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Research Article

Service Robots, the Innovation of Our Era: A Qualitative Research in the Tourism Sector

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Abstract

Today, robots are widely used in service and manufacturing operations. Service robots are becoming more and more popular in the tourism sector. Therefore, there is a growing body of research on consumer perceptions and expectations of service robots. This study also investigated consumers' views of service robots in the tourism sector. The sample consisted of 787 participants. Data were collected online using a survey. The data were analyzed using MAXQDA. The results revealed nine dimensions: emotion, standardization, time, social impact, convenience, communication, impact on the workplace, technical problems, and assurance. The dimension of emotion consists of ten subdimensions: understanding emotions, apathy, sincerity, interaction, problematic interaction, personalized service, body language, attractiveness, irritability, and the privilege of being a human. The dimension of "standardization" consisted of seven subdimensions: reliability, defined job, quality, monotony, patience, practicality, and equality. The dimension of "time" consisted of two subdimensions: speed and timeliness. The dimension of "social impact" consisted of six subdimensions: unemployment, social communication, adaptation problems, financial problems, social problems, and technology dependence. The dimension of "convenience" consisted of four subdimensions: facilitating, workload, flexibility, and safety. The dimension of "communication" consisted of four subdimensions: understanding, foreign languages, informing, and comfort. The dimension of "impact on the workplace" consisted of five subdimensions: efficiency, cost, experience, suitability for the workplace, and workforce stability. The dimension of "assurance" consisted of four subdimensions: health, danger, trust, and information security.

Keywords: Robot technology, tourism industry, service robots

Jel Codes: M10, O33, 036

Introduction

There have been significant advances in technology over the past decades. In line with this, artificial intelligence (AI) has been integral to industrial activities worldwide. Artificial intelligence is the development of computer systems that perform tasks and activities that require human intelligence. John McCarthy coined the term "artificial intelligence" during a conference on the Dartmouth College campus in 1956. In the following decades, AI has made remarkable progress and introduced character recognition, face recognition systems, and mobile robotics (Samala et al., 2020:1-2). Today, researchers and scientists are using AI technology to build robots and equip them with living systems' capabilities. In other words, artificial intelligence is about designing machines that can understand and use human language to operate autonomously. Artificial intelligence has permeated almost all aspects of our lives, including reasoning, learning, communicating, perceiving, planning, and others

(Lukanova and Ilieva, 2019:3). Service robots are AI-based mechanical devices that become increasingly efficient every day.

The International Organization for Standardization defines (ISO 8373) service robots as robots that perform functional tasks for humans or equipment, excluding industrial automation applications. According to ISO 8373, service robots are somewhat autonomous robots that perform tasks based on external sensors (Collins, 2020:62). Service robots interact with and engage people. They are system-based autonomous and adaptable interfaces that interact, communicate, and deliver service to customers (Cain et al., 2019). Robots are becoming more efficient and a reality in our lives these days. Therefore, the bond between humans and autonomous service robots is based on emotional elements and social interaction. Unlike traditional task-oriented robots, service robots are interaction-oriented robots designed to communicate with humans and participate in human communities (Lee et al., 2021:3). Sepulka is the earliest example of a service robot designed as a tour guide at the Polytechnic Museum in Moscow, Russia (Collins, 2020:62).

Service robots are becoming increasingly popular in shopping malls, hotels, airports, and commercial facilities. They provide guidance, cleaning, or motion support for service areas. They interact with people more than industrial robots (Choi et al., 2020:617). Robots are classified into two depending on their functions and tasks. For example, communication robots are designed to answer consumers' questions and provide information. Guiding robots act as instant personal assistants that provide consumers with direction- and location-based information. Security robots ensure the safety of consumers. Delivery robots carry goods. Cleaning robots are used for cleaning operations (Go et al., 2020:628-629). The robot product application industry continues to grow thanks to the gradual advances in AI technology and the expansion of human-machine cooperation (Jia et al., 2021:1).

Japan's Henn-Na hotel is the first hotel entirely staffed by robots. It has been accepted as the beginning of the relationship between robotics and the hotel and tourism industry, making the headlines in the international press. Since then, accommodation businesses have staffed robot butlers and door attendants to comfort their guests (Jia et al., 2021:1). The first robotic hotel concierge, "Connie," was introduced by Hilton in 2016, which was the beginning of the activities of service robots in the tourism sector. Connie answers guests' questions about hotel amenities and services and recommends nearby attractions and activities (Ivanov et al., 2017:1506). Thanks to recent technological advances, service robots are becoming increasingly popular in accommodation services.

Most importantly, AI has enabled service robots to "talk" to customers, including humanoid robots like Hilton's Connie or non-humanoid robots like computer kiosks (Choi et al., 2019:32). TUG robots deliver meals and luggage and help people find their way through the San Gabriel Sheraton Hotel. In contrast, butler robots operate in SpAloft Hotels (Go et al., 2020:627). An AI robot named "Pepper" serves guests at some hotels, such as the Mandarin Oriental Hotel in Las Vegas. 'Toshiba's Chihira Kanae is a communication android serving as a hotel receptionist in some hotels in Japan. Concierge robots help guests check in and out and provide information on hotel services, local attractions, dining facilities, weather forecasts, and more (Lukanova and Ilieva, 2019:17). Robots are not science fiction anymore. They are popular AI machines with significant contributions to the accommodation sector (Cain et al., 2019:625).

There is an ongoing debate about using robots in the service sector. Some argue that service robots are against the principle of hospitality, while others claim that service robots are part of the inevitable development of technology. The proponents maintain that service robots will eventually alleviate the labor-intensive aspects of the tourism sector (Choi et al., 2021:718). This study investigated 'customers' views of the advantages and disadvantages of service robots in the tourism sector. We asked customers open-ended questions and analyzed their views based on content analysis.

Conceptual framework

The Advantages of Service Robots in the Tourism Sector

Today, more and more hotels use service robots to interface with guests, provide food and beverage services, and automate various tasks, such as check-in/check-out, luggage transfers (Kim et al., 2021:4). All these services are based on trust. Customers trust chatbots with their personal information regarding their travel plans and reservations. Trust concerns customer privacy and the quality of information and services provided by security robots and chatbots (Pillai and Sivathanu, 2020:3205).

Today, hotel managers consider using service robots for accomplishing tasks in tourism. Service robots will become increasingly popular because they can perform more complex frontline tasks at a lower cost than humans. However, the future of service robots depends on whether customers are

satisfied with them (Belanche et al., 2020:11). We live in a technology-centric world. Therefore, artificial intelligence is becoming more integral to the tourism industry. Advances in technology allow us to build more intelligent service robots that can help tourists/guests with their questions and problems and specific spheres of their trips. Customer satisfaction with service robots is key to unlocking their potential in the tourism sector. Service robots will automatize processes and protocols, allowing managers to keep tabs on them (Samala et al., 2020:11). Even customers with difficulty adopting technology are more likely to book hotels with robots and recommend them to their friends and relatives. This also indicates the critical role that service robots can play in the hotel industry (Zhong et al., 2020:788).

Hotels are labor-intensive enterprises. However, service robots will provide better personal assistance with more outstanding mobility capabilities, thereby helping tourism enterprises improve their service quality with a less labor-intensive process. Researchers underline the impact of human-robot interaction in hotels because they see robots as an integral part of customer experiences (Choi et al., 2020:613). Technology advancements allow service robot providers to interact with customers efficiently and effectively. In other words, service robots/service providers can use technology to develop their relationships with customers. Specifically, robots can handle various orders requested by consumers because they can operate 24/7. Moreover, service robots can help overcome language barriers more efficiently than humans, who can speak only a few languages (Park, 2020:3).

Consumers often attribute human traits to non-human beings. Robots that are human-like in appearance can facilitate human-robot interactions and encourage the enforcement of established social norms. The more similar robots are to humans, the more robust sense of social presence and social inclusion they create. Customers prefer to spend more time with anthropomorphic or intelligent robots (Belanche et al., 2020:209). Voice is critical in communication. Service robots with human-like voices appeal more to customers, resulting in more positive human-robot interactions in the hospitality and tourism industry (Lu et al., 2021:3).

The COVID-19 pandemic has caused severe problems in many sectors, including the travel and tourism industry. History has shown us that a crisis leads to technological innovation and development. Thanks to advances in miniaturization and other technologies, robots have become increasingly essential to the hospitality and tourism industries, working as concierges, cleaners, and caterers. Experts used to argue that people would not accept social robots. However, the COVID-19 pandemic has paved the way for new robotic applications in the tourism industry (Zeng et al., 2020:725).

Businesses are under tremendous pressure to stay afloat. The hospitality and entertainment industries have focused on providing contactless technologies, security, and assurance to customers vulnerable to the pandemic to relieve the pressure mentioned above. Since the pandemic, service robots have been increasingly adopted by the hospitality and tourism industry (Fusté-Forné and Jamal, 2021:54). Hotel guests like service robots help to reduce person-to-person contact during the pandemic. Service robots also help hotel staff with cleaning, check-in, and check-out, which also appeals to hotel guests (Pillai et al., 2021:5). Therefore, people are more likely to prefer to stay in hotels staffed by robots in future pandemics (Kim et al., 2021:4). Contactless guest engagement has also become a priority for hoteliers. Businesses adopt more and more digital or automatic contact features to meet the challenges of the pandemic. Hospitality and tourism businesses use service robots to ensure physical distancing during the COVID-19 pandemic (Lin and Mattila, 2021:1).

The Disadvantages of Service Robots in the Tourism Sector

More and more hotels use service robots for their operations. However, the effectiveness of service robots has been less than expected. Population aging, increasing labor costs, and technological advances have encouraged many hotels to use service robots. However, they have not benefited as much from the service robots as they would like. For example, some hotels in China stopped using robots and decided to reorganize their strategy (Qiu et al., 2020:247). Tourism entrepreneurs do not use robots because consumers have reservations about them. For example, Henn-na Hotel laid off half the robots because of customer complaints (Hou et al., 2021:1).

Some hotel managers report that their customers complain about chatbots. Some customers are not comfortable with the speed and language of chatbots and doubt the reliability of their recommendations. They enjoy the hospitality and personal attention traditional travel planners provide rather than robots and feel more comfortable using human assistance (Pillai and Sivathanu, 2020:3214).

Another disadvantage of service robots is that they cannot feel anything. Although they seem like they adapt to short-term emotions, customers who interact with them for a more extended period realize that what they feel is not accurate. Most customers need to see hotel staff expressing real emotions (Wirtz et al., 2018: 910). For example, eye contact conveys the actor's interest in the other person's words. However, avoiding eye contact sends the message that the other party does not have time or is not interested in what the actor says. Therefore, most robots are like-human but have the dead eyes of a 3D computer model. In other words, customers interacting with service robots that look like inanimate beings experience negative emotions, such as fear or disgust (Huang et al., 2021:9).

Although humanoid robots interact with customers better than cartoonish and functional robots, they are less friendly and less appealing than humans. Human staff is better than service robots at attracting new customers to the brand and providing them with a pleasant experience during their visit. In other words, service robots are not as good at interacting with customers as humans (Choi et al., 2020:630).

It is believed that robots cannot be hospitable and warm agents who make customers feel welcome. In addition, there is a growing concern that human communication will end with the widespread use of service robots. Robots cannot have deep and meaningful conversations with customers and cannot make them feel welcome (Christou et al., 2020:3676).

Methods and Findings

This study investigated 'customers' views of service robots in the tourism sector. Data were collected online using a survey. It was applied Kastamonu University Ethics Committee with the date 07.10.2021 for the research. Ethics Committee approved the study with the decision number 22.07 at 07.12.2021. Participants were asked what they thought about service robots in the tourism sector. The data were analyzed using MAXZQDA (2022).

The sample consisted of 787 participants. Table 1 shows all 'participants' demographic characteristics.

Table 1: Demographic Characteristics

Gender	**Frequency**	**Percentage**
Woman	463	58.83
Man	324	41.17
Age	**Frequency**	**Percentage**
18-25	253	32.15
26-35	221	28.08
36-45	186	23.63
46-55	93	11.82
≥56	34	4.32
Education	**Frequency**	**Percentage**
Bachelor's	314	39.90
High school	202	25.67
Academy	160	20.33
Master's	65	8.26
Primary school	46	5.84

Although participants were asked their views of service robots in the tourism sector, they mostly talked about robot-human interactions and services provided by human staff.

'Participants' statements were evaluated from three perspectives: projections, viewpoints, and evaluation criteria about service robots.

Projections about Service Robots in the Tourism Sector

Figure 1 shows the projections - hierarchical code-subcode model.

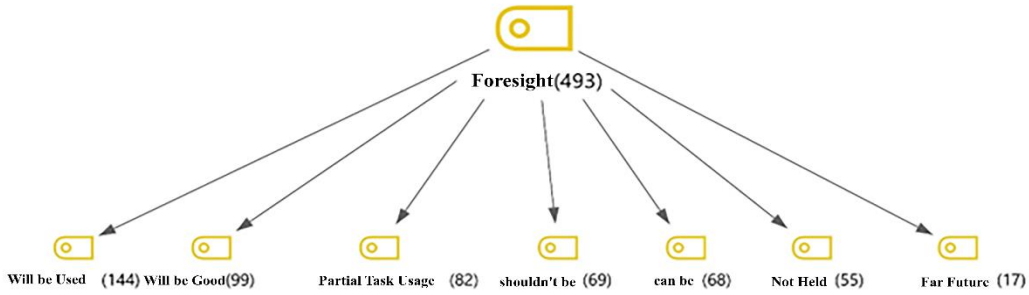

Figure 1: Projections - Hierarchical Code-Subcode Model

One hundred and forty-four participants stated that service robots would soon be used in tourism. Ninety-nine participants noted that service robots would be good for the tourism sector. Eighty-two participants remarked that service robots could be used to perform some tasks. Sixty-nine participants expressed that service robots should not be used in tourism. Sixty-eight participants stated that service robots might be used in the tourism sector. Fifty-five participants noted that service robots would not be preferred in the long term. Seventeen participants remarked that service robots would be preferred only in the distant future.

Evaluation Criteria

The participants were asked what kinds of things they looked for when evaluating the potential use of service robots in the hospitality industry. Figure 2 shows the evaluation criteria- the hierarchical code-subcode model.

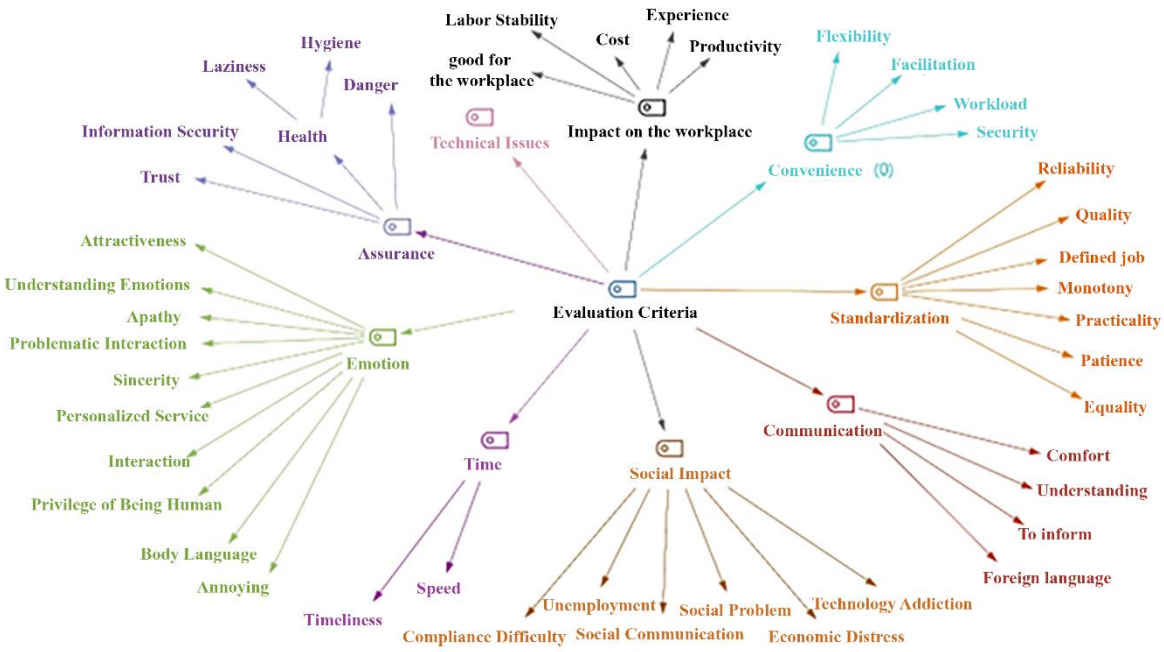

Figure 2: Evaluation Criteria - Hierarchical Code-Subcode Model

'Participants' evaluation criteria regarding the use of service robots in the tourism sector were coded under nine dimensions. Table 2 shows the code statistics and relations.

Table 2: Evaluation Criteria - Code Statistics and Relations

Code System	Code Statistics			Code Relations	
	Documents	Percentage	Percentage (valid)	Positive	Negative
Emotion	423	53.75	53.89	108	341
Standardization	370	47.01	47.13	235	171
Time	272	3466	34.65	260	13
Social impact	202	25.67	25.73	5	199
Convenience	159	20.20	20.25	158	1
Communication	149	18.93	18.98	57	102
Impact on the workplace	137	17.41	17.45	107	33
Technical problems	65	8.26	8.28	0	65
Assurance	44	5.59	5.61	24	21
Coded DOCUMENTS	787	100	100.00		
TOTAL/GENERAL	787	100.00	-	569	632

Participants made statements about emotions (n=423), standardization (n=370), time (n=272), social impact (n=202), convenience (n=159), communication (n=149), impact on the workplace (n=137), technical problems (n=65), or safety (n=44).

Participants' evaluations were coded. Moreover, their perspectives were also considered and coded as positive or negative.

Five hundred and sixty-nine documents included positive statements, whereas six hundred and thirty-two documents included negative statements about using service robots in the tourism sector. Participants mostly made positive statements under the codes of "standardization," "convenience," "time," and "impact on the workplace." However, their statements were primarily negative under the codes of "communication," "emotion," "technical problems," and "social impact."

Emotion

Emotion was the most critical factor addressed by participants. Four hundred and twenty-three documents included statements about emotions.

The dimension of "emotion" consists of ten subdimensions: understanding emotions, apathy, sincerity, interaction, problematic interaction, personalized service, body language, attractiveness, irritability, and the privilege of being a human. **Understanding emotions** included statements about the ability of robots to understand human emotions. Most statements were negative as participants believed that robots lacked this ability. **Apathy** refers to the lack of emotions. **Sincerity** refers to friendly service. **The interaction** was about the dialogues and conversations during service. **Problematic interaction** was broached during participants' evaluations of humans and was about negative interactions due to humans. Participants favored robots over humans because they believed they would not have problematic interactions with robots. **Personalized service** was more about the service provided by humans, as participants noted that humans could provide services according to their needs. **Body language** refers to smiles and gestures during service. Although we could have evaluated smiles and gestures under the dimension of "communication," we considered it more appropriate to evaluate them under the dimension of "emotion" because participants mostly talked about the effects of body language on emotional interaction. **Attractiveness** came up as participants stated that it would be interesting to see robots serve. Most statements about this dimension were positive. **Irritability** was about participants' concern that seeing robots around might be uncomfortable. **The privilege of being a human** came up as participants stated that robots could never replace humans. Table 3 shows the emotion-code statistics and relations.

Table 3: Emotion- Code Statistics and Relations

Code System	Code Statistics			Code relations	
	Documents	Percentage	Percentage (valid)	Positive	Negative
Understanding emotions	122	15.50	28.84	1	121
Apathy	100	12.71	23.64	11	91
Sincerity	87	11.05	20.57	0	87
Interaction	72	9.15	17.02	0	72
Problematic interaction	65	8.26	15.37	65	0
Personalized service	53	6.73	12.53	0	53
Attractiveness	42	5.34	9.93	42	0
Body language	42	5.34	9.93	1	41
The privilege of being a human	19	2.41	4.49	0	19
Irritability	11	1.40	2.60	0	11
Coded DOCUMENTS	423	53.75	100.00		
Uncoded DOCUMENTS	364	46.25	-		
Total/General	787	100.00	-	108	341

The documents addressed the subdimensions of understanding emotions (n=122), apathy (n=100), sincerity (n=87), interaction (n=72), problematic interaction (n=65), personalized service (n=53), attractiveness (n=42), body language (n=42), the privilege of being a human (n=19), or irritability (n=11).

One hundred and eight documents included positive statements, while three hundred and forty-one documents included negative statements about the dimension of "emotion" regarding services provided by robots. Participants viewed robots negatively in all dimensions, except for problematic interaction and attractiveness.

Standardization

Standardization was the second most crucial factor in that participants expressed their opinions. Three hundred and seventy documents included statements about standardization.

The dimension of "standardization" consisted of seven subdimensions. **Reliability** was about the fact that participants expected robots to provide flawless services. **Defined job** referred to participants' view that robots could only do what they were programmed to do. **Quality** included statements about service quality. **Monotony** was about participants' concern that robots would always do the same thing. **Patience** referred to participants' views that robots could fulfill their assigned tasks despite customers' adverse reactions. **Practicality** refers to the regular and practical fulfillment of services. **Equality** referred to participants' views that robots could provide the same service and charge people without discriminating against them. Table 4 shows the standardization code statistics and relations.

Table 4: Standardization Code Statistics and Code Relations

Code System	Code Statistics			Code relations	
	Documents	Percentage	Percentage (valid)	Positive	Negative
Reliability	206	26.18	55.68	175	39
Defined job	102	12.96	27.57	5	97
Quality	69	8.77	18.65	52	17
Monotony	41	5.21	11.08	0	41
Patience	21	2.67	5.68	21	0
Practicality	7	0.89	1.89	7	0
Equality	6	0.76	1.62	6	0
Coded DOCUMENTS	370	47.01	100.00		
Uncoded DOCUMENTS	417	52.99	-		
Total/General	787	100.00	-	235	171

The documents addressed the subdimensions of reliability (n=206), defined job (n=102), quality (n=69), monotony (n=41), patience (n=21), practicality (n=7), or equality (n=6).

Two hundred thirty-five documents included positive statements, whereas 171 documents included negative ones. Participants viewed robots positively in all dimensions, except "defined job" and "monotony."

Time

Time was the third most crucial factor in that participants expressed their opinions. Two hundred and seventy-two documents included statements about time.

The dimension of "time" consisted of two subdimensions. **Speed** refers to the fast execution of services by robots. **Timeliness** refers to the timely delivery of services by robots. Table 5 shows the time-code statistics and relations.

Table 5: Time - Code Statistics and Relations

Code System	Code Statistics			Code relations	
	Documents	Percentage	Percentage (valid)	Positive	Negative
Speed	238	30.24	87.50	229	10
Timeliness	66	8.39	24.26	62	4
Coded DOCUMENTS	272	34.56	100.00		
Uncoded DOCUMENTS	515	65.44	-		
Total/General	787	100.00	-	260	13

The documents addressed the subdimensions of speed (n=238) or timeliness (n=66).

Two hundred sixty documents included positive statements, whereas 13 included negative ones. Participants viewed robots positively concerning all subdimensions of "time."

Social Impact

The social impact was the fourth most crucial factor in that participants expressed their opinions. Two hundred and two documents included statements about social impact.

The dimension of "social impact" consisted of six subdimensions. **Unemployment** referred to participants' view that robots would take over jobs. **Social communication** was about participants' opinions that using robots would impact communication among humans. **Adaptation problems** were participants' belief that people would have difficulty getting used to service robots. **Financial problems** were related to unemployment because participants stated that robots would cause macro-financial problems. **Social problems** arose as participants believed that robots would cause disruptions in the social fabric. **Technology dependence** was about participants' belief that using robots would make humans more and more dependent on technology. Table 6 shows the social impact-code statistics and relations.

Table 6: Social Impact-Code Statistics and Relations

Code System	Code Statistics			Code relations	
	Documents	Percentage	Percentage (valid)	Positive	Negative
Unemployment	150	19.06	74.26	5	149
Social communication	25	3.18	12.38	0	25
Adaptation problems	23	2.92	11.39	0	23
Financial problems	17	2.16	8.42	0	17
Social problems	6	0.76	2.97	0	6
Technology dependence	5	0.64	2.48	0	5
Coded DOCUMENTS	202	25.67	100.00		
Uncoded DOCUMENTS	585	74.33	-		
Total/General	787	100.00	-	5	199

The documents addressed the subdimensions of unemployment (n=150), social communication (n=25), adaptation problems (n=23), financial problems (n=17), social problems (n=6), or technology dependence (n=5).

Five documents included five positive statements, while 199 documents included negative statements. Participants viewed robots negatively concerning all subdimensions of "social impact."

Convenience

Convenience was the fifth most important factor in that participants expressed their opinions. One hundred and fifty-nine documents included statements about convenience.

The dimension of "convenience" consisted of four subdimensions**.** F**acilitating** refers to the ability of robots to make service delivery and reception easier. **The workload** was associated with the view that robots could carry out many repetitive and arduous tasks and relieve the workload. **Flexibility** was about robots being flexible machines that could do any task anytime. **Safety** refers to the effects of robots on complicated service processes. Table 7 shows the convenience-code statistics and relations.

Table 7: Convenience-Code Statistics and Relations

Code System	**Code Statistics**			**Code relations**	
	Documents	**Percentage**	**Percentage (valid)**	**Positive**	**Negative**
Facilitating	90	11.44	56.60	90	0
Workload	57	7.24	35.85	56	1
Flexibility	19	2.41	11.95	19	0
Safety	11	1.40	6.92	11	0
Coded DOCUMENTS	159	20.20	100.00		
Uncoded DOCUMENTS	628	79.80	-		
Total/General	787	100.00	-	154	1

The documents addressed the subdimensions of facilitating (n=90), workload (n=57), flexibility (n=19), or safety (n=11).

One hundred and fifty-four documents included positive statements, while one document included negative statements. Participants viewed robots positively concerning all subdimensions of "convenience."

Communication

"Communication" was the sixth most important factor in that participants expressed their opinions. One hundred and forty-nine documents included statements about "communication."

The dimension of "communication" consisted of four subdimensions. **Understanding** refers to the ability of robots to understand customers' requests accurately. **Foreign languages** refer to the ability of robots to speak different languages to communicate with foreign customers. **Informing** refers to the ability of robots to have and communicate accurate and sufficient information. **Comfort** refers to the ability of robots to feel comfortable communicating with customers. Table 8 shows the communication-code statistics and relations.

Table 8: Communication-Code Statistics and Relations

Code System	**Code Statistics**			**Code relations**	
	Documents	**Percentage**	**Percentage (valid)**	**Positive**	**Negative**
Understanding	107	13.60	71.81	7	101
Foreign languages	30	3.81	20.13	30	0
Informing	23	2.92	15.44	23	0
Comfort	6	0.76	4.03	4	2
Coded DOCUMENTS	149	18.93	100.00		
Uncoded DOCUMENTS	638	81.07	-		
Total/General	787	100.00	-	57	102

The documents addressed the subdimensions of "understanding" (n=107), "foreign languages" (n=30), "informing" (n=23), or "comfort" (n=6).

Fifty-seven documents included positive statements, while 102 documents included negative statements. Participants viewed robots positively concerning all subdimensions except "understanding."

Impact on the Workplace

"Impact on the workplace" was the seventh most crucial factor in that participants expressed their opinions. One hundred and thirty-seven documents included "impact on the workplace."

The dimension of "impact on the workplace" consisted of five subdimensions. **Efficiency** refers to the effects of robot use on the efficiency of tourism services. **Cost** refers to the effects of robot use on costs. **Experience** refers to the lack of human experiences on the part of robots. **Suitable for the workplace** referred to the statements regarding the positive effects of robots on workplaces. **Workforce stability** referred to the fact that robots had low turnover rates and did not come up with excuses to slack off. Table 9 shows the impact on workplace-code statistics and relations.

Table 9: Impact on the Workplace-Code Statistics and Relations

Code System	**Code Statistics**			**Code relations**	
	Documents	**Percentage**	**Percentage (valid)**	**Positive**	**Negative**
Efficiency	87	11.05	63.50	73	16
Cost	34	4.32	24.82	26	9
Good for the workplace	10	1.27	7.30	10	0
Experience	9	1.14	6.57	0	9
Workforce stability	6	0.76	4.38	6	0
Coded DOCUMENTS	137	17.41	100.00		
Uncoded DOCUMENTS	650	82.59	-		
Total/General	787	100.00	-	107	33

The documents addressed the subdimensions of "efficiency" (n=87), "cost" (n=34), "good for the workplace" (n=10), "experience" (n=9), or "workforce stability" (n=6).

One hundred seven documents included positive statements, while 33 included negative ones. Participants viewed robots positively concerning all subdimensions but "experience."

Technical Problems

"Technical problems" were related to technical issues that might arise from using robots in the tourism sector. Sixty-five documents addressed the dimension of "technical problems." Faults and battery problems were coded under the "technical problems" dimension, which had no subdimension. Participants viewed robots negatively concerning the dimension of "technical problems."

Assurance

Forty-four documents addressed the dimension of "assurance."

The dimension of "assurance" consists of four subdimensions: **Health** refers to the effects of service robots in the tourism sector on health. It had two subdimensions: "hygiene" and "laziness." "Hygiene" was about the positive statements referring to the ability of robots to provide hygienic services. "Laziness" referred to participants' views that robots might affect people's health negatively due to laziness and immobility because robots would perform most of the tasks. **Danger** was about participants' belief that robots might go out of control and cause danger. **Trust** refers to service security depending on robots' technical competencies, including correct information and fast processing. **Information security** included negative statements about the use of information that robots can access depending on their visual and auditory perception abilities, as well as positive statements about considering robots safer in terms of privacy. Table 10 shows the assurance-code statistics and relations.

Table 10: Assurance-Code Statistics and Relations

Code System	**Code Statistics**			**Code relations**	
	Documents	**Percentage**	**Percentage (valid)**	**Positive**	**Negative**
Health	25	3.18	56.82	19(Hygiene)	7(Laziness)
Danger	11	1.40	25.00	0	11
Trust	6	0.76	13.64	6	1
Information security	5	0.64	11.36	1	4
Coded DOCUMENTS	44	5.59	100.00		
Uncoded DOCUMENTS	743	94.41	-		
Total/General	787	100.00	-	24	21

The documents addressed the subdimensions of "health" (n=25), "danger" (n=11), "trust" (n=6), or "information security" (n=5).

Twenty-four documents included positive statements, while 21 documents included negative statements. Participants viewed service robots positively concerning the subdimensions of "hygiene" and "trust." In contrast, they viewed service robots in a negative light concerning the subdimensions of "laziness," "information security," and "danger."

Conclusion

Robots have been used in the production industry for decades. They have also been popular in the service sector thanks to advances in AI technology. Service brings service providers and service recipients together. Therefore, customers come to interact with robots. Enterprises should prove to their customers that AI technologies can reduce costs and risks and help them gain a competitive advantage (Lu et al., 2020:380).

Robots can navigate complex service environments and interact with humans thanks to advanced image recognition and natural language processing techniques. Over the past decades, microprocessors have evolved dramatically in technology, computing power, and AI. In line with this, we can state that robots will impact markets and the workforce for centuries (Murphy et al., 2019). Service robots need dynamic, extensive data mining, AI, and emotional intelligence to operate in the tourism sector. Accommodation and tourism businesses, marketing organizations, and destination managers must also understand customers' needs and perceptions. It will be beneficial in process management if they evaluate the implementation of robots and their development in line with shortcomings (Fusté-Forné and Jamal, 2021:51).

Employees and customers must adapt to service robots because they need to learn how to use robots and become accustomed to a high-tech service environment. Training programs can help employees and customers adapt to robots. However, customers should also be informed about the details of service technology tools (Seyitoğlu and Ivanov, 2020:6). Service robots have to perform tasks in ever-changing environments (for example, moving luggage to rooms). They must also navigate in busy and tight spaces (e.g., hotel elevators). They need to interact with humans to perform tasks that require varying levels of skill and AI (for example, taking an order or answering a question) (Collins, 2020:62).

Designers should ensure service robots look like humans so customers feel comfortable interacting with them. Robots should operate under the supervision of human personnel to ensure that customers do not experience any anxiety while interacting with them (Lu, Cai & Gursoy, 2019:46).

Social robots will become famous soon. Despite recent technological advances, the capacity of robots to interact with humans intuitively and socially is still quite limited (Huang et al., 2021).

Service robots can provide value-added services because they stick to safety standards when interacting with humans. We can use other technologies (kiosks, mobile payment, touch screens) to perform the tasks undertaken by service robots. However, service robots can provide frontline services where customers feel both a sense of fun and enjoyment (Xu et al., 2020). Service robots change their voice patterns and pace to appear interested and capable. For example, they end their sentences on a low note, giving the impression that they will help customers or solve their problems. They face customers directly while speaking. They use gestures to facilitate understanding while interacting with customers. For example, greeting customers from a distance sends the message "Yes, I understand you" with a slight nod or smile (Collins, 2020).

Service robots perform tasks quickly, make customers comfortable, and help them make decisions quickly. They also increase service performance by improving service consistency, providing reliable information, and minimizing errors in service delivery. Automation helps employees and managers with information and resources to plan and organize to serve customers better, improving customer relationship management. For example, some robot waiters greet customers, address them by their names, or walk them to their favorite tables (Belanche et al., 2020).

The voice patterns of service robots give customers clues about their attitudes towards them. Customers make judgments that affect the quality of service interaction. Service robots that make eye contact with customers give the impression that they are concerned and interested in what customers have to say. Eye contact is an essential social behavior in human-robot interaction. Ideally, talking service robots should direct their gaze toward customers. The more human-like robots look, the more customers will interact with them. In other words, the more human-like, the more humans like. For example, smiling service robots are perceived as more friendly and approachable. However, most robots only have a few gestures. Suppose a customer wants to order food at a restaurant. A service robot moves its hand, makes eye contact with the customer, and comes up to the table. Hand gestures are a good way of nonverbal communication, but they mean nothing without eye contact. Head

movements also affect interpersonal communication. For example, the customer may observe the service robot's head movements (for example, nodding) as a sign of interest or agreement (Collins, 2020).

Although service robots are becoming increasingly popular in tourism and hospitality, many customers still have reservations about them, preventing service providers from adopting robotic technology. Therefore, we can argue that most customers prefer human staff and are hesitant to accept service robots. This phenomenon shows that researchers should investigate the factors that encourage customers to communicate with service robots. The willingness of customers to accept service robots depends on two factors: technological and psychological. Research shows that customers are more likely to accept service robots if service robots show high performance and if customers better understand how they operate. In this context, advances in robotic technology and increased knowledge of robotics make customers more used to service robots (Hou et al., 2021).

Technology anxiety refers to consumers' concerns and fears about using new technology. In this context, technology anxiety is accepted as an essential psychological antecedent that affects the adoption of new technology (Pillai and Sivathanu, 2020). Technology influences people's lives and perceptions and changes how they see, perceive and demand new technologies. For example, hospitality robots should provide information and interact with guests. However, how much technology shapes people's lives and perspectives depends on how willing people are to engage and interact with new technology. For example, some people are more willing to develop social relationships with robots and engage with new technology. Robots cannot replace human relationships based on love and sincerity. However, evidence suggests that humans can establish some kind of social relationship with robots (Christou et al., 2020).

The more the hospitality industry uses robotic technology, the faster customer experiences will change. For example, service robots can provide hedonic experiences. However, society may oppose using service robots to provide human services. This may be due to ethical concerns regarding unemployment and the lack of human contact. In the future, service robots are likely to replace human staff. This poses psychological challenges to the traditional view of service. Managers must also accept and cope with those challenges (Xu et al., 2020).

Service robots designed for the hospitality sector must be improved to meet customers' demands. Service robots are not intelligent enough to perform some service tasks because they are still under development. Advances in robotic technologies and robot design can solve that problem. Robots that use cute sounds and greetings can bridge the emotional gap with customers. This can make customers more comfortable (Qiu et al., 2020).

This study investigated what customers thought about service robots in the tourism sector. The sample consisted of 787 documents. The data were analyzed using MAXQDA. The results showed that participants believed that service robots would be used more and more in the tourism sector in the future. Participants' views of service robots were coded under nine dimensions: emotion, standardization, time, social impact, convenience, communication, impact on the workplace, technical problems, and assurance.

Five hundred and sixty-nine documents included positive statements, while 632 documents included negative statements regarding the use of service robots in the tourism industry. Participants viewed service robots in a positive light regarding the dimensions of "standardization," "convenience," "time," and "impact on the workplace." However, they viewed them in a negative light regarding the dimensions of "communication," "emotion," "technical problems," and "social impact." As for the dimension of "emotion," participants thought that robots could not understand human emotions and could not communicate effectively with humans. Therefore, participants believed they would have difficulty interacting with service robots because they could not use body language. As for the dimension of "standardization," participants noted that robots could perform standard tasks better and were more patient with customers than human staff. They also remarked that robots performed tasks with higher quality but were more monotonous than human staff. As for the dimension of "time," participants thought that robots would serve jobs in a more timely manner than humans. As for the dimension of "social impact," participants believed that service robots would cause unemployment, social interaction, adaptation and financial problems, and technology dependence. As for the dimension of "convenience," participants believed that service robots would make service delivery and procurement much easier, undertake boring and repetitive jobs and reduce the workload, operate more flexibly, and replace humans for dangerous operations. As for the dimension of "communication," participants thought that robots would have difficulty understanding customers' wants and needs fully and accurately but would eliminate the language barriers because they could

speak foreign languages and provide accurate and sufficient information that customers might need. As for the dimension of "impact on the workplace," participants believed that service robots would provide cost and efficiency advantages but would lack experience. As for the dimension of "assurance," participants thought that robots would be more hygienic and provide services in a safer way than humans but would cause concerns about information security.

All in all, customers have reservations about service robots in the tourism industry. Although customers think service robots will be technically helpful, they do not believe they can fully meet emotional expectations. The results indicate that tourism enterprises should use service robots in a limited way to allow customers to get used to them. Researchers should examine people's reactions to and views of robots in pilot regions and carry out studies with more conscious steps towards spreading robots in the tourism sector. The COVID-19 pandemic has shown the whole tourism sector that it should focus more on the health of customers and employees and the physical distance that robots can successfully provide (Seyitoğlu and Ivanov, 2020). The pandemic has also made people more conscious about health, making them more willing to get used to service robots in the tourism industry.

Advances in technology will help people and enterprises get used to robots in daily life. This study focused on a current issue. Therefore, our results will contribute to the literature and pave the way for further research. Researchers should use different variables to develop different models to expand the scope of the topic and keep it up to date. Researchers should also use our dimensions to develop scales to conduct quantitative studies.

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It was applied Kastamonu University Ethics Committee with the date 07.10.2021. Ethics Committee approved the study with the decision number 22.07 at 07.12.2021.