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RESEARCH TO DETERMINE THE POTENTIAL USE OF HUMANOID (ANTHROPOMORPHIC) ROBOTS IN ACCOMMODATION FACILITIES

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ABSTRACT

Study participants evaluated the use of robots in general, and specifically the use of humanoid robots for 36 different job positions in accommodation establishments in Turkey. This exploratory study aimed to determine the positions in which it will be easier to adopt the use of robots in accommodation businesses. It also examined the role of the participant's gender and age regarding the potential use of robots. An online survey was used to collect data, and the data was obtained from 407 participants. Contrary to the theory of anthropomorphism, but consistent with the Uncanny Valley and social comparison theories, the results of the study showed that the participants were adamant that it was not appropriate to use robots for 25 of the job positions out of 36. Humanoid robots were considered appropriate for positions that provide cleaning services, perform takeaway and delivery services, or where customers do not interact one-on-one during their stay. It was concluded that young people evaluated the use of robots in the sector more positively than older people. Similarly, women tended to make more positive evaluations than men. The original value of this research is based on the lack of studies evaluating the potential of using robots for positions in accommodation establishments.

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INTRODUCTION

The development of robotics, automation, and artificial intelligence (Tung & Au, 2018) means that robots have started to serve in many industrial fields, especially in automotive, electronics, metal, and chemical production, with increases in efficiency and cost reductions (Robotics Federation Annual Report, 2020). Robots are seen as the workforce of the future and have started to be used in accommodation businesses (Choi et al., 2020). One issue that needs to be understood is whether robots employed in the accommodation sector, which is seen as labor-intensive, will be accepted by hotel clients. This is because adapting any element to an area where production and consumption processes are carried out simultaneously is closely related to the acceptance of the people who consume the service.

Studies in different populations have examined the convenience and benefit provided by robots to hotel users (Ivanov et al., 2018a, 2018b; Lin & Mattila, 2021; Luo et al., 2021; Sharma et al., 2020; Tavitiyaman et al., 2022) and the attitudes of hotel managers towards service robots (Doğan & Vatan, 2019; Vatan & Doğan, 2021). The post-COVID-19 pandemic period, and the new climate where epidemics affect tourism movements may reveal the possible advantages and disadvantages of using robots compared to human workers in hotels (Kim et al., 2021; Wan et al., 2021; Wu et al., 2021; Zhang, 2021).

The labor-intensive nature of the accommodation sector meant it did not benefit much from the third industrial revolution, which introduced automation, or the fourth industrial revolution, which was identified with cyber-physical systems. Humanoid (anthropomorphic) robots, which are the result of the fifth industrial revolution, now allow human-robot collaboration and a high level of service customization and are thus an opportunity for accommodation businesses. The use of humanoid robots in hotels has a positive effect on attitude, customer satisfaction, and purchase intention (Jia et al., 2021).

Social relations directly affect service quality due to the intense human relations in the tourism sector and the high human-to-human interaction. It is thus important to examine the way users perceive robots in the tourism sector. This study examines the use of robots in accommodation businesses, which form a large part of the tourism sector, and the reaction of people to this situation. The human-ness of robots goes beyond appearance and is defined through human competencies, autonomy, and actions. Humanoid robots can have different personalities and

communication styles (Murphy et al., 2017). Users prefer humanoid robots to other types of robots in hotels, and find them more empathetic (Christou et al., 2020a). Studies on human-robot interaction note that users may feel more empathy for service robots and treat them as one of their kind when they resemble humans (Huang et al., 2021).

Previous studies have evaluated the degree of similarity between robots and human beings, or whether they were convincingly humanoid. The originality of this study lies in asking potential users to evaluate humanoid robots according to different job positions in a hotel. The aim of the study is thus to gather evaluations from potential users, in this case hotel clients, regarding the use of robots in hotels, and whether this differs according to gender and age. The results will shed light on which positions robots can be used in the accommodation sector according to the acceptance of potential users.

The study consists of three parts. In the first part, the concepts related to the subject are explained and examples of applying the use of robots in accommodation establishments are given. A conceptual framework was created combining with anthropomorphism, Uncanny Valley Theory and Social Comparison Theory, and various studies in the literature on the use of robots in accommodation establishments. The study method and the findings of the study are then described. Finally, a comment and conclusion section consider theoretical and sectorial recommendations for the use of humanoid robots.

LITERATURE REVIEW

Conceptual Framework

The word robot originates in the Czech word "robota" which means "forced service" (Hockstein et al., 2007), which in turn is based on "rabu" which means "slave" in Old Slavonic (Online Etymology Dictionary, 2021). In the Merriam-Webster (2021) dictionary, robots are defined as machines with human-like features, capable of performing complex tasks and being directed through automatic control. The American Robotics Institute defines the concept of a robot as "material with a pre-programmed motion system to perform various tasks" (TUBITAK, 2021). According to these definitions, a robot can be conceptualized as a smart device that has learned how to achieve its aims thanks to pre-prepared codes.

The concept of a "robot" first appeared in the play RUR (Rossumovi Univerzální Roboti), written by Czech playwright Karel Capek in 1921, but the person who suggested the word was Josef Capek, not Karel (Kurfess, 2005). Although the word robot was used for the first time in 1921, the history of the first machines that could be called robots, in retrospect, goes back to before the Common Era, to the third millennium BCE. The ancient Chinese (Needham, 1991), Egyptian, and Greek (Rosheim, 1994) civilizations developed robot-like machines. Throughout classical antiquity, a strong connection was seen between the creation of "artificial beings" or automations using mechanics, and the divine. Some sculptures resembling gods and ideals of human beauty are equipped with complex mechanics (Fron & Korn, 2019).

The Golden Age of Islam (eighth to sixteenth century AD) witnessed the contributions of İsmail al-Jazari, who is known as the father of robotics, to the field of robotics. Leonardo Da Vinci, allegedly influenced by Al-Jazari, also contributed to developing the field of robotics, as well as being an iconic figure for the European Renaissance (Rusu & Rusu, 2020). The names Vaucanson and Von Kempelen come to the fore in the period between the post-Renaissance and the great technological leap in the 20th century (Geoghegan, 2020).

Electro was developed between 1937 and 1938 by the Westinghouse Electric Corporation, enabling today's modern humanoid robots to take shape, and was introduced at the New York Fair in 1939 (Qiu & Wang, 2020). In the early 1940s, Isaac Asimov and John Campbell proposed the idea of an intelligent robot that obeys and acts on human commands. Isaac Asimov is known for the following three laws regulating robot behavior in his compilation stories; a robot should not harm any human being, should obey people's orders as long as it is not harmed, and should protect its own existence (Hockstein et al., 2007: 114).

In 1961, a company named Unimation developed the first commercial robot, "Unimate", in the form of a robot arm (Engelberger, 1999). The robot was used by General Motors for jobs where human strength was not enough (Yıldız, 2018: 168). The robot industry has started to lead globally. The Waseda University WABOT project started in 1967, and produced the first humanoid robot, Wabot-1, which can communicate with humans and move objects (Ceccarelli et al., 2020). Dante II, which was developed in 1994, has become able to make expeditions for volcanic gas samples (Bares & Wettergreen, 1999).

Thanks to all these steps, robots gradually started to develop. Robots can now perform almost all humanoid physical actions. Researchers have tried to give robots the ability to understand human gestures, facial expressions, and even emotions. There are many types of robots, and it is possible to classify them in different ways according to their functional features, joint structures, control methods, working principles, and areas of use, and so on (Gürgöze & Türkoğlu, 2019). Accordingly, robots can be classified into two categories; industrial robots and mobile robots.

Industrial robots are used in assembly, cutting, and transportation jobs, because they can be programmed, controlled automatically and do work on their own. Mobile robots, on the other hand, are robots with high mobility, and are classified in six categories; multi-robots, swarm robots, micro-nano robots, bio-inspired robots, collaborative robots (cobots) and humanoid robots (Gürgöze & Türkoğlu, 2019). Robots which can think and behave like humans, make decisions, and respond to diverse situations, are known as humanoid robots. They were developed to perform various tasks undertaken by humans (Singh et al., 2018). Humanoid robots are built with the ability to connect and interact with humans and other robots, and to interpret information.

This study examines examples in the accommodation sector. The first examples of robotic applications being used in the tourism industry are the first electrically powered robot pool cleaner in 1967, which Hjalager (2015) described as among the first hundred innovations that changed tourism, and the first lawn mowers used in hotels, produced in 1989. As robot technology developed over time, robots began to be used by accommodation businesses in different departments. Although there are many different types of robots, those used in accommodation businesses are mobile social robots and are used as service robots. The goal of accommodation businesses is to serve guests (Tung & Law, 2017: 2500). There are thus many robot applications in accommodation businesses. Robots have many uses, and these uses can be classified as follows (Tuomi et al., 2021) to:

Support: Service robots may deal with routine tasks so that employees can spend their time in more sophisticated situations.

Substitute: Service robots may replace human employees entirely in some extent.

Differentiate: Service robots may be used as a tool to differentiate the service offered in order to attract new customers.

Upskill: The presence of service robots may mean that human employees require a new set of skills.

Improve: Service robots may improve efficiency in a way that allows businesses to allocate unused resources to improve their service offer.

Wirtz et al. (2018) drew a frame defining the differences between human and robot employees. They provided three levels (micro, meso, and macro), one of which focused on customer experience at the micro level. Service robots produce more homogenous output than human employees, such as in the customization and personalization of services, which can be delivered more consistently by robots, whereas human employees depend on their personal skill and effort. Robot employees also have no biases and are good at subordinate service roles. On the other hand, human employees have genuine emotions and the ability to solve problems in a creative way. The increase in human-robot interactions means that new robot technologies are also changing consumer experiences (Fusté-Forné & Jamal, 2021).

The Inter-Continental Hotel Group put Dash, a robot employee, into service at the Crown Plaza San Jose-Silicon Valley hotel in 2015. A robot named Savioke Relay can go up to the accommodation floors and bring guests the items they want. The Starwood Aloft Hotel appointed a robot steward named Boltr to provide comfort for hotel guests (İbiş, 2019). The task of the robot, named "Connie", developed by the Hilton Hotels Group in cooperation with IBM in 2016, is to help hotel guests by making theater and restaurant reservations, and arranging tours (Konstantinova, 2019). Guests can also ask the robot questions about food, beverages, and travel plans and get information about the hotel surroundings. Connie can understand many different languages and can respond to multiple guests simultaneously. As robots interact with guests, they learn new things and contribute to improving service quality (Zeng et al., 2020).

The Marriott Hotel operating in Belgium has a robot employee named “Mario”. Mario can speak 19 different languages, hand over their room keys to guests and inform them about activities inside and outside the hotel. One of the first hotel trials without human personnel was started by a company called Alibaba in China (Alexieva, 2016). Robots perform operations in the reception department, such as check-in and check-out, and provide food service to guests. The robot in the bar of the hotel can prepare more than twenty kinds of cocktails and add the price to the consumer’s invoice by scanning their face (Ohlan, 2018).

The ProPILOT Park Ryokan Hotel, on the other hand, is equipped with self-moving objects rather than humanoid robots (Kayıkçı & Bozkurt, 2018). A table waiting team of robots has been established in the bar section of the Royal Caribbean Hotel (Tung & Law, 2017). In the Henn-na Hotel in Japan, entry and exit procedures, room service and cleaning are all done by robots. Robots in the form of dinosaurs welcome the guests at the entrance of the Henn-na Hotel and help them find their rooms (Lukanova & Illieva, 2019). The hotel's robots can also communicate with guests in different languages and assist guests who want their luggage delivered to their room (İbiş, 2019). The Henn-na Hotel had a number of issues, however (Reis et al., 2020). It had to decommission almost half its robot employees since they were unable to perform the social tasks for which they were designed. Some hotel guests were understandably irritated by this. Many Henn-na hotel guests experienced disruptions due to language barriers that prevented them from communicating with robots. Another Henn-na passenger believed that the technology "did not yet exist" because in fact the robots were unable to assist clients when they needed it (Tung & Au, 2018). Henn-na therefore combined traditional human services with android receptionists, returning to a human-robot partnership (HRC).

As can be seen from the examples, robots are used in accommodation businesses to provide services in various departments or provide support for human personnel. Some are robotic receptionists, luggage carriers, room assistants, housekeeper robots and luggage storage robots. Some hotels employ robots to perform tasks that would otherwise require human intervention, such as delivering food and beverages to guest rooms and completing check-in and check-out processes. Developing robot technology is used in accommodation, travel, and catering businesses for reasons such as improving operational activities and making product quality consistent (Ivanov et al., 2017).

Theoretical Framework

The literature describes two conflicting basic theories that can be used to explain the production and use of humanoid robots. These theories are anthropomorphism and the Uncanny Valley. Social comparison theory is used to explain how to overcome the dissonance (contradiction) that arises where ideas, impulses, and attitudes are concerned. Anthropomorphism is the tendency of individuals to explain non-human objects as having human characteristics such as emotions or intentions (Epley et al., 2007). Anthropomorphism, in other words, is to attribute human-specific and human-like characteristics to objects or animals. This tendency, which has

been common since ancient times, expresses a glorification of humans, and, in a way, although not fully, involves identifying with God (Pareyson, 1996).

"Why does man [sic] feel the need to humanize non-human beings?" Guthrie (1993) offers three reasons. The first is that people perceive what is happening in the environment through the information they have about it. The second reason is that people approach beings through humanization in order to eliminate the social emptiness they feel. The last reason is a need to build the world in a way that resembles humans (Khogeer, 2013: 29). These three reasons support the consideration of the concept of anthropomorphism (humanization) with semantic, social and cultural dimensions.

The main function of the semantic dimension is the point at which people predict and control the future behavior of other beings (Epley et al., 2007). The underlying causes of the social dimension involve the desire to control one's environment and to eliminate loneliness with the need to belong. The inadequacy in people's social relationships pushes them to perceive non-human beings as humanoid, thus removing the loneliness that the individual feels to some extent (Puzakova et al., 2009; Waytz et al., 2010). Culture is one of the most basic elements that affects the way people perceive their environment (Hofstede, 2011). An example of the culture dimension of anthropomorphism, in the context of consumption culture, is that the bear, which is a wild animal by nature, has become a favorite toy for babies (Delikan & Şener, 2020).

Prominent types of anthropomorphism seem to include visual anthropomorphism and linguistic anthropomorphism. Visual anthropomorphism involves identifying a product or brand with a certain human characteristic. Animation is a commonly used technique in visual anthropomorphism. However, there are situations when a real person can also represent an object; for instance, an overweight man appeared in a well-known car commercial for an airbag.

In linguistic anthropomorphism, human-specific qualities are transferred to an object or service through the words used. For example, in a coffee advertisement, coffee "gains its unique taste and smell" or "sweetens human relations" (Yücel Altınel, 2003). In addition to the visual and linguistic distinctions of anthropomorphism, there is also an idea that it can occur in four different ways (Di Salvo et al., 2005: 4-5):

• *Structural anthropomorphic form*: the imitation of human body structure and function. Shapes, mechanisms, or mechanisms that imitate human body features in their appearance or function, are examples of this type of anthropomorphism.

• *Gesture-based anthropomorphic form*: the use of movements and stances, which are elements of free behavior, to express a meaning or intention.

• *Character-based anthropomorphic form*: the reflection of human personality traits and social roles onto inanimate objects.

• *Awareness-based anthropomorphic form*: the principle of imitating human-specific features such as thinking and questioning. Robotics and artificial intelligence applications are examples.

The need for a more human world means that anthropomorphism is found in many different fields. Anthropomorphism is most frequently used in advertisements, toys, games and robots (Murphy et al., 2017). According to Baudrillard (1968: 169), one of the most common examples of anthropomorphizing objects is robots. Robots, which are a combination of full anthropomorphism and functionality, are the supreme object because of these features. Because people find humans more reliable than non-human objects, they gain control over objects and reduce uncertainty through anthropomorphism (Wang, 2017).

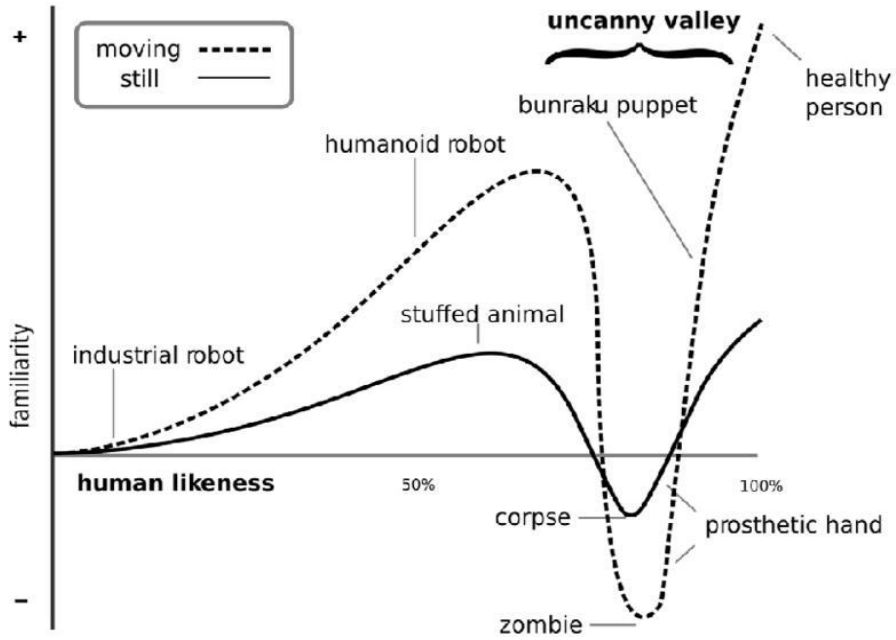

Figure 1. *Mori's Uncanny Valley Theory Graph (Hegel, 2016)*

According to MacInnis and Folkes (2017), there are three anthropomorphism strategies used in robot production. These are the uses of human-like features, such as a human face (a service robot with a human face, etc.), a human-like mind (a service robot with intentions, etc.), and a human personality (a friendly service robot, etc.). People thus try to make everything around them look like them, and they want to see a more human-like world. Sympathy for any object, person, or community, however, can be replaced by boredom, disgust, and hatred when it is exposed to that stimulus very often, for a long time, or when it evolves into something different from what was initially perceived by people. Doxey (1975) tried to explain this situation in terms of local people and tourists, in his Irritation Index. The Uncanny Valley Theory states that this arises in terms of robots due to their degree of resemblance to human beings.

Humanoid robots can imitate human behavior in many ways. Features such as the hands, eyes, speech skills, perception of the environment, and the ability to respond to people by interacting with them are attributed to robots from humans. People fill the world they live in with human-like creations, for reasons such as seeing them as more human and sometimes to feel less lonely (Puzakova et al., 2009; Waytz et al., 2010). The fact that the things they create have human-like characteristics makes them seem more sincere, friendly and safe. The Uncanny Valley theory by Japanese robot scientist Masahiro Mori can be confusing at this point. According to the Uncanny Valley theory, artificial designs and humanoid robots are attractive to humans up to a point (Brink et al., 2019), however, as the level of reality increases, negative emotions such as disgust, fear and hatred emerge, instead of positive ones (Geller, 2008: 11).

Figure 1 shows the levels of human similarity in artificial designs, and people's reactions to these similarities. According to Mori, if the appearance and behavior of a robot is humanoid, then a person's attitude towards the robot develops positively. However, as the robot begins to become more like a human, this attitude takes a negative turn. If humanoid features continue to be added to the robot, it can avoid being perceived as strange and frightening if humanoid features continue being added to the robot (Güngörmüş, 2018).

In Figure 1, the Uncanny Valley is depicted as a pit. The ideal location on the graph is the elevated section before falling into the valley, and after that point people start to feel hatred and disgust for an artificial object. This sense of the uncanny arises when humanoid robots are perceived as dangerous, in other words, when humans have no control over these robots.

If there is no threat, or it is at a very limited level, then robots are considered cute (Flach et al., 2012: 108). In this context, industrial robots are not perceived as uncanny because they do not have human-like features and are far from a real human in appearance. These robots are less likely to fall into the Uncanny Valley. Humanoid robots, on the other hand, raise expectations due to their human-like features. If its movements do not match a robot's humanoid appearance, it is perceived by people as uncanny and frightening (Tinwell et al., 2010).

At this point, the fact that the attitude of potential users towards robot employees can be affected by the general attitude emerges, because science is not rigid in its explanations, and there is variability in the ideas of the human species. How this general attitude has changed is not one of the subjects of this study, but it is a fact that change has taken place and further change is inevitable. One of the inferences of social comparison theory (Festinger, 1954), whose basic hypothesis is that people have an urge to evaluate their own ideas and competences, is that when there is incompatibility between ideas in a community, those ideas will change in order to eliminate the incompatibility. This can be interpreted as meaning that the minority will somehow accept the opinions of the majority after a certain point. On the other hand, another of the propositions in the same theory is that this comparison will be realized with the group that people see closest to them when comparing their ideas and competences. Humanoid robots in the hospitality industry can thus only be successful if the majority accept them. One of the main purposes of this study is to seek an answer to the question of how this level of acceptance is achieved in different job positions.

This study examined prominent and current research in the literature on the use of robots in accommodation establishments. Ivanov et al. (2017) revealed the difficulties faced by user companies if robots and service automation are used to serve tourists in hotels, restaurants, airports, event parks, travel agencies, museums and art galleries. Bowen and Morosan (2018) looked at how artificial intelligence and robotics are used in the hospitality industry, and offered ideas about how they might be used in 2030. Research indicates that robots will make up approximately one fourth of the workforce in the hospitality industry by 2030. Ivanov et al. (2018a) studied Russian adults and found that the use of robot personnel in accommodation enterprises was mostly supported by men. Ivanov et al. (2018b) studied Iranian tourists and found that they prefer human personnel in accommodation businesses, regardless of variables such as gender and age.

Choi et al. (2020) concluded that the services of human employees are perceived more positively in terms of interaction in the quality and physical service environment compared to the services provided by service robots. Doğan and Vatan (2019) discussed the opinions of hotel managers in Turkey about service robots in their study. They found that although hotel managers use technology intensively, they find the concept of a robot to be repulsive and emotionless, and most managers do not want to receive service from a service robot. Managers believe human communication is essential in the tourism industry. On the other hand, the managers thought that robots were advantageous in terms of not being late for work, not getting sick, not making mistakes, not asking for a raise, and working without limits. Yu and Ngan (2019) found that male and female participants from thirty-five different nationalities differed in their attitudes towards robot personnel.

According to Christou et al. (2020b), hotel guests have a positive attitude towards humanoid robots, however, when it comes to the danger that robots will take the jobs currently done by employees, their perceptions towards the robot change negatively. Xu et al. (2020) investigated how human resources experts believe the presence of service robots will affect leadership and human resource management in the hospitality industry. The results showed that while service robots are expected to increase the efficiency of hotel operations, they can create challenges such as higher costs, skill gaps, and significant changes to the organizational structure and culture of hotels.

Kuramoto et al. (2020) found that interacting with social robots was a pleasant experience for hotel guests, and many participants felt friendlier, livelier and less lonely due to this interaction. Sharma et al. (2020) revealed the attitudes of hotel guests towards robot staff in their study in India. According to their findings, hotel guests think that robots do not have social skills, and that they are unable to understand the special requests of the guests because they do programmed jobs. The participants stated that they were excited about the robot personnel, but that the balance between human and robot personnel should be adjusted. Yu (2020), on the other hand, found that human-like robots tend to provoke negative attitudes in potential users when there is any discussion, and that humans are more sensitive to robots with animated features. The study also found that many of the participants were nervous about the eyes of the robots.

Vatan and Doğan (2021), examined the attitudes of Turkish hotel employees towards robots. They found that the word robot evokes negative

emotions in employees, and they believe that service robots may create problems when communicating with customers. Hotel workers also believe that service robots will lead to increased unemployment in the future. Fusté-Forné and Jamal (2021) discussed the opportunities and challenges of using service robots in the tourism industry in their study. Lin and Mattila (2021) revealed that the benefits of service robots and the appearance of the robot positively affect the attitude of hotel guests towards their adoption. They also found that with the increase in the benefits of robots, the attitudes of guests towards them changed in a positive way. Luo et al. (2021) analyzed the feelings of hotel guests towards robots in order to evaluate the service qualities of robots in hotels. They found that feelings towards robotic services were positively related to hotel service satisfaction, which plays an important role in determining the overall satisfaction of guests.

The studies examined in the literature reveal that robots used in accommodation businesses provide many benefits to businesses (Bowen & Morosan, 2018; Choi et al., 2019; Doğan & Vatan, 2019; Fusté-Forné & Jamal, 2021). On the other hand, people's attitudes towards humanoid robots differ. Some find humanoid robots friendly (Christou et al., 2020; Ivanov et al., 2018a; Kuramoto et al., 2020; Yu & Ngan, 2019), while others find them cold and frightening (Doğan & Vatan, 2019; Fusté-Forné & Jamal, 2021; Ivanov et al., 2017; Ivanov et al., 2018b; Lin & Mattila, 2021; Sharma et al., 2020; Yu, 2020; Vatan & Doğan, 2021; Yu & Ngan, 2019).

METHODOLOGY AND RESEARCH DESIGN

This study examines participant evaluations of the use of humanoid robots in job positions in accommodation businesses and presents ideas for academics interested in the subject and practitioners in the sector. Several studies examine attitudes towards the use of human robots in hospitality businesses (Christou et al., 2020a; Ivanov et al., 2018a, 2018b; Lin & Mattila, 2021; Sharma et al., 2020; Yu, 2020; Yu & Ngan, 2019), however, either the participants in these studies are a very specific group, or attitudes are measured on a departmental basis instead of for each position.

In this study, the participants' evaluations of the use of humanoid robots for these positions were evaluated through a survey that was created after determining 36 job positions in accommodation enterprises. Forty-seven job positions were originally listed by first considering all departments in the accommodation establishments, and 36 job positions thought to be directly related to the sector were included in the scope of the research, in a 45-minute focus group study involving five tourism

academicians and two sector managers. The main criterion for the positions on this list was that they were in an accommodation business of any size or were directly related to the accommodation industry. The job positions that did not meet this criterion were removed from the list.

The questionnaire created via Google Forms was shared on various social media sites, and non-random sampling methods were used in the collection of data. The results of the research thus cannot be generalized at the population level, but they can give an idea about the population. The entire data collection process took place online. Images of robots with and without humanoid forms were presented, and their features were explained, and then the participants were asked, "Do you think robots should be used in the following positions in the accommodation establishments? If you say it should be used, which robot, humanoid or non-humanoid, should be used for the position in question?" For each job position, they were asked to tick one of the options presented: "No, robots should not be used", "Yes, humanoid robots can be used", "Yes, non-humanoid robots can be used" and "Use a robot or not, I see no difference in either situation".

In this study, the most important reason for determining the evaluations of demographically similar groups (gender and age) and testing whether there is a statistically significant difference between them is that this comparison will be made with the group they see closest to themselves when comparing the ideas and competences of people, which is one of the inferences of the Social Comparison Theory.

At the end of the data collection process, 407 people had been included. One of the advantages of online survey forms is that the form cannot be returned before it is completed, and so all surveys were included in the analysis. This met the required sample size in the 0.95 confidence interval for normally distributed series. In the findings section of the study, firstly, the frequency analysis tables for the demographic characteristics of the participants will be included in the findings section, and then the results of the chi-square test used in the analysis of the differentiation of a categorical variable in the independent groups are presented and interpreted.

RESULTS

The values for the demographic characteristics of the participants are shown in Table 1. Table 1 shows that when the age groups of the sample are

evaluated, the groups other than the 65+ age group are very close to the demographic structure of the country. The CIA World Report (2020) shows that there is a great deal of overlap between the 25-54 age group and the 55-64 age group in age groups. There were deviations in the sample of the study, with the 18-24 age group being more common and the 65+ age group being relatively low. This is thought to be due to the data being collected using an online questionnaire.

Table 1. *Frequency Values for the Demographic Characteristics of the Participants*

Gender	**n**	**%**	**Monthly Income**	**n**	**%**
Female	215	52.8	Below minimum wage	103	25.3
Male	192	47.2	Minimum wage	104	25.6
Total	407	100	2826-5000	148	36.4
			5001-10000	38	9.3
Age	**n**	**%**	10000+	14	3.4
18-24	105	25.8	Total	407	100
25-34	122	30.0	**Education Level**	**n**	**%**
35-44	93	22.9	Primary school	69	17.0
45-54	37	9.1	High school	106	26.0
55-64	34	8.4	Associate/Bachelor's Degree	184	45.2
65+	16	3.9	Master's/PhD	48	11.8
Total	407	100	Total	407	100

Not: Minimum wage on 14.12.2021: 2,826 TL; 1 Dollar: 14.38 TL.

Table 1 shows that when the age groups of the sample are evaluated, the groups other than the 65+ age group are very close to the demographic structure of the country. The CIA World Report (2020) shows that there is a great deal of overlap between the 25-54 age group and the 55-64 age group in age groups. There were deviations in the sample of the study, with the 18-24 age group being more common and the 65+ age group being relatively low. This is thought to be due to the data being collected using an online questionnaire.

While primary school graduates comprised 17.0% of the sample, half the individuals in the study were educated to the third level or had received any education within a university. There are approximately equal numbers of female (215) and male (192) participants. These rates reflect those of the country in general. Various analyses were conducted according to the gender and age of the participants, to determine whether gender affected ideas about whether robots should be used for each job position. In the next part of the study, extensive information is presented about the results of the analysis.

The study also gathered information about income levels, and the information obtained is presented in Table 1. Almost half the participants (50.9%) had a monthly minimum wage or less. This again shows that the sample is very close to the general demographic structure of the country, considering the minimum wage and unemployment rates in Turkey. As of October 2021, the unemployment rate in Turkey was 11.2%, and the number of people working at or below the minimum wage was 38.3% of all wage earners (TUIK, 2021). No analysis was carried out according to the education and income levels of the participants, these descriptive statistics simply present data about the study sample.

Table 2. *Descriptive Statistics for Participants' Reasons for Travel and Frequency of Accommodation*

Purpose of visit	**n**	**%**	**Frequency of stay**	**n**	**%**
Visit for friends and relatives	174	42.8	Never stayed in a hotel or etc.	98	24.1
Holiday	134	32.9	Less than once a year	172	42.3
Work Travel	30	7.4	Once a year	87	21.4
Health	12	2.9	Twice or three times a year	40	9.8
Others	57	14.0	Four times a year and more	10	2.5
Total	407	100	Total	407	100

Table 2 contains frequency data regarding the reasons for travel and the frequency of using accommodation establishments. Approximately one-third (32.9%) of the participants gave "holiday" as the reason for their last trip. It is striking that the most common reason for travel in this area is visiting friends and relatives (42.8%). However, 7.4% of the participants stated that they traveled for business reasons, and 2.9% stated that they traveled for health reasons.

Around a quarter (24.1%) of the respondents to the question about the frequency of use of accommodation establishments stated that they have never stayed in accommodation establishments, and those who stay less than once a year or once a year constitute 42.3% and 21.4% of the respondents, respectively. The regular customer base for the accommodation establishments is comprised of slightly more than 10% of the participants.

Table 3. *Statistics about Evaluations about the Use of Robots in Hospitality Businesses by Job Position*

Position	Robots shouldn't be used	Humanoid robots can be used	Non-humanoid robots can be used	I see no difference in either situation	Gender	Age
	n(%)	n(%)	n(%)	n(%)	χ2 (p)	χ2 (p)
P1-Waiter/Waitress	257 (63.14)	128 (31.45)	11 (2.70)	11 (2.70)	5.058 (.168)	**36.786 (.000)** [a]
P2-Barstaff	311 (76.41)	76 (18.67)	17 (4.18)	3 (0.74)	2.379 (.543)[a]	**34.443 (.000)** [a]
P3-Room Service Staff	85 (20.88)	232 (57.00)	35 (8.60)	55 (13.51)	4.703 (.195)	**58.438 (.000)** [a]
P4-Transfer Vehicle Driver	336 (82.56)	29 (7.13)	39 (9.58)	3 (0.74)	**9.325 (.017)** [a]	**43.023 (.000)** [a]
P5-Hotel Doctor	364 (89.43)	30 (7.37)	10 (2.46)	3 (0.74)	**11.538 (.005)** [a]	**17.385 (.000)** [a]
P6-Lifeguard	357 (87.71)	31 (7.62)	17 (4.18)	2 (0.49)	**10.533 (.007)** [a]	**24.480 (.019)** [a]
P7-SPA Attendant	342 (84.03)	52 (12.78)	11 (2.70)	2 (0.49)	**12.056 (.004)** [a]	**34.442 (.001)** [a]
P8-Masseur/ Masseuse	330 (81.08)	62 (15.23)	13 (3.19)	2 (0.49)	5.154 (.122) [a]	**43.319 (.000)** [a]
P9-Security	345 (84.77)	39 (9.58)	21 (5.16)	2 (0.49)	**10.187 (.010)** [a]	**30.905 (.002)** [a]
P10-Animator	325 (79.85)	59 (14.50)	17 (4.18)	6 (1.47)	6.511 (.081) [a]	**42.355 (.000)** [a]
P11-Common Area Cleaning Staff	27 (6.63)	196 (48.16)	122 (29.98)	62 (15.23)	3.539 (.316)	**39.977 (.000)** [a]
P12-Valet	339 (83.29)	41 (10.07)	22 (5.41)	5 (1.23)	**9.489 (.017)** [a]	**32.853 (.001)** [a]
P13-Cashier	239 (58.72)	131 (32.19)	29 (7.13)	8 (1.97)	5.375 (.140) [a]	**81.286 (.000)** [a]
P14-Concierge	333 (81.82)	49 (12.04)	16 (3.93)	9 (2.21)	**8.246 (.036)** [a]	**40.099 (.000)** [a]
P15-Bellhop	47 (11.55)	261 (64.13)	40 (9.83)	59 (14.50)	5.662 (.126) [a]	**52.017 (.000)** [a]
P16-Doorstaff	54 (13.27)	265 (65.11)	28 (6.88)	60 (14.74)	3.541 (.317)	**43.367 (.000)** [a]
P17-Night Manager	349 (85.75)	41 (10.07)	9 (2.21)	8 (1.97)	5.701 (.121) [a]	**29.453 (.002)** [a]
P18-PR Officer	351 (86.24)	37 (9.09)	11 (2.70)	8 (1.97)	6.145 (.092) [a]	**31.596 (.001)** [a]
P19-Receptionist	329 (80.84)	63 (15.48)	7 (1.72)	8 (1.97)	2.327 (.513) [a]	**47.553 (.000)** [a]

P20-Reservation Officer	315 (77.40)	66 (16.22)	16 (3.93)	10 (2.46)	3.879 (.275)	**44.457 (.000)** [a]
Position	**Robots shouldn't be used**	**Humanoid robots can be used**	**Non-humanoid robots can be used**	**I see no difference in either** situation	**Gender**	**Age**
	n (%)	**n (%)**	**n (%)**	**n (%)**	**χ2 (p)**	**χ2 (p)**
P21-General Manager	357 (87.71)	28 (6.88)	14 (3.44)	8 (1.97)	7.022 (.063) [a]	**24.264 (.018)** [a]
P22-HR Staff	352 (86.49)	36 (8.85)	13 (3.19)	6 (1.47)	6.690 (.078) [a]	**28.758 (.004)** [a]
P23-Finance Staff	283 (69.53)	59 (14.50)	32 (7.86)	33 (8.11)	7.630 (.050)	**36.861 (.000)** [a]
P24-Accounting Staff	279 (68.55)	60 (14.74)	34 (8.35)	34 (8.35)	7.095 (.069)	**39.535 (.000)** [a]
P25-Purchasing Staff	344 (84.52)	36 (8.85)	18 (4.42)	9 (2.21)	**8.269 (.038)** [a]	**31.311 (.002)** [a]
P26-Housekeeper	87 (21.38)	250 (61,43)	29 (7,13)	41 (10,07)	3.661 (.300)	**57.008 (.000)** [a]
P27-Marketing Staff	347 (85.26)	35 (8.60)	18 (4.42)	7 (1.72)	**12.881 (.004)** [a]	**31.158 (.002)** [a]
P28-IT Staff	332 (81.57)	41 (10.07)	25 (6.14)	9 (2.21)	**14.861 (.002)** [a]	**34.313 (.001)** [a]
P29-Event Planner	353 (86.73)	33 (8.11)	12 (2.95)	9 (2.21)	**10.199 (.016)** [a]	**28.009 (.005)** [a]
P30-Technician	318 (78.13)	47 (11.55)	28 (6.88)	14 (3.44)	**13.584 (.004)**	**42.138 (.000)** [a]
P31-Gardener	45 (11.06)	154 (37.84)	105 (25.80)	103 (25.31)	2.902 (.407)	**35.588 (.001)** [a]
P32-Warehouse Worker	36 (8.85)	165 (40.54)	100 (24.57)	106 (26.04)	4.105 (.250)	**39.417 (.000)** [a]
P33-Switchboard Operator	303 (74.45)	51 (12.53)	37 (9.09)	16 (3.93)	7.074 (.070)	**34.380 (.001)** [a]
P34-Laundry Staff	55 (13.51)	240 (58.97)	90 (22.11)	22 (5.41)	2.656 (.448)	**45.618 (.000)** [a]
P35-Kitchen Staff	298 (73.22)	6 (14.99)	38 (9.34)	10 (2.46)	**22.519 (.000)**	12.217 (.602) [a]
P36-Dishwasher Staff	50 (12.29)	246 (60.44)	88 (21.62)	23 (5.65)	6.236 (.101)	**43.252 (.000)** [a]
Average	257,6 (63.30)	95,3 (23.41)	32,5 (8.00)	21.5 (5,30)		

a. Fisher-Freeman-Halton Exact test.

Evaluating the average of the data in Table 3 shows that 63.30% of the participants believed robots should not be used in any position in an accommodation business. Those who approve of the use of humanoid robots comprised 23.41% of the total (63.78% of those who were not against the use of robots). Those who say humanoid robots should not be used made up 8.00% of the total (21.79% of those who are not against the use of robots) and form 5.30% of the total (14.44% among those who are not against the use of robots) who say that whether there is a robot or not will not make a difference.

There is a risk that this holistic perspective may lead to incorrect evaluations, however, because those who think that robots should not be used for 25 of the 36 positions that are the subject of the study number above the average. As can be seen in Figure 2, the rate for 17 positions (transfer vehicle driver, hotel doctor, lifeguard, general manager, event planner, human resources staff, public relations officer, night manager, marketing staff, security guard, purchasing staff, spa attendant, valet, receptionist, IT staff, masseur or masseuse, receptionist) was over 80%.

When this situation is interpreted, participants generally do not find the use of robots appropriate in positions that provide services related to people's health and bodies (hotel doctor, lifeguard, spa attendant, masseur or masseuse), in positions that concern life and property safety (security guard, valet, transfer vehicle driver), or in positions related to the management of the enterprise (general manager, HR staff, night manager, marketing staff, purchasing staff). Finally, it was concluded that the participants did not favor the use of robots for positions where they thought that one-to-one communication would be at a high level throughout the accommodation experience (event planner, public relations officer, concierge, and receptionist).

There are consistent results when we look at the other side of the coin, because it turns out that the participants will not be in one-to-one communication more or they do not see any harm in using robots for limited positions that have already been opened to automation. According to the results of the research, the positions where the "no robots should be used" option is below 20% were accepted as the areas where robots are accepted. These positions are also the positions where the use of humanoid robots is accepted; in other words, according to the participants, they are the positions with the highest value for the humanoid robot as a usable option. These are positions that provide cleaning services (housekeeping staff, laundry staff, dishwashing staff, common area cleaning staff), provide

bring-and-take services (room service staff, bellboy, door staff), or positions where customers do not have one-to-one communication during the holiday experience (gardener, warehouse officer).

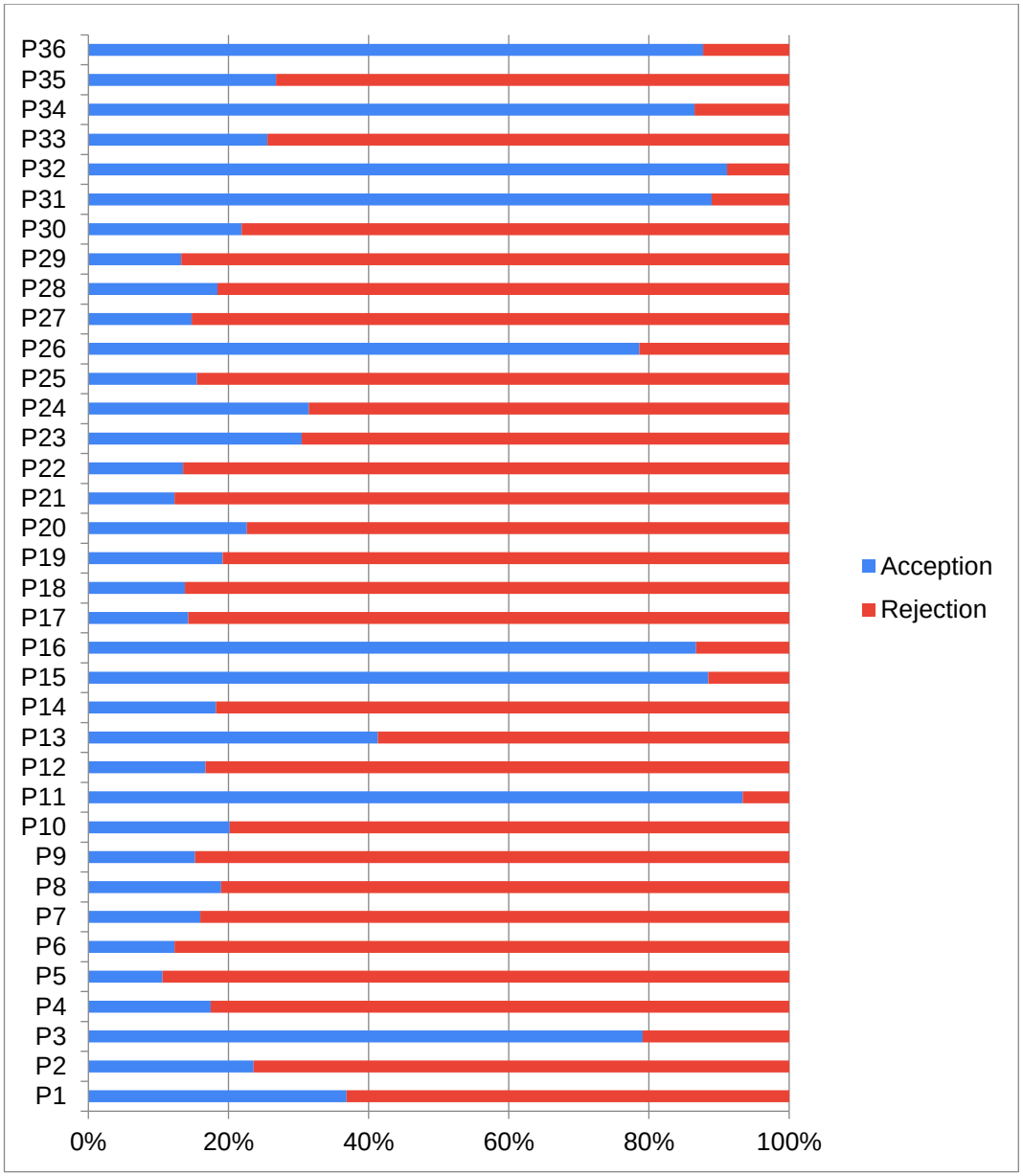

Figure 2. *Acceptance – Rejection Ratios for Robot Use Based on Job Positions*

Table 1 shows the chi-square results investigating the relationship between participant gender and their evaluations of robot use for the 36 positions considered within the scope of the research. The "a" icon in the table shows the Fisher-Freeman-Halton Test results used for RXC tables when the expected count less than 5 cells is more than 20% and the minimum expected count is less than 5, and a Monte Carlo simulation was used for the test. The Exact test p-value obtained with the Monte Carlo

simulation (with 10,000 samples and 99% confidence interval) is the same as the Exact test p-value obtained with the Exact option, up to three zeros after the decimal point (Mehta & Patel, 2011).

Accordingly, the participants' evaluations of robot use by gender differ at a 0.05 level of significance for 13 positions (transfer vehicle driver, hotel doctor, lifeguard, spa attendant, security guard, valet, information officer, purchasing staff, marketing staff, IT staff, event planner, technician, and kitchen staff). Female participants were in favor of using robots for each of these 13 positions. It is significant that 11 of the 13 positions (except for technician and kitchen staff) that differ about the use of robots according to gender, are positions in which more than 80% of respondents recommended robots not be used.

A chi-square analysis was conducted to compare the ages of the participants and their evaluations of robot use. As can be seen in Table 3, there is a statistically significant difference in 35 (excluding kitchen staff) out of 36 positions in the accommodation sector. Evaluations that robots should not be used increase as age increases for 29 positions (excluding common area cleaning staff, bellhop, gardener, warehouse worker, dishwashing staff, and laundry staff). All 34 participants between the ages of 55-64 (for purchasing staff, marketing staff, and IT staff), all 16 participants aged 65 and over (for waiter/waitress, bartender, and finance staff), and 50 participants over 55 (for transfer vehicle driver, hotel doctor, lifeguard, spa attendant, masseur or masseuse, security guard, animator, valet, cashier, information desk officer, night manager, public relations officer, receptionist, reservation officer, general manager, human resources personnel, and event planning personnel) also expressed their opinions on not using robots is a summary of the age-technology acceptance relationship.

DISCUSSION AND CONCLUSIONS

Tourism is one of the industries in which artificial intelligence and robotic technologies are used in service automation. These technologies are integrated into business processes, especially the operations of accommodation businesses, to increase their productivity, offer consistent product quality and transfer a part of the service delivery process to customers (Ivanov et al., 2017). Developments in the field of robot technology mean that more and more independence opportunities are created for robots to make decisions. More humanoid features are being added related to perception, memory, dexterity and physical strength, and

it is thus thought that robots will gain the capacity to reproduce human behaviors and will soon gain new human-like abilities by establishing various agreements with human or other robotic colleagues thanks to increased human-robot interactions (Arduengo & Sentis, 2019).

This is one of the first attempts to evaluate the potential use of robots, and beyond that, of humanoid robots, in the context of job positions in accommodation establishments among Turkish users. The participants strongly preferred not using any kind of robot for 25 of the 36 positions. These results are in line with previous findings from different cultures (Doğan & Vatan, 2019; Fusté-Forné & Jamal, 2021; Ivanov et al., 2018b; Lin & Mattila, 2021; Sharma et al., 2020; Yu, 2020; Vatan & Doğan, 2021). These are the positions that provide services for people's health and bodies, are related to the safety of life and property, and are related to the management of the business, and where the participants think that one-to-one communication will be at a high level throughout the accommodation experience.

Theoretical Implications

According to anthropomorphism theory, people tend to anthropomorphize everything, internalizing them by attributing unique traits. However, when it comes to robots, they evaluate their use strictly and negatively, because they find them unattractive, insincere and worry that they will take their place, and so on. The use of humanoid robots was found appropriate in nine positions: those that provide cleaning services, perform bring-and-go services, or where customers do not interact directly with them during the holiday experience. These results are also supported by the Uncanny Valley theory. The positions deemed suitable for the use of humanoid robots are those where guests interact less with the robots than in other positions. In summary, even if the guests find it appropriate to use humanoid robots in these areas, they do not want to stay together and communicate with them too much. It is reported in the literature that robots have been used by leading companies in the sector as waiters, room service staff, common area cleaning staff, bellhops, and gardeners (Alexieva, 2016; İbiş, 2019; Ivanov et al., 2017; Konstantinova, 2019; Lukanova & Illieva, 2019; Tung & Law, 2017; Zeng et al., 2020). In short, the findings are consistent with industry practices, and robots could thus be included in similar positions where robot use is appropriate.

The study also investigated whether there was a difference between attitudes to the use of robots in 36 job positions in accommodation

businesses according to the gender and age of the participants, in the context of social comparison theory. It was observed that young people have a more positive attitude towards the use of robots than the elderly. The study also found that the participants differed according to gender in their attitudes towards whether a robot should be used or not. Male participants wanted robots to be used in fewer job positions, but female participants stated that they thought that robots could be used in more job positions.

It is particularly noteworthy that more female than male think more robotic staff should be employed in the kitchen staff and laundry staff positions. This finding is due to occupational gender stereotypes, and that this preference of women compared to men serves the occupational gender equality in question (Çilingir Ük et al., 2019). In other words, this preference stems from the fact that the job positions in question are perceived as socially feminine and they are deemed worthy of them, so women work more often in these positions than men, and that these jobs are roles that are stigmatized to women in their daily lives.

When the attitudes of the participants are evaluated according to their age, young participants were found more inclined to accept robot personnel, while participants over 50 were far from accepting robot personnel and prefer human personnel. This seems to be in line with the technology acceptance model, which aims to explain user attitudes towards the changing world of technology, their preferences for technology usage, and their possible resistance to using technology, and is frequently used in the field (Uğur & Turan, 2016: 103).

Managerial Implications

According to the findings of this study, there is a difference between attitudes according to age and gender. The younger participants began their lives in close contact with technology, whereas participants aged 50 and over began using technology at a later date, which may cause these people to be resistant to some forms of technology. Ivanov et al. (2018a) studied Iranian tourists and found that human personnel are preferred in accommodation businesses regardless of variables such as gender and age. Ivanov et al. (2018b) studied Russian adults and found that the use of robot personnel in accommodation enterprises was mostly supported by men. The degree of acceptance of robot personnel may thus vary among different nationalities. Similarly, Yu and Ngan (2019) found that male and female

participants from different nationalities differ in their attitudes towards robot personnel.

In light of our research results, the managers of accommodation businesses targeting women, and especially young guests, could more easily adopt the use of robots in their establishments. In order to avoid negative results, however, as in the example of the Henn-na Hotel, this transformation should be implemented gradually by managers, rather than radically, to ensure the success of this digital transformation. The beginning of this transition should be the job positions in which the use of robots is more accepted in the study (common area cleaning, bellhop, doorstaff, gardener, warehouse worker, laundry staff, dishwasher staff). Similarly, managers should make the last transformation in 17 job positions where the use of robots is least accepted in the study, or not. As new generations who are more accepting of the digital transformation are added to the guest profile, we predict that acceptance rates for the use of robots in accommodation establishments will increase in the future.

Limitations and Future Research

Although the current study provides evidence of attitudes toward potential humanoid robot use in the hospitality industry, a number of limitations may have affected the results and seem worthy of discussion. First, a limited number of suitable samples were selected, but the findings are not representative of the entire population of Turkey, as probabilistic sampling methods were not used. Appropriate and larger samples could be used to ensure the generalizability of the findings in future studies. Second, changes in user attitudes towards robot use can be observed over time using longitudinal methods. Third, different positions can be added to the work carried out only in the positions determined in the accommodation enterprises in the future, and the subject can be applied to the positions in other tourism enterprises (travel, food and beverage enterprises, etc.). Fourth, while the role of culture in attitudes is known, a cross-cultural evaluation can compare the attitudes of users from different cultures regarding the use of humanoid robots in the industry. Fifth, the difference between demographics other than gender and age, and the effect of some accommodation indicators (frequency, reason, etc.) on attitudes can be examined. Sixth, the positions covered in the study could be considered in the context of the technology acceptance model developed by Ajzen and Feshbein (1975). Finally, this was a pilot study to identify potential robot use in 36 job positions in the hospitality industry, and a more in-depth

analysis could be offered in the future by using a scenario-based approach to just a few positions.

Obviously, there is still much more work to be done in order to truly understand user evaluations of humanoid robot use; however, to our best knowledge, this is the first study to consider the evaluations of participants regarding the use of humanoid robots in accommodation establishments. We therefore hope that it serves as a preliminary study for broader research on the topic.

REFERENCES

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological Bulletin*, *82*(2), 261.

Alexieva, S. (2016). Sustainable tourism development between innovation competitiveness of the industry and effective communications in the digital era. *Journal of Science and Research, 9*, 41-50.

Arduengo, M., & Sentis, L. (2019). Robot economy: ready or not, here it comes. Retrieved April 25, 2021, from https://arxiv.org/abs/1812.01755.

Bares, J. E., & Wettergreen, D. S. (1999). Dante II: technical description, results, and lessons learned. *The International Journal of Robotics Research, 18*(7), 621-649.

Baudrillard, J. (1968). *Systeme des objets*. Paris, Gallimard: S.E.P.C. Press.

Bowen, J., & Morosan, C. (2018). Beware hospitality industry: robots are coming. *Worldwide Hospitality and Tourism Themes, 10*(6), 726-733.

Brink, K. A., Gray, K., & Wellman, H. M. (2019). Creepiness creeps in: uncanny valley feelings are acquired in childhood. *Child Development, 90*(4), 1202-1214.

Ceccarelli, M., Russo, M., & Morales-Cruz, C. (2020). Parallel architectures for humanoid robots. *Robotics*, *9*(4), 75.

Choi, Y., Choi, M., Oh, M., & Kim, S. (2020). Service robots in hotels: understanding the service quality perceptions of human-robot interaction. *Journal of Hospitality Marketing and Management, 29*(6), 1-24.

Christou, P. A., Simillidou, A., & Stylianou, M. (2020a). Robots in tourism: tourists' perceptions over the use of anthropomorphic and other types of robots in services. *Apac CHRIE* 2020, October, Hong Kong.

Christou, P., Simillidou, A., & Stylianou, M. C. (2020b). Tourists' perceptions regarding the use of anthropomorphic robots in tourism and hospitality. *International Journal of Contemporary Hospitality Managemen, 32*(11), 3665-3683. http://dx.doi.org/10.1108/IJCHM-05-2020-0423.

CIA World Factboom. (2020). Retrieved November 13, 2021, from https://www.cia.gov/the-world-factbook/countries/turkey/#people-and-society.

Çilingir Ük, Z., Gültekin, Y., & Arslan, B. (2019). Turizm sektöründe mesleki toplumsal cinsiyet algılamalarının belirlenmesi: Üniversite öğrencileri üzerine bir uygulama. *Turizm Akademik Dergisi*, *6*(2), 75-97.

Delikan, B., & Şener, G. (2020). Marka maskotlarındaantropomorfizm kullanımına yönelik göstergebilimselbir analiz: Arçelik markası robot çelik vakası. *Manas Sosyal Araştırmalar Dergisi*, *9*(3), 1836-1854.

Di Salvo, C., Gemperle, F., & Forlizzi, J. (2005). Imitating the human form: four kinds of anthropomorphic form. Retrieved April 19, 2021, from http://www.cs.cmu.edu/~kiesler/anthropomorphism-org/pdf/Imitating.pdf.

Doğan, S., & Vatan, A. (2019). Hotel managers' thoughts towards new technologies and service robots at hotels: a qualitative study in Turkey. In: C. Cobanoglu, M. Cavusoglu, A. Corbaci (eds.) *Advances in Global Business and Economics*, Vol. 2, ANAHEI Publishing, Sarasota, 382-399.

Doxey, G. V. (1975). A causation theory of visitor resident irritants: methodology and research inferences. Paper Presented at the *Travel and Tourism Research Association Sixth Annual Conference Proceedings*, San Diego, 195-198.

Engelberger, J. F. (1999). Historical perspective and role in automation. Handbooks of industrial robotics. In S. Y. Nof (eds.), *Handbook of industrial robotics,* New York, NY: John Wiley & Sons, 3-10.

Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: a three-factor theory of anthropomorphism. *Psychological Review, 114*(4), 864-886.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*(2), 117-140.

Flach, L. M., Moura, R. H., Musse, S. R., Dill, V., Pinho, M. S., & Lykawka, C. (2012). Evaluation of the uncanny valley in CG characters, in *Proceedings of the Brazilian Symposium on Computer Games and Digital Entertainment* (SB Games) (Brasiìlia), 108-116.

Fron, C., & Korn, O. (2019). A short history of the perception of robots and automata from antiquity to modern times. *In Social Robots: Technological, Societal and Ethical Aspects of Human-Robot Interaction*, Offenburg, Germany: Springer, Cham.

Fusté-Forné, F., & Jamal, T. (2021). Co-creating new directions for service robots in hospitality and tourism. *Tourism and Hospitality, 2*(1), 43-61.

Geller, T. (2008). Overcoming the uncanny valley. *IEEE Computer Graphics and Applications*, *28*(4), 11-17.

Geoghegan, B. D. (2020). Orientalism and informatics: alterity from the chess-playing Turk to Amazon's mechanical Turk. *Ex-position*, *43*, 45-90.

Guthrie, S. E. (1993). *Faces in the clouds: a new theory of religion*. New York, Oxford: Oxford University Press.

Güngörmüş E. (2018). İnsanın karanlığı ve Freud. Retrieved May 5, 2021, from http://www.ercankesal.com/makaleler-sunumlar/insanin-karanligi-ve-freud/.

Gürgöze, G., & Türkoğlu, İ. (2019). Kullanım alanlarına göre robot sistemlerinin sınıflandırılması. *Fırat Üniversitesi Mühendislik Bilimleri Dergisi*, *31*(1), 53-66.

Hjalager, A. M. (2015). Turizmi değiştiren 100 yenilik (Çeviren: Güler, O., Akdağ, G., Çakıcı, A. C. ve Benli, S.). *Anatolia: Turizm Araştırmaları Dergisi, 26*(2): 290-317.

Hockstein, N., Gourin, C., Faust, R., & Terris, D. (2007). A history of robots: from science fiction to surgical robotics. *Journal of Robotic Surgery*, *1*, 113-118.

Hofstede, G. (2011). Dimensionalizing cultures: the Hofstede model in context. *Online Readings in Psychology and Culture, 2*(1), 1-26.

Huang, H. L., Cheng, L. K., Sun, P. C., & Chou, S. J. (2021). The effects of perceived identity threat and realistic threat on the negative attitudes and use intentions toward hotel service robots: the moderating effect of the robot's anthropomorphism. *International Journal of Social Robotics, 13*, 1599-1611.

Ivanov, S. H., Webster, C., & Berezina, K. (2017). Adoption of robots and service automation by tourism and hospitality companies. *Revista Turismo & Desenvolvimento, 27*(28), 1501-1517.

Ivanov, S., Webster, C., & Garenko, A. (2018a). Young Russian adults' attitudes towards the potential use of robots in hotels. *Technology in Society*, *55*, 24-32.

Ivanov, S., Webster, C., & Seyyedi, P. (2018b). Consumers' attitudes towards the introduction of robots in accommodation establishments. *Tourism: An International Interdisciplinary Journal, 66*(3), 302-317.

İbiş, S. (2019). Turizm endüstrisinde robotlaşma. *Türk Turizm Araştırmaları Dergisi*, *3*(3), 403-420.

Jia, J. W., Chung, N., & Hwang, J. (2021). Assessing the hotel service robot interaction on tourists' behaviour: the role of anthropomorphism. *Industrial Management & Data Systems. 121*(6), 1457-1478.

Kayıkçı, M. Y., & Bozkurt, A. K. (2018). Dijital çağ vealphakuşağı, yapay zeka uygulamaları ve turizme yansımaları. *Sosyal Bilimler Metinleri, 1*, 54-64.

Khogeer, Y. K. (2013). *Brand anthropomorphism: the literary lives of marketing mascots* (PhD Thesis). University of Liverpool, Management School, Liverpool.

Kim, S. S., Kim, J., Badu-Baiden, F., Giroux, M., & Choi, Y. (2021). Preference for robot service or human service in hotels? Impacts of the covid-19 pandemic. *International Journal of Hospitality Management, 93*, 2-12.

Konstantinova, S. (2019). Digital transformation in tourism. *Knowledge International Journal, 35*(1), 188-193.

Kurfess, Thomas R. (2005). *Robotics and automation handbook.* Abingdon: Taylor and Francis.

Kuramoto, S., Sawada, H., & Hartono, P. (2020). Visualization of topographical internal representation of learning robots. *In 2020 International Joint Conference on Neural Networks (IJCNN)*, 1-7.

Lin, I., & Mattila, A. (2021). The value of service robots from the hotel guest's perspective: a mixed-method approach. *International Journal of Hospitality Management, 94,* 2-4.

Lukanova, G., & Ilieva, G. (2019). Robots, artificial intelligence and service automation in hotels. In S. Ivanov and C. Webster (eds.), *Robots, artificial intelligence, and service automation in travel, tourism, and hospitality.* Bingley: Emerald Publishing, 157-183.

Luo, J. M., Vu, H. Q., Li, G., & Law, R. (2021). Understanding service attributes of robot hotels: a sentiment analysis of customer online reviews. *International Journal of Hospitality Management, 98*(103032), 1-10.

MacInnis, D. J., & Folkes, V. S. (2017). Humanizing brands: when brands seem to be like me, part of me, and in a relationship with me. *Journal of Consumer Psychology, 27*(3), 355-374.

Mehta, C. R., & Patel, N. R. (2011). *IBM SPSS exact tests*. Armonk, NY: IBM Corporation.

Merriam-Webster English Dictionary (2021). *Robot*. Retrieved May 11, 2021, from https://www.merriam-webster.com/dictionary/robot.

Murphy, J., Gretzel, U., & Hofacker, C. (2017). Service robots in hospitality and tourism: investigating anthropomorphism. *In 15th APacCHRIE conference* (Vol. 31), Retrieved May 11, 2021, from http://heli.edu.au/wp-content/uploads/2017/06/APacCHRIE2017_Service-Robots_paper-200.pdf

Needham, J. (1991). *Science and civilisation in China*. *History of scientific thought*. Cambridge: Cambridge University Press.

Ohlan, R. (2018). Role of information technology in hotel industry. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology, 3*(2): 277-281.

Online Etymology Dictionary (2021). Retrieved September 22, 2021, from https://www.etymonline.com/word/robot.

Pareyson, L. (1996). *Ontologie de la liberte*, Retrieved from www.lyber-eclat.net/lyber/pareyson/ontoll-12.html.

Puzakova, M., Kwak, H., & Rocereto, J. (2009). Pushing the envelope of brand and personality: antecedents and moderators of anthropomorphized brands. *Advances in Consumer Research, 36*, 412-420.

Qiu, Z., & Wang, Z. (2020). Technology forecasting based on semantic and citation analysis of patents: a case of robotics domain. Big Data and Smart Computing (BigComp) 2021 *IEEE International Conference*, 203-209.

Reis, J., Melão, N., Salvadorinho, J., Soares, B., & Rosete, A. (2020). Service robots in the hospitality industry: The case of Henn-na hotel, Japan. *Technology in Society*, *63*, 101423.

Robotics Federation Annual Report (2020). Retrieved November 16, 2021, from https://ifr.org/img/worldrobotics/Executive_Summary_WR_2020_Industrial_Robots_1.pdf.

Rosheim, M. E. (1994). *Robot evolution: The development of anthrobotics.* New York: John Wiley & Sons.

Rusu, N., & Rusu, A. (2020). Filosofiainvenţiilor Lui Leonardo Da Vinci siimportanţalorînevoluţiamecanicii. *In Conferinţatehnico-ştiinţifică a studenţilor, masteranzilorşidoctoranzilor,* 503-506.

Sharma, R., Uniyal, M., & Sharma, N. (2020). Guest attitude towards introducing automation using service robots in hotels of Delhi. *International Journal of Advanced Science and Technology*, *29*(5), 2930-2937.

Singh, H., Unger, J., Zariffa, J., Pakosh, M., Jaglal, S., Craven, B. C., & Musselman, K. E. (2018). Robot-assisted upper extremity rehabilitation for cervical spinal cord injuries: a systematic scoping review. *Disability and Rehabilitation: Assistive Technology*, *13*(7), 704-715.

Tavitiyaman, P., Zhang, X., & Tsang, W. Y. (2022). How tourists perceive the usefulness of technology adoption in hotels: Interaction effect of past experience and education level. *Journal of China Tourism Research, 18*(1), 64-87.

Tinwell, A., Grimshaw, M., & Williams, A. (2010). Uncanny behavior in survival horror games. *Journal of Gaming & Virtual Worlds, 2*(1), 3-25.

TUBITAK (2021). *Robot*. Retrieved May 28, 2021, from http://www.bilimteknik.tubitak.gov.tr/sites/default/files/bilgipaket/robotik/tanimlar.html.

TUIK (2021). İşsizlik oranları. Retrieved December 17, 2021, from https://www.tuik.gov.tr/.

Tung, V. W. S., & Au, N. (2018). Exploring customer experiences with robotics in hospitality. *International Journal of Contemporary Hospitality Management, 30*, 2680-2697.

Tung, V. W. S., & Law, R. (2017). The potential for tourism and hospitality experience research inhuman-robot interactions. *International Journal of Contemporary Hospitality Management, 29*(10), 2498-2513.

Tuomi, A., Tussyadiah, I. P., & Stienmetz, J. (2021). Applications and implications of service robots in hospitality. *Cornell Hospitality Quarterly*, *62*(2), 232-247.

Uğur, N. G., & Turan, A. H. (2016). Mobil uygulama kabul modeli: birölçek geliştirme çalışması. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 34*(4), 97-126.

Vatan, A., & Dogan, S. (2021). What do hotel employees think about service robots? A qualitative study in Turkey. *Tourism Management Perspectives, 37*, 100775.

Wan, L. C., Chan, E. K., & Luo, X. (2021). Robots come to rescue: how to reduce perceived risk of infectiousdiseaseincovid19-strickenconsumers? *Annals of Tourism Research, 88*, 103069.

Wang, W. (2017). Smartphones as social actors? Social dispositional factors in assessing anthropomorphism. *Computers in Human Behavior, 68*, 334-344.

Waytz, A., Epley, N., & Cacioppo, J. T. (2010). Social cognition unbound: insights into anthropomorphism and dehumanization. *Current Directions in Psychological Science, 19*(1), 58-62.

Wirtz, J., Patterson, P. G., Kunz, W. H., Gruber, T., Lu, V. N., Paluch, S., & Martins, A. (2018). Brave new world: service robots in the frontline. *Journal of Service Management*, *29*(5), 907-931.

Wu, J., Zhang, X., Zhu, Y., & Yu-Buck, G. F. (2021). Get close to the robot: the effect of risk perception of covid-19 pandemic on customer–robot engagement. *International Journal of Environmental Research and Public Health, 18*(12), 6314.

Xu, S., Stienmetz, J., & Ashton, M. (2020). How will service robots redefine leadership in hotel management? Adelphi approach. *International Journal of Contemporary Hospitality Management, 32*(6), 2217-2237.

Yıldız, S. (2018). Turist rehberliği mesleğinde robot rehberlerin yükselişi. *Süleyman Demirel Üniversitesi Vizyoner Dergisi*, *10*(23), 164-177.

Yu, C. E. (2020). Humanlike robots as employees in the hotel industry: thematic content analysis of online reviews. *Journal of Hospitality Marketing and Management, 29*(1), 22-38.

Yu, C. E., & Ngan, H. F. B. (2019). The power of head tilts: gender and cultural differences of perceived human vs human-like robot smile in service. *Tourism Review*, *74*(3), 428-442.

Yücel Altunel, H. (2003). Reklamlarda insanbiçimsellik. *İletişim Araştırmaları, 1*(1), 107-121.

Zeng, Z., Chen, P. J., & Lew, A. A. (2020). From high-touch to high-tech: covid-19 drives robotics adoption. *Tourism Geographies, 22*(3), 724-734.

Zhang, Y. (2021). A big-data analysis of public perceptions of service robots amid covid-19. *Advances in Hospitality and Tourism Research (AHTR), 9*(1), 234-242.