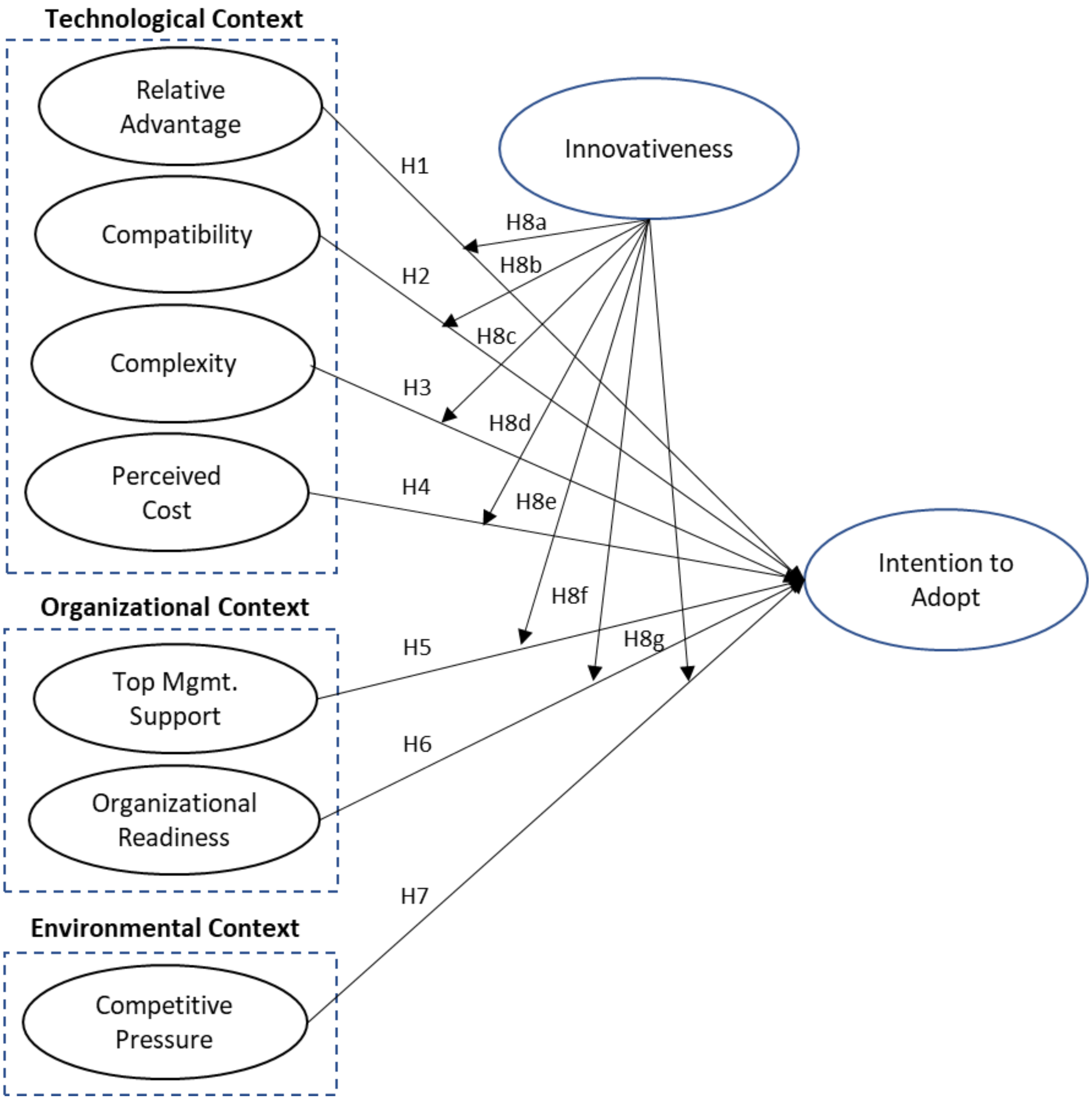

Figure 1: Research Model

3. METHODOLOGY

3.1. Instrument

The measurement scales used in this study were adapted from prior studies. Some alterations were made to confirm that the scales reflect the Robotics context**. Relative advantage was measured with three items. Two of the items were adapted from Groover (1993) and one item was adapted from Premkumar and Roberts (1999). A three items scale was used to**

measure compatibility. Two of items were adapted from Groover (1993) and one item was adapted from Ramamurthy, Premkumar and Crum (1999). To measure complexity, a three items scale was used. Two items were adapted from Groover (1993) and one item was adapted from Premkumar and Roberts (1999). Competitive pressure was measured with a three-item scale. Two items were adapted from Premkumar and Roberts (1999) and one item was adapted from Premkumar and Ramamurthy (1995). Perceived cost and organizational readiness were adapted from Sharma (2007) and measured with three items each. Top management support was measured using a total of three items developed by Soliman and Janz (2004). Personal Innovativeness was measured with 20 items adapted from Hart, Joseph and Cook (2013). Finally, intention to adopt was measured with three items adapted from Davis et al. (1992).

All of the surveys were in English except the surveys for Japan and Spain. For these two countries, a back- translation method was utilized. In the first step, the original English questionnaires were translated into Japanese and Spanish languages. In the second step, the questionnaires were back translated into English by two of the authors who were fluent in both languages. In the final step, two scholars (i.e., one scholar who was fluent in Japanese and English, and another scholar who was fluent in Spanish and English) cross-checked the questionnaires for consistency to confirm that the translation kept the language sensitivities and meanings of the original English phrases of the questionnaires.

After informal discussions with faculty members and industry experts, a pilot test was performed to ensure the clarity and comprehensiveness of the questionnaires. Based on the results, the measurement scales were modified, and the final version of the questionnaire was developed. A seven-point Likert scale (i.e., 1 = strongly disagree to 7 = strongly agree) was utilized to measure the study constructs.

3.2. Data Collection and Data Analysis

Hotel managers were the target population in the current study. A web-based survey was used to collect data of the study from eleven countries including Brazil, Canada, Greece, India, Israel, Japan, Romania, Spain, Turkey, United Kingdom, and United States. **The data for United States, Turkey, Canada, and Spain were collected through a marketing company (i.e., Qualtrics). For Greece, United Kingdom, Romania, India, Israel, and Brazil, authors used hotel associations or similar companies to collect data from variety of hotels. For Japan, the**

link of the survey was distributed to respondents through different channels including social media (i.e., Facebook), hotel journals, and hotel management training companies' listservs.

A definition of robot and an explanation of robotics technologies in the hotel industry with examples were included at the beginning of the questionnaire to make sure that the respondents have a clear understanding of robotics technologies. **A screening question in each survey (e.g., Are you currently working as a manager or a decision maker in a hotel in the United States?) were used to verify that only hotel managers participated in the survey.**

A total of 1112 questionnaires were collected and after cleaning the data, a total 1077 (US N=105, Canada N=116, Israel N=102, Brazil N=102, Spain N=120, Japan N=120, Greece N =103, India N=107, Turkey N =109, UK N=49, Romania N=44) questionnaires were used for data analysis.

A standard two-step approach was used for the data analysis of the study (Anderson and Gerbing,1988). The first step involved performing a confirmatory factor analysis (CFA), which allowed researchers to test the validity of the measurement scales. In the second step, structural equation modelling (SEM) was conducted to test the study hypotheses.

4. RESULTS

4.1. Preliminary Results

Visual inspection of histograms and box plots were used to assess the normality of the dataset. The results illustrated that the study's variables demonstrated normal distribution. Additionally, skewness and kurtosis values were analyzed. The results indicated that skewness and kurtosis values were all in acceptable range of −2 and +2 (George & Mallery, 2010). Furthermore, tolerance values were examined to evaluate multicollinearity. The results revealed that tolerance values of each construct were above 0.2 (Hair et al., 2010) indicating no multicollinearity in this study.

Regarding participants' demographic and individual difference characteristics, the results indicated that around 50% of the respondents were males and 31% were females. Forty five percent of the participants were between the ages of 36 and 55 and 32% of the respondents had a bachelor's degree. Around 15% of the participants had 4 to 7 years of experience and 13% of the participants had 8 to 11 years of experience in the hotel industry. Eighteen percent of the participants had 4 to

7 years of managerial experience in the hotel industry and 51% of the participants had no hotel experience outside their own country (Appendix A).

In terms of hotels' profile, the results indicated that around 32% of the hotels had 51 to 150 full time employees and around 35% of the hotels had 51 to 200 rooms. A plurality of the hotels (45%) were in an urban area and around 29% of the hotels were luxury hotels. Thirty seven percent of the hotels had mostly domestic guests and around 28% of the hotels had mainly leisure guests. Around 29% of hotels were in operation for 11 to 25 years. Finally, 27 % of the hotels were members of a franchise or an independent chain, and 23% of the hotels were independently owned but managed by a management company or corporate owned and managed (Appendix B).

4.2. Measurement Model Analysis

A confirmatory factor analysis (CFA) was conducted to assess the validity of the measurement scales. Items with factor loadings equal or greater than 0.5 were kept in the CFA analysis (Table 1). The chi-square statistics were significant and the ratio of chi-square value to degree of freedom was less than the cut of point of 5 ($\chi 2$= 956.939, df = 220). Other goodness-of-fit measures including RMSEA (0.56), CFI (0.96), GFI (0.92), NFI (0.96). and RFI (0.94) demonstrated a good theoretical model fit (Browne & Cudeck, 1993; Hair, Anderson, & Tatham, 1998). The reliability of the measurement scales were evaluated by assessing composite reliability (CR) estimates. The CR values were above 0.8, which indicated a support for construct reliability (Fornell & Larcker, 1981). Average Variance Extracted (AVE) values were utilized to assess the convergent validity. The AVE values varied from 0.61 to 0.88, which exceeded the recommended value of 0.5. These results indicated a good convergent validity for the scales (Fornell &Larcker, 1981). Furthermore, the square roots of AVE scores were compared with the correlations among constructs to evaluate the discriminant validity of the scales. The results produced evidence for discriminant validity as the squared correlations between pairs of constructs were less than the AVE values (Table 2).

Table 1: Measurement Model Results

Constructs	Loadings	CR	AVE
Relative Advantage		0.82	0.61
1. Robot applications can allow us to increase the market share of my hotel.	0.696		
2. Robot applications can allow us to improve customer service in my hotel.	0.839		
3. Robot applications can increase the profitability of my hotel.	0.801		
Compatibility		0.88	0.72
1. I perceive robot applications are consistent with my hotel's existing values.	0.756		
2. I perceive robot applications are consistent with my hotel's existing practice.	0.880		
3. I perceive robot applications are compatible with my hotel's existing information technology infrastructure.	0.917		
Complexity		0.84	0.64
1. Learning how to operate robot applications would be difficult.	0.718		
2. Robot applications are too complex to implement.	0.898		
3. Integrating robot applications in our current work practices is very difficult.	0.790		
Cost		0.93	0.81
1. I believe, the expected cost of equipment, software and networking for robot applications is expensive.	0.879		
2. I believe, the expected cost of integrating robot applications with my hotel's existing information management systems is expensive.	0.924		
3. I believe, the expected cost of re-engineering my hotel business processes around robot applications is expensive.	0.907		
Top Management Support		0.89	0.74
1. The owners/my top management are likely to invest funds in robot applications.	0.809		
2. The owners/my top management are likely to be interested in adopting robot applications in order to gain competitive advantage.	0.876		
3. The owners/my top management are likely to take risk in the adoption of robot applications	0.893		
Organizational Readiness		0.83	0.62
1. Availability of financial resources to meet the costs of adoption and implementation of robot applications is high in my hotel.	0.873		
2. Presence of policies that support funding for new technology projects such as robot applications adoption and implementation is high in my hotel.	0.791		
3. The overall level of readiness of my hotel for adopting, implementing, and using robot applications is high.	0.704		
Competitive Pressure		0.84	0.64
1. My hotel will experience a competitive disadvantage if robot applications are not adopted.	0.906		
2. I believe that we will lose customers to our competitors if we do not adopt robot applications.	0.761		
3. I feel that it is a strategic necessity to introduce robot applications in my hotel in order to compete in the existing marketplace.	0.730		
Intention to Adopt		0.95	0.88
1. If I were the decision maker, I would intend to adopt robot applications for my hotel in the future.	0.918		
2. If I were the decision maker, I predict that I will adopt robot applications for my hotel in the future.	0.953		
3. If I were the decision maker, I will make an effort to adopt robot applications for my hotel in the future.	0.944		

Table 2: Discriminant Validity Matrix

	1	2	3	4	5	6	7	8
1. Competitive Pressure	**0.803**							
2. Relative Advantage	0.726	**0.781**						
3. Compatibility	0.660	0.697	**0.854**					
4. Complexity	0.133	0.032	0.102	**0.805**				
5. Cost	0.052	0.154	0.021	0.480	**0.904**			
6. Management Support	0.659	0.678	0.647	0.062	0.037	**0.860**		
7. Organizational Readiness	0.627	0.514	0.602	0.157	-0.002	0.740	**0.792**	
8. Intention	0.695	0.763	0.604	-0.050	0.128	0.649	0.459	**0.938**

Off-diagonal elements: Inter-construct correlations. Diagonal elements (bold): Squared root of AVEs.

4.3. Structural Model Analysis

To test the study hypotheses, a SEM analysis was conducted. The same goodness-of-fit measures were used as in the CFA. Chi-square to degrees of freedom ratio was equal to 4.35, which was below the cutoff point of 5 ($\chi 2$= 956.939; df = 220) (Hair et al., 1998). Other fit indices were also in satisfactory range including RMSEA (0.05), CFI (0.96), GFI (0.92), TLI NFI (0.95) and RFI (0.94) (Hair et al., 1998).

Regarding the results of the hypotheses testing, the study results indicated that H1, H3, H5, H7 were supported in their proposed directions ($p < 0.01$). More specifically, the results indicated that relative advantage, top management support, and competitive advantage positively affected hotel managers' intention to adopt robotic technologies while complexity negatively influenced hotel managers' intention to adopt robotics technologies **(Table 3)** (Figure 2). Furthermore, the study results revealed that relative advantage (H1 path coefficient = 0.44) had the strongest impact on intention to adopt followed by competitive advantage (H7 path coefficient = 0.29), top management support (H5 path coefficient = 0.26) and complexity (H3 path coefficient = -0.16). The variance explained for intention to adopt was 66%.

Table 3: Hypotheses Test Results (Moderation Hypotheses Excluded)

Structural Paths	**Standardized Path Coefficients**	**Hypothesis Supported yes/no**
H1: Relative Advantage → Intention to Adopt	0.44	Yes
H2: Compatibility → Intention to Adopt	-0.03	No
H3: Complexity → Intention to Adopt	-0.16	Yes
H4: Perceived Cost → Intention to Adopt	0.04	No
H5: Top Mgmt. Support → Intention to Adopt	0.26	Yes
H6: Organizational Readiness → Intention to Adopt	-0.03	No
H7: Competitive Pressure → Intention to Adopt	0.29	Yes

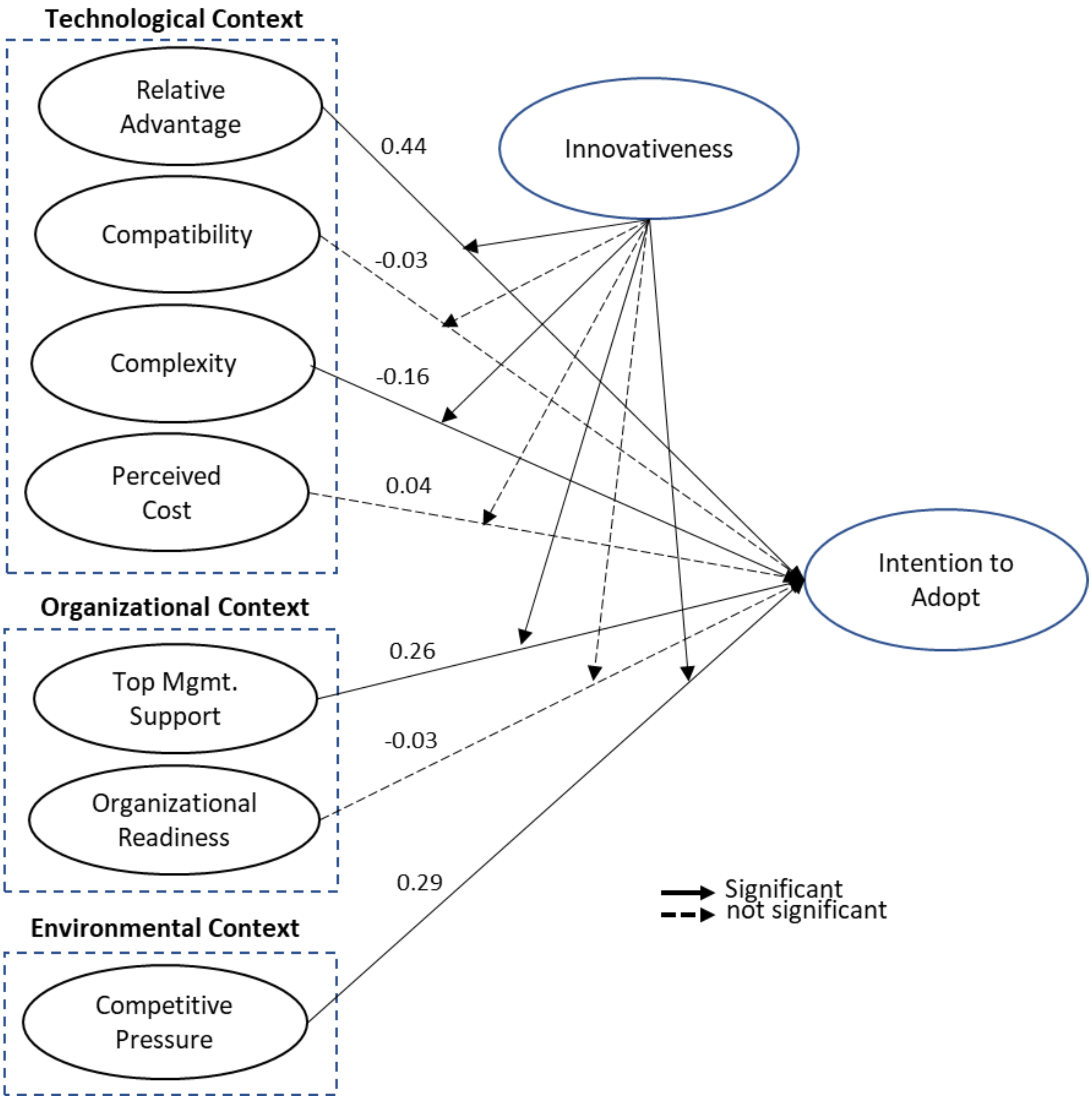

Figure 2: Results for Structural Modeling Analysis

4.4. Moderating Role of Innovativeness

As mentioned earlier, a 20-item scale adapted from Hart, Joseph and Cook (2013) was used to measure innovativeness (Appendix C). Hotel managers' different innovativeness levels were calculated by following the three steps proposed by Hart at al. (2013). In the first step, the scores for items 4, 6, 7, 10, 13, 15, 17, and 20 were added. In the second step, the scores for items 1, 2, 3, 5, 8, 9, 11, 12, 14, 16, 18, and 19 were added. In step three, the following formula was utilized to generate an innovativeness score.

Innovativeness = 42 + total score for step 2 – total score for step 1

Scores above 80 were classified as *innovators*; scores between 69 and 80 were classified as *early adopters*. scores between 57 and 68 were classified as *early majority*; scores between 46 and 56 were classified as *late majority*; and scores below 46 were classified as *traditionalists*. To examine the moderating effect of innovativeness on the structural model, a multigroup moderation analysis was conducted. The study results demonstrated that the impacts of relative advantage, complexity, top management support, and competitive advantage on intention to adopt were moderated by innovativeness. More specifically, the impacts of relative advantage, complexity, and top management support on intention to adopt was stronger for *innovators* than *traditionalists* and *late majority* and stronger for *early adopters* than *traditionalists*. In addition, the impact of competitive pressure on intention to adopt was stronger for *innovators* than *traditionalists* (Appendix E). These results indicated that H8a, H8c, H8e, and H8g were supported.

5. DISCUSSION

Based on the TOE framework, the purpose of this study was to examine hotel managers' adoption behavior in the context of robotic technologies. The study result indicated that relative advantage had a significant positive impact on intention to adopt a robotic technology, confirming H1. This finding is consistent with conclusions from prior studies conducted in the context of new technology adoption (Ifinedo, 2005; Mallat & Tuunainen, 2008; Yadegaridehkordi et al., 2020). This result implies that hotel managers are more willing to adopt robotic technologies if they perceive that these technologies will give them relative advantage in terms of its position in the market through new stream of revenues, improved customer service and increased profitability.

However, compatibility was not found to have a significant impact on intention to adopt a robotic technology, rejecting H2. While prior studies highlighted the significant

impact of compatibility as a facilitator in new technology adoption (Ifinedo, 2011; Mallat & Tuunainen, 2008; Wang et al., 2010), this study found no association between compatibility and adoption intention. The likely explanation for this insignificant result could be that managers are unsure if having robotic technologies in their hotels will support their organizational values and practices, and their existing information technology infrastructure.

Complexity is found to have a significant negative impact on intention to adopt a robotic technology (H3) implying that hotel managers are less likely to adopt robotic technologies when they perceive these technologies as complex to use and find it difficult to integrate robots in their current work practices. Prior literature provided inconsistent findings related to complexity-adoption relationship. Our finding is consistent with the RFID adoption study of Ozturk et al. (2012), Wang, Li, Li , and Zhang's (2015) study of adoption of mobile reservation systems, and Chatterjee et al.'s (2021) study in the context of AI adoption in manufacturing and production. In contrast, Ahmadi, Nilashi, Shahmoradi, & Ibrahim's (2016) study found no association between complexity and adoption of hospital information system.

Interestingly, perceived cost was not found to be significant in adoption of a robotic technology (H4) in the hotel industry. This insignificant result differs from prior empirical studies, which found cost as a strong predictor of technology adoption (Lian et al., 2014; Mutlu & Forlizzi, 2008; Oliveira, Thomas, & Espadanal, 2014). Thus, based on the finding of this study, it can be argued that managers in the current study sample had neither specific knowledge nor opinions about the costs associated with deploying robots in their hotels.

In the context of organizational factors, top management support was found to be important factor influencing managers' intention to adopt a robotic technology which supports H5. This finding is consistent with prior studies, which found that support from top management promotes managers' adoption intention of a new technology (e.g., Pateli, 2020; Yang, Sun, Zhang, & Wang, 2015). The utilization of AI supported technologies to drive the business is a strategic decision and requires substantial strategic investments (Alami et al., 2020). Therefore, managers may look up to the top management's support in their adoption decision as top management is ultimately responsible for strategic planning and decision making related to new technology adoption. Thus, if mangers believe that the top

management is willing to invest funds for the robotic technology and open to take risks involved, then the hotel managers will have higher intention of adopting robotic technologies.

Organizational readiness did not have a significant impact on intention to adopt a robotic technology in this study (H6). This insignificant result is consistent to Wang et al.'s (2015) study of mobile reservation systems. A likely explanation is that managers were not able to judge if their hotels were ready for the deployment of robots mostly from a financial perspective. Another possible explanation for this insignificant result may be due to the hospitality managers' lack of awareness regarding the resources, infrastructure and procedure needed to adopt the robotic technologies in their hotel.

As an environmental factor, competitive pressure had a significant positive impact on intention to adopt a robotic technology (H7). This finding is in accordance with prior studies (Molla & Licker, 2005; Kurnia et al., 2015) which reported significant influence of environmental pressure in the context of E-commerce technology adoption. In the same vein, Cruz-Jesus et al. (2019) also reported a significant influence of competitive pressure on managers' decision to adopt customer relation management. Finally, with regards to moderation effects, the study results indicated that innovativeness positively moderates the relationship between intention to adopt and relative advantage (H8a), complexity (H8c), top management support (H8e), and competitive pressure (H8g) justifying that innovativeness acts as a countable factor to moderate in organizational adoption of robotic technologies. In other words, these results suggest that the positive impact of relative advantage, top management support and the negative impact of complexity on intention to adopt and competitive pressure strengthens when the hotel managers innovativeness level increases.

6. THEORETICAL AND PRACTICAL IMPLICATIONS

The current study offers several theoretical contributions in the context of robotic technology adoption literature in the hospitality industry. While there has been a general interest among researchers in hospitality service robots, majority of these studies have been conducted from customers perspective, and managers perspective on the adoption of robotic technologies remains relatively unknown (Ivanov et al., 2020). More specifically, only handful of studies have focused on the adoption behavior of managers despite the fact that they are the ultimate decision makers in the organization. Thus, this study contributes to the

current body of literature in robotic technology adoption by directly addressing this gap in prior empirical investigations.

Hospitality organizations' reliance on human labor makes this sector very appealing for application of new technological innovations including AI (Noone & Coulter, 2012; Tuomi, Tussyadiah, & Stienmetz, 2021) and researchers agree that the application of robotic technologies will continue to grow in the hospitality field. Furthermore, crisis such as COVID-19 pandemic has also created new innovation opportunities for hospitality organizations. It is evident that hospitality industry greatly suffered during the pandemic due to social distancing measures (Zeng et al., 2020) and many service industries including hospitality, that greatly rely on human labor, are forced to use robots for sanitation and physical distancing (Sayitoglu & Ivanov, 2020). Breier, Kallmuenzer, Clauss, Gast, Kraus, & Tiberius (2021) argue that this is a technological innovation opportunity for hospitality managers, and they should seize this opportunity not only to overcome the ongoing crisis, but also to be prepared in advance for possible future crises.

While robotic technologies may have been somewhat distant concept for hospitality managers in the past, this study provides evidence that there is a general support among hotel managers to adopt robotic technologies in their hotels. As hospitality organizations continue to expand the applications of robots, new empirical investigations are needed to inform and guide the researchers about the progress of this emerging research area. This is one of the first studies that investigated factors that influenced hospitality managers intention to adopt robotic technologies.

In addition, this study adopted TOE framework to investigate the impacts of technological, organizational, and environmental factors on hotel managers intention to adopt robotic technologies. The study results provided strong evidence that relative advantage, complexity, top management support, and competitive pressure were the significant predictors of hotel managers adoption intention. While there is an abundance of literature regarding adoption of innovative technologies in the hospitality industry, we believe that this study provides unique contribution by confirming TOE framework as an appropriate conceptual model in predicting the adoption intention of robotic technologies in the hospitality industry.

This is one of the first studies that attempted to highlight the moderating role of innovativeness and found significant results on the abovementioned relationships which provides comprehensive information surrounding the formation of managers' behavioral intention to adopt robotic technologies. Thus, in our opinion, this study is an additional building block in the innovation adoption literature and the findings could inform scholars in the field beyond hospitality such as health care and education.

Hospitality technology vendors, suppliers and hotel operators can draw various practical implications from the findings of this study to increase hotel managers' intention to adopt robotic technologies. This study found that the relative advantage positively affected hotel managers' intention to adopt the robotic technology. As such, technology companies must understand the problems that hotels frequently face and how their products can provide the best solution. Technology vendors should focus their efforts on highlighting how their robotic technologies can increase the hotels' market share, customer service, and profitability. By collaborating with hotel industry partners, technology companies could better understand the additional benefits they can offer hotels and will have the knowledge necessary to aim marketing efforts to make them stand out as the superior product to solve hotel problems (Kurnia et al., 2015).

The results of this study also found that the support of top management positively affects hotel managers' intention to adopt robotic technologies. In order to increase hotel managers' positive perceptions about adopting robotics technologies, top management should clearly indicate their support through various communication channels which may help to alleviate managers' concerns about adopting this new technology. In addition, to sway hotel top management to support robotic technologies, hospitality technology vendors should present business proposals outlining the potential benefits of implementing their robotic technologies, including an estimate of cost reduction on the hotels' bottom line (Ivanov et al., 2020). Additionally, hospitality technology vendors should create plans to provide demonstrations for hotel managers before adoption to encourage understanding of how hotels could adopt and implement the technology in their organization (Kurnia et al., 2015).

As the adoption of robotics technology in hotels becomes increasingly common, competitive pressure threatens the business of hotels that have not yet implemented robotics technology. Hospitality technology vendors should focus on generating more competitive

pressure to push hotels to consider new strategies such as implementing robotic technologies to gain a competitive edge. Lin (2006) states that first adapters often have a greater competitive advantage; thus, vendors should convey a sense of urgency when pitching robotics technology to hotel managers.

Hospitality technology vendors should also ensure that their technology is not perceived as too complicated to increase hotel managers' likelihood of adopting it. This study determined that complexity negatively influenced hotel managers' intention to adopt robotic technologies. By conducting beta testing with industry partners before launching the technology, hospitality technology companies can better understand the level of complexity that their users perceive.

Beta testing can provide valuable insight to determine which aspects of the technology are perceived as too complex, allowing the company to make the necessary changes to simplify their product. Hospitality technology companies should also provide hotel managers with a designated point of contact or an internal support team available through a web-based chat feature to ensure that all technology-related questions and concerns are answered and resolved quickly. Self-paced video training tutorials should also be created and included with the technology to allow hotel management and their staff to learn at the leisure of the hotel's operating schedule.

In general, managers' intent to adopt robotic technologies depends on their innovativeness or willingness to change. Innovative technologies, such as robotics, often provide sales growth, advertising and reduces hotel costs (Lukanova & Ilieva, 2019). Technology companies should seek to identify hotel groups that have previously successful track records of implementing other innovative strategies as they are likely to have leadership willing to make further changes to improve their organization. Marketing campaigns that appeal specifically to innovative hotel leadership should also be created to target organizations that are likely candidates to adopt robotics technology. In consideration of long-term implementation, technology vendors should work in conjunction with hospitality educational institutions to encourage future generations of hotel management to be more innovative through educational initiatives and programs.

7. LIMITATIONS AND FUTURE RESEARCH

The current study has several limitations that should be considered when interpreting its results. For example, since this study was done with a select group of countries and within each country it was performed with a convenience sample, it is not possible to claim that its results are generalizable and representative of the entire hotel industry, worldwide. Furthermore, because the information that was given to the subjects of this study before asking their opinion, was limited, some subjects were unable to express either support or objection to the question of intention to adopt robotic technologies in their hotels. Moreover, at this stage of theoretical development and empirical evidence, we are only able to partially predict the factors that affect or influence hotel managers' intention to adopt robotic technologies in their hotels. Thus, future empirical studies can incorporate other factors such as cross-cultural issues and barriers related to technology adoption. While this study finds enough support among hotel managers for the introduction of robotic technologies, this is a perception-based study and behavioral intention measures may not reflect actual behaviors (Dolnicar, 2020). As robotic technologies become widely adopted with time, future empirical studies can examine the factors that influences managers adoption intention and their actual adoption behavior in a longitudinal setting to provide the deeper understanding on how actual adoption decision forms. For future research, we would also like to recommend that this study or a similar one be conducted with a mixed-method design by collecting both qualitative and quantitative data from other countries which can produce more comprehensive findings.

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Appendix A: The Description of Robot and Robotic Technologies

Robots can be defined as programmable machines capable of carrying out a complex series of actions automatically that can substitute for humans and replicate human actions. Examples of the application of robotics in the hotel industry may include but not limited to concierge robots that provide guests with information about hotel services and nearby attractions, front desk robots that check-in guests and butler robots, who can travel the entire hotel to make deliveries such as snacks, toiletries, and other hotel amenities

Appendix B: Hotel Managers' Profile and Demographic Characteristics

Demographics/Profile	N	%
Gender		
Male	528	49.0
Female	339	31.4
Prefer not to say	44	4.0
Missing	164	15.2
Total	1077	100
Age		
18-25	46	4.3
26-35	178	16.5
36-45	259	24.0
46-55	231	21.4
56-65	146	13.6
66 or older	36	3.3
Prefer not to say	17	1.6
Missing	164	15.2
Total	1077	100.0
Education		
High School	50	4.6
Associate degree (2 years of college or technical/vocational school)	67	6.2
Some college	102	9.5
Bachelor's Degree in hotel, restaurant, or tourism management	179	16.6
Bachelor's Degree in other fields	167	15.5
Master's Degree in hotel, restaurant, or tourism management	137	12.7
Master's Degree in business administration (MBA)	85	7.9
Master's Degree in other fields	54	5.0
Doctorate Degree	22	2.0
Other (Please specify):	8	0.7
Prefer not to say	31	2.9
Missing	175	16.2
Total	1077	100
Experience in the Hotel Industry (year)		
1 to 3	77	7.1
4 to 7	160	14.8
8 to 11	136	12.6
12 to 15	93	8.6
16 to 20	104	9.6
21 to 25	113	10.4
26 to 30	86	7.9
31 and more	110	10.2
Missing	198	18.3
Total	1077	100
Managerial Experience in the Hotel Industry (year)		
1 to 3	192	17.8
4 to 7	192	17.8
8 to 11	115	10.6
12 to 15	111	10.3
16 to 20	114	10.5

21 to 25	48	4.5
26 to 30	50	4.6
31 and more	42	3.8
Missing	213	19.7
Total	1077	100
Managerial Experience in Hotels other than Your Own Country (year)		
No Experience	550	51.0
1 to 3	118	10.9
4 to 7	79	7.3
8 to 11	41	3.8
12 to 15	33	3.0
16 to 20	16	1.4
21 to 25	10	0.9
26 to 30	12	1.1
31 and more	7	0.6
Missing	211	19.5
Total	1077	100

Appendix C: Hotel Profile

Profile	N	%
Full-time Employees		
1 to 50	317	29.4
51 to 100	230	21.4
101 to 150	112	10.4
151 to 200	69	6.4
201 to 250	49	4.5
251 and more	137	12.7
Missing	163	15.1
Total	1077	100
Number of Rooms		
1 to 50	219	20.3
51 to 100	186	17.2
101 to 200	190	17.6
201 to 300	135	12.5
301 to 500	81	7.52
501 to 700	29	2.69
701 to 1000	14	1.29
1001 and more	34	3.15
Missing	189	17.5
Total	1077	100
Hotel Location		
In an urban area	485	45.0
In a suburban area	142	13.2
In a rural area	74	6.9
In a resort area	175	16.2
Other	39	3.6
Missing	162	15.0
Total	1077	100
Type of Hotel		
Budget/Economy	140	12.9
Extended Stay	104	9.6
Midscale	202	18.7
Upscale	75	6.9
Luxury	311	28.8
Other	83	7.7
Missing	162	15.0
Total	1077	100
Domestic or International Guest		
Majority Domestic	401	37.2
Majority International	273	25.3
Almost equal amount of domestic and international	241	22.4
Missing	162	15.0
Total	1077	100.0
Type of Guest		
Leisure	300	27.9
Family	201	18.7
Business	293	27.2
Group	49	4.5
Backpackers	20	1.9

Seniors	21	1.9
Other	32	3.0
Missing	161	14.9
Total	1077	100.0
Number of Years in Operation		
Less than 1 year	1	0.09
1 to 5	171	15.8
6 to 10	161	14.9
11 to 15	142	13.1
16 to 25	167	15.5
26 to 35	114	10.5
36 to 45	79	7.3
46 and more	81	7.5
Missing	161	14.9
Total	1077	100
Type of Ownership		
Single independent	330	30.6
Member of an independent chain	144	13.4
Franchisee	149	13.8
Independently owned but managed by a management comp.	116	10.8
Corporate owned and managed	131	12.2
Other	23	2.1
Missing	184	17.1
Total	1077	100.0

Appendix D: Innovativeness Scale

Innovativeness Items
1. My peers often ask me for advice or information.
2. I enjoy trying new ideas.
3. I seek out new ways to do things.
4. I am generally cautious about accepting new ideas.
5. I frequently improvise methods for solving a problem when an answer is not apparent.
6. I am suspicious of new inventions and new ways of thinking.
7. I rarely trust new ideas until I can see whether the vast majority of people around me accept them.
8. I feel that I am an influential member of my peer group.
9. I consider myself to be creative and original in my thinking and behavior.
10. I am aware that I am usually one of the last people in my group to accept something new.
11. I am an inventive kind of person.
12. I enjoy taking part in the leadership responsibilities of the group I belong to.
13. I am reluctant about adopting new ways of doing things until I see them working for people around me.
14. find it stimulating to be original in my thinking and behavior.
15. I tend to feel that the old way of living and doing things is the best way.
16. I am challenged by ambiguities and unsolved problems.
17. I must see other people using new innovations before I will consider them.
18. I am receptive to new ideas.
19. I am challenged by unanswered questions.
20. I often find myself skeptical of new ideas.

Appendix E: The Moderation Effect of Innovativeness

	Rel Adv → Int	**Cmplx→ Int**	**Mgmt Sup→ Int**	**Comp Press→ Int**
Innovators	0.831	-0.149	0.316	0.337
Early Adopters	0.875	-0.080	0.350	0.275
z-score	-0.262	-0.868	-0.344	0.793
Innovators	0.831	-0.149	0.316	0.337
Early Majority	0.776	-0.168	0.163	0.330
z-score	0.317	0.232	1.445	0.077
Innovators	0.675	-0.491	0.350	0.367
Late Majority	0.207	-0.129	0.167	0.337
z-score	2.687**	1.665*	1.862*	-0.179
Innovators	0.831	-0.341	0.497	0.555
Traditionalists	0.407	-0081	0.163	0.275
z-score	1.723*	2.115**	2.131**	2.013**
Early Adopters	0.875	-0.080	0.035	0.275
Early Majority	0.076	-0.168	0.047	0.330
z-score	0.624	1.241	-0.197	-0.670
Early Adopters	0.351	-0.127	0.350	0.275
Late Majority	0.487	-0.327	0.497	0.362
z-score	-0.897	1.285	-0.972	-0.623
Early Adopters	0.875	-0.324	0.191	0.151
Traditionalists	0.409	-0.080	0.035	0.035
z-score	1.987**	2.249**	1.815*	-1.124
Early Majority	0.776	-0.168	0.047	0.330
Late Majority	0.407	-0.324	0.191	0.362
z-score	1.532	1.398	-1.639	-0.222
Early Majority	0.776	-0.168	0.047	0.330
Traditionalists	1.016	-0.341	0.151	0.555
z-score	-0750	1.249	-0.992	-1.558
Late Majority	0.191	-0.324	0.397	0.362
Traditionalists	0.151	-0.341	0.589	0.555
z-score	0.338	0.104	1.035	-1.048

Notes: Rel Adv = Relative Advantage; Complx = Complexity; Mgmt Sup = Management Support; Com Press = Competitive Pressure; Int = Intention.

*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10