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Empirical Research Article

Does Trust Matter to Use Hotel Service Robot in COVID-19 Pandemic?

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Abstract

Because of increasing anxiety about infectious diseases and the demand for contactless service caused by the COVID-19 pandemic, it has become crucial for the tourism and hospitality sector to understand customers' psychological mechanism of contactless service during and post COVID-19. Thus, this paper proposes a conceptual model by integrating trust in the framework of the behavioral immune system. Interestingly, our study found that anxiety about infectious diseases during the COVID-19 pandemic has not only increased hotel customers' desire for contactless service and changed their behavioral intentions, but it has also impacted customers' trust in hotel service robots. Therefore, irrespective of how the hotel service environment changes, trust in technology has become the most fundamental factor for hotel customers' attitudes toward adopting technology. Based on the results, this paper provides salient theoretical and practical implications.

Keywords

COVID-19 pandemic; hotel service robot; contactless service; trust; behavioral immune system

1. Introduction

The Fourth Industrial Revolution has advanced service automation and produced the service robot, one of the most innovative current service automation systems in which autonomous driving technologies are combined. Accordingly, many hotels have introduced service robots with high expectations. Representative examples of these robots are Saviork's relay and Softbank's humanoid robot, Pepper. the Mandarin Oriental Hotel in Las Vegas has introduced Pepper as a customer service robot (Hart, 2017). However, some other hotels have fired or even stopped introducing service robots because they performed poorly (Liao, 2019).

Meanwhile, the unprecedented pandemic of Coronavirus disease 19 (COVID-19) in the first half of 2020 has led to a surge in demand for "contactless" service, which minimizes direct contact with people (Kim, 2017). COVID-19 is a respiratory syndrome caused by SARS-CoV-2 infection, and is known to be transmitted through saliva and contact with infected people. As of February 2021, COVID-19 had infected 112,121,063 people, and killed 2,489,194 (World Health Organization, 2020). Moreover, this unusual global pandemic is having a huge negative impact on the tourism and hospitality industries. For example, FlyBe airline officially declared bankruptcy in March 2020 (Business Insider, 2020), and many other major airlines are struggling with economic difficulties (Gössling et al., 2021). Under this tourism and hospitality crisis, various studies related to COVID-19 are rapidly being published. Specifically, the existing literature has investigated the negative impact on tourism and the hospitality industry (e.g., Foo et al., 2020; Khalid et al., 2021), post-COVID-19 customers' behavioral intentions to travel or receive hospitality services (e.g., Bae & Chang, 2020; Nazneen et al., 2020; Zhu & Deng, 2020), and the role of tourism technologies post COVID-19 (e.g., Gretzel et al., 2020; Sigala, 2020). These studies suggest that the demand for contactless services will continue to increase, and the tourism and hospitality industry must respond flexibly to this change. However, very few studies have been conducted that theoretically explain tourists' anxiety caused by COVID-19 and the psychological mechanism of customers regarding contactless service. Thus, it is worth exploring the impact of customers' anxiety regarding infectious diseases and their attitude towards the theoretical use of contactless services such as robots. Consequently, we consider the behavioral immune system as a relevant theoretical framework.

In addition, the present study identifies other underexplored areas regarding behavioral intentions toward contactless service. Specifically, customers do not adopt a new technology just because of their anxiety. They adopt such technology because they trust that technology (Lee & Wan, 2010; Lippert & Davis, 2006). Basically, customers do not use service providers (human or technological) they don't trust (Jeong & Lee, 2017; Lippert & Davis, 2006). Therefore, trust is a core variable that must be considered, especially in adopting unfamiliar technologies. Park (2020) conceptualized a multidimensional trust (i.e., performance, process, purpose) that reflects the features of service robots, out of the context of e-commerce. This study is attracting attention in the tourism and hospitality sector, and adequately explains customers' trust and its relation to the use of service robots in a service context. In this vein, if a service robot does not successfully deliver the contactless service a customer wants, there is a possibility the service will not be used. Therefore, it is a variable a hotel must consider in order to introduce service robots for post COVID-19 hotel guests.

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Regarding these points, this research proposes the following research questions:

• Research question 1: Will hotel guests' anxiety about infectious diseases really affect behavioral intentions to service robots and hotels providing them?

• Research question 2: Is there a causal relationship between trust in a service robot and the desire for contactless service and avoidance contact with humans?

In this way, this paper fills the current gap by developing a research model that extends the behavioral immune system (i.e., anxiety about infectious diseases, desire for contactless service, and avoidance contact with humans) and service robot trust (i.e., performance, process, and purpose). Thus, the aim of this paper is to investigate post COVID-19 hotel guests' psychological mechanism for contactless service based on the behavioral immune system. The results of this paper provide both theoretical and practical implications for service robot designers and hotel marketers.

2. Theoretical Background

2.1 The Behavioral Immune System

As COVID-19 hits the world, global citizens feel anxiety and fear about infectious diseases, and there the COVID-19 pandemic situation has changed people's lives significantly. However, the COVID-19 pandemic is not the first of the world's pandemics. It is no exaggeration to say that human history has been marked by infectious diseases, which have been the leading cause of death throughout the ages (Inhorn & Brown, 1990). In this way, humanity has evolved along with infectious diseases, and a pre-emptive immune system has evolved that avoids places with high infectivity. Humans also take specific action in advance to minimize the possibility of infection from the beginning (Morens et al., 2004). This is called a behavioral immune system, which is more pronounced in animals with high cognitive function.

"The behavioral immune system consists of a suite of psychological mechanisms that (a) detect cues connoting the presence of infectious pathogens in the immediate environment, (b) trigger disease-relevant emotional and cognitive responses, and thus (c) facilitate behavioral avoidance pathogen infection" (Schaller & Park, 2011, p. 99). More specifically, individuals identify targets with a high likelihood of infection, and negative emotions such as hatred and avoidance toward the identified targets are activated (Curtis et al., 2004). At this time, the individual exhibits a negative behavioral reaction to the object contaminated with the pathogen, rather than a feeling of aversion and anxiety toward the pathogen. These individual psychological reactions explain the aversive reactions to Asians in the United States (US). Tsai et al. (2020) describe how Americans demonstrated racial prejudice toward Asians in the US after the COVID-19 outbreak, based on behavioral immune system theory. In the US, an aversive reaction to the Chinese who are claimed to have first caused COVID-19 is not an aversive reaction to the COVID-19 pathogen itself, but has been manifested in social reactions such as avoiding Asians.

COVID-19 triggers a negative social reaction to interpersonal interaction, that is direct contact with other people, and individuals tend to avoid interaction with humans and induce interaction through technologies. In other words, hotel guests may exhibit a series of behavioral immune responses that avoid direct interactions with human employees, who are potentially contaminated targets due to infectious diseases. Such behavioral immune responses may include avoidance contact with humans and showing a preference for interacting with technology as an alternative. (see Figure 1).

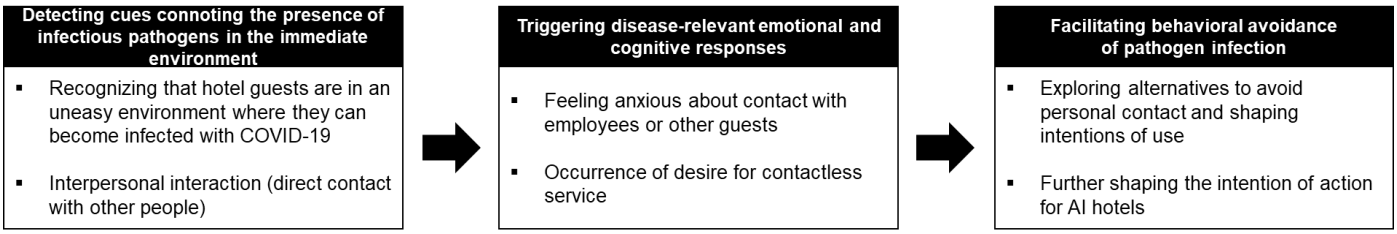

Fig. 1. Post COVID-19 hotel guests' psychological mechanism for contactless service

2.2 Contactless Service and Service Automation in Tourism and the Hospitality Industry

As mentioned earlier, infectious diseases have always existed in human history, but COVID-19 has been simultaneously devastating and has negatively affected the world. This infectious disease caused a pandemic situation that left a strong impression on human history and caused numerous social changes. One industry particularly hard hit by the pandemic is the hospitality industry, and COVID-19 has caused a paradigm shift in the this industry by making customers avoid personal contact, particularly in hotels, and created a demand for a new type of service called contactless service. Contactless service is a new trend. Specifically, contactless, which has the opposite meaning to contact, refers to a form of behavior that minimizes direct contact between individuals, and interacts with technologies (Bae & Chang, 2020; Kim, 2017).

In fact, contactless service is not a completely new type of service. To date, research on service automation in the hotel sector has drawn the attention of an increasing number of scholars. Specifically, it has been studied in various area such as profiles of customers who prefer self-service technologies (Ho & Ko, 2008; Simon & Usunier, 2007), hotel guests' perception of self-service technologies (e.g., Kucukusta et al., 2014; Lee, 2016), satisfaction with, and adoption of, self-service technologies (Oh, Jeong, Lee, et al., 2016; Yen, 2005) , and hotel guests' perceptions and adoption of AI-based service automation (e.g., chatbot or service robot) (Choi et al., 2020; Jia et al., 2021; QianTing et al., 2021). According to existing studies, service automation can be regarded as a contactless service that has experienced a surge in demand since the COVID-19 outbreak, and tourism and hospitality customers have experienced a lot of service automation and have their own perceptions about service automation.

However, the contactless service that is the subject of this study can be regarded as AI-based service automation rather than service automation such as SSTs. The development of the Fourth Industrial Revolution made advanced service automation possible, and consequently service robots – representing the integration of artificial intelligence (AI) and robots – were introduced. Therefore, service automation goes beyond SSTs that replace simple tasks, and enables communication. Furthermore, the service robot itself mimics human behavior in controlling the situation. That is, in the post COVID-19 era, service automation, namely contactless service, that can actually replace human employees is required. Therefore, we need to think about the contactless service offered by service robots.

2.3 Trust in Service Robots

Scholars have studied the subject of trust in information technology in the tourism and hospitality sector. Extant research has examined the effect of self-service technology trust on hotel technology adoption (e.g., Kaushik et al., 2015), the impact of website trust on behavioral intention (e.g., Kim et al., 2011; Kim et al., 2017; Pappas, 2017), and the moderating effect of loyalty on the relationships between antecedents and trust (e.g., Kim et al., 2012). The common setting of these previous studies is similar to the context of e-commerce. In other words, it is trust that has been studied as a key factor in close transactions with strangers in virtual space. More specifically, trust allows consumers to overcome the uncertainty of e-commerce transactions in virtual spaces and make transactions possible; this is a multi-dimensional construct consisting of competence, benevolence, and integrity (McKnight et al., 2002). However, trust in a service robot needs to be defined in a completely different context from existing studies.

At present, the combination of artificial intelligence and robots has brought advanced information technology to the tourism and hospitality industry, and service robots are being introduced in many hotels. Unlike previous information technology, service robots interact directly with customers in a physical environment, so a new perspective is needed to define trust in service robots. In this context, Park (2020) proposed that the biggest feature of a service robot is autonomy. In other words, service robots interact and communicate with customers in a service environment with many variables, and provide appropriate services to the customers. Therefore, the use of service robots is motivated by professional and personal goals.

Considering these features of service robots, Park (2020) conceptualized trust in service robots as a multidimensional concept composed of three sub-dimensions: performance, process, and purpose (p. 4). Performance refers to the service robot's ability to achieve the user's goal, which implies what service robots do. Process means that the service robot consistently and properly responds to a specific situation, which indicates how the service robot operates. Purpose means the degree to which the robot is utilized according to the designer's intention, which explains why the service robot was developed (Park, 2020, p. 4). Our study is related to Park's (2020) notion; thus, we employ this multifaceted trust to identify the antecedents of technology adoption in the context of the COVID-19 pandemic.

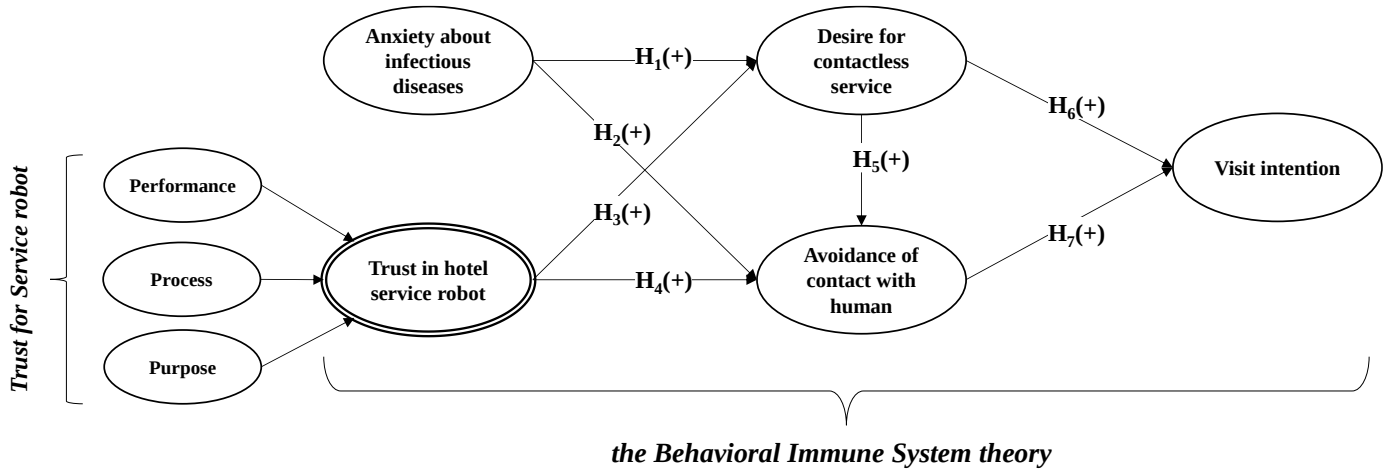

Fig. 2. Proposed research model

3. Research Model and Hypotheses Development

To examine the impact of anxiety about infectious diseases and trust on behavioral intention toward contactless service and AI hotels, this paper proposes the research model shown in Figure 2 based on extant studies. In this section, the current study proposes hypotheses for the causal relationship among the constructs and presents the theoretical background.

3.1 Anxiety about Infectious Diseases, Desire for Contactless Service, and Avoidance Contact with Humans

The initial point of our research model is the behavioral immune system. As mentioned above, this theory postulates that if individuals detect there is a possibility of getting an infectious disease, an emotional and cognitive response will be triggered. As a result, people will avoid environments in which there is a high likelihood of infection (Schaller & Park, 2011). In particular, according to van Leeuwen and Petersen (2018), individuals are most likely to avoid the higher probability of infection than any other condition. In other words, individuals are more likely to avoid a place, even if they are familiar with it, if there is a high likelihood of infection. In a similar vein, Bae and Chang (2020) also demonstrated that the perception of the risk of infectious diseases has a significant effect on behavioral intentions that can minimize interpersonal interaction and influence a customer's attitude toward technology-based tourism. Therefore, we can assume that anxiety caused by an infectious disease can trigger a desire for contactless service and behavior to avoid contact with familiar employees.

Referring to these previous studies, this paper postulates that in the context of contactless service (i.e., service robot), hotel customers with high anxiety about infectious diseases are likely to perceive a strong desire for contactless service and avoid interpersonal interaction. Thus, we propose the following hypotheses:

• Hypothesis 1: Anxiety about infectious diseases is positively related to a desire for contactless service.

• Hypothesis 2: Anxiety about infectious diseases is positively related to avoidance contact with humans.

• Hypothesis 3: Desire for contactless service is positively related to avoidance contact with humans.

3.2 Trust in a Hotel Service Robot, Desire for Contactless Service, and Avoidance Contact with Humans

In adopting new technologies, customers are influenced by a variety of factors, among which trust is a key factor. As stated

earlier, just because a hotel guest feels anxious does not indicate a positive attitude or intention to act toward a contactless service. Like service robots, highly evolved new technology has limitations that customers cannot easily access, so it is salient to build trust between hotel guests and service robots.

The extant literature has investigated the role of trust in new information technology. For example, Ul Hassan et al. (2020) examined the mediating effect of technology trust on the relationship between SSTs' service quality and behavioral intentions in the service industry and found that trust in the context of technology has a partial mediating effect on behavioral intention. A number of other studies (e.g., Johnson et al., 2008; Kaushik et al., 2015) have demonstrated a positive link between trust and behavioral intention.

Meanwhile, Oh, Jeong, and Baloglu (2013) demonstrated that privacy and autonomy have a negative impact on desire for interaction. Privacy and autonomy applied in this study are concepts related to trust, and the desire for interaction refers to desire for interaction with desk staff. In other words, the privacy and autonomy of SSTs undermines the desire to interact with employees. Converting this to fit the context of this study, it can be assumed that trust in service robots reinforces the desire for contactless service. Thus, this paper formulates the following hypotheses:

• Hypothesis 4: Trust in hotel service robots is positively related to the desire for contactless service.

• Hypothesis 5: Trust in hotel service robots is positively related to avoidance contact with humans.

3.3 Desire for Contactless Service, Avoidance Contact with Humans, and Visit Intention

The desire for a specific object forms the intended action toward that object. Yi et al. (2020) verified that desire positively influences the intention to adopt Airbnb. Thus, customers with a strong desire for contactless service are likely to avoid direct contact with humans.

Considering the relationship between service robots and providers (hotels), customers with strong intentions to act on contactless services are more likely to naturally use AI hotels. In other words, hotel guests who have a strong desire for contactless service will try to avoid direct contact with employees; as a result, they will want to use an AI hotel that provides contactless service. Thus, this paper proposes the following hypotheses:

• Hypothesis 6: Desire for contactless service is positively related to visit intention.

• Hypothesis 7: avoidance contact with humans is positively related to visit intention.

4. Research Methods

4.1 Measures

Based on previous studies, this study adopted the following measurement items: anxiety about infectious diseases (Mahmud et al., 2020; Lee et al., 2012), trust (i.e., performance, process, and purpose) (Park, 2020), desire for contactless service (Lee et al., 2012), avoidance contact with humans (Liang & Xue, 2012), and intention to visit an AI hotel (Bae & Chang, 2020). This procedure yielded 26 measurement items. All items are summarized in Table 3 by each construct: anxiety about infectious diseases (6 items), performance (3 items), process (3 items), purpose (3 items), desire for contactless service (4 items), avoidance contact with humans (3 items), and intention to visit an AI hotel (4 items). All items were measured on a 7-point Likert scale, ranging from strongly disagree (1) to strongly agree (7). Table 1 shows the operational definitions of the constructs and key references.

Table 1. Operational definitions of measurements

Construct		Operational Definition	Reference
Anxiety about infectious diseases		The extent to which hotel customers feel anxious about infectious diseases such as COVID-19.	Lee et al. (2012); Mahmud et al. (2020)
Trust in hotel service robots	Performance	The extent to which hotel customers perceive that service robots have the ability to perform services.	Park (2020)
	Process	The extent to which hotel customers perceive that service robots perform appropriate services for specific situations.	
	Purpose	The extent to which hotel customers perceive that service robots perform services according to the purpose of the service.	
Desire for contactless service		The extent to which hotel customers want services that minimize personal contact	Lee et al. (2012)
Avoidance contact with humans		The extent to which hotel customers want to avoid contact with employees and receive service through service robots.	Liang and Xue (2010)
Visit intention		The extent to which hotel customers intend to use hotels with service robots	Bae and Chang (2020)

4.2 Data Collection

To verify the proposed research model, we collected data from a top-ranked Internet survey firm (Macromill Embrain) in Korea. This paper targeted a sample of hotel guests who reserved a hotel room during the previous two years. The respondents were presented with a video depicting a service robot at a hotel performing room service (see Figure 3). The online survey was conducted during one week in October 2020, and 232 valid responses were collected. Table 2 summarizes the characteristics of the respondents.

Fig. 3. Examples of service robot at Courtyard by Marriott Seoul Botanic Park

Table 2. Sample description

Profile Category	Frequency	Percentage (%)	Profile Category	Frequency	Percentage (%)
Gender			Education		
Male	116	50.0	High school	30	12.9
Female	116	50.0	In university/college	34	14.7
Age			University/college	140	60.3
20-29	57	24.6	Graduate school	28	12.1
30-39	56	24.1	Job		
40-49	57	24.6	Student	21	9.1
Over 50	62	26.7	Office management	121	52.2
Monthly Income (KRW)			Sales service	13	5.6
<1 million won *	23	9.9	Technical post	20	8.6
1–1.9 million won	16	6.9	Specialist	11	4.7
2–2.9 million won	65	28.0	Self-employed	11	4.7
3–3.9 million won	48	20.7	Public servant	7	3.0
4–4.9 million won	30	12.9	Housewife	24	10.3
Over 5 million won	50	21.6	Other	4	1.7

5. Analysis and Results

5.1 Common Method Bias Test

When variables are acquired from one source, common method bias can distort statistical analysis results (Lee et al., 2020). In other words, it is necessary to test this because respondents may unconsciously or consciously respond to the independent variable and the dependent variable in the same direction. Thus, we employ Harman's single-factor test. A general rule of thumb is that if one factor is explained by less than 50% of the covariance, it can be considered that common method bias does not exist (Podsakoff et al., 2003). Each construct explains from 3.931% to 46.264% of the covariation among measurement items. Thus, this test concludes that the paper's analysis results are not seriously affected by common method bias.

5.2 Analysis

The present study applied partial least squares (PLS) to test the proposed research model. Smart PLS version 3.0 PLS analysis offers several advantages. This tool is applicable when the sample size is small or when there are few assumptions about the measurement scale and normal distribution (Ahuja & Thatcher 2005). The sample size for a PLS estimation is required to exceed 10 times the number of measurement items of the most complex construct, which is six in this study (anxiety about infectious diseases) (Barlett et al., 2001). Therefore, 60 questionnaires are needed for analysis. Because we collected 232 responses, the requirement was satisfied.

5.3 Measurement Model

After confirming that there is no problem with the common method bias,. we followed the recommendations of Fornell and Larcker (1981) and Hair et al. (2013) to validate the measurement model. All factor loadings of items should be above the threshold value of 0.5, and all values of average variance extracted (AVE) should be greater than 0.5. A confirmatory factor analysis (CFA) was conducted to verify the construct validity of all constructs used in the study. As shown in Table 3, the factor loadings of all measurement items were well beyond 0.6, and all values of AVE were above 0.5. Additionally, the values of Cronbach's α and CR for all constructs exceeded 0.7. The assessment of discriminant validity was conducted based on the recommendation of Fornell and Larcker (1981); it was verified by comparing the values of the squared root of AVE for each variable with the inter-construct correlation coefficients. As shown in Table 4, all values of the squared root of AVE were higher than any other corresponding inter-construct correlations, confirming the discriminant validity of all measurements. Based on the evidence for the convergent and discriminant validities, the measurement model appears to be acceptable.

Table 3. Reliability and cross-loadings

Construct	Measurement Items	Loadings	α	CR	AVE
Anxiety about infectious diseases	I am worried that infectious diseases such as COVID-19 will occur at any time in the future and it will be dangerous to receive services at hotels.	0.791	0.918	0.936	0.709
	I am worried that there will always be a scary infectious disease such as COVID-19.	0.884			
	I am worried that an infectious disease that is more terrifying than the new influenza, MERS, SARS, and COVID-19 will occur again anytime in the future.	0.866			
	I will continue to search for information on infectious diseases that can occur at any time in the future.	0.802			
	I am afraid of infectious diseases that can occur anytime in the future.	0.879			
	People around me will continue to be limited in their behavior due to infectious diseases that can occur at any time in the future.	0.825			
Trust in hotel service robot					
Performance	The service robot has all functionalities needed to fulfill its goal.	0.910	0.915	0.946	0.855
	I can count on the information provided by the service robot to be accurate.	0.931			
	I can rely on the service robot to check in the hotel room.	0.933			
Process	I think that no one can pretend to be me within the process checking in the hotel via the service robot.	0.751	0.711	0.839	0.635
	I understand how the service robot works.	0.769			
	I think that the service robot does not change or use my data for other purposes without being noticed.	0.867			
Purpose	I think that my personal data is used for delivering the services the service robot offers.	0.601	0.755	0.857	0.674
	I think that the designers of the service robot want to help me to check-in a hotel.	0.919			
	I think the service robot will be an useful for managing hotel guest experiences in the future.	0.903			
Desire for contactless service	I want to use services through service robot (not people) in the near future.	0.954	0.969	0.977	0.915
	I wish to use services through service robot (not people) in the near future.	0.973			
	I am eager to use services through service robot (not people) in the near future.	0.965			
	My wish to use services through service robot (not people) in the near future can be expressed as desirably.	0.933			
Avoidance of contact with human	I intend to use services through service robot to avoid human contact.	0.940	0.941	0.962	0.894
	I predict I would use services through service robot to avoid human contact.	0.965			
	I plan to use services through service robot to avoid human contact.	0.932			
Visit intention	I intend to visit hotels with service robot in the near future.	0.938	0.951	0.965	0.872
	I am planning to visit hotels with service robot in the near future.	0.931			
	I will make an effort to visit hotels with service robot in the near future.	0.935			
	I will certainly invest and money to visit hotels with service robot in the near future.	0.932			

Note: CR = composite reliability; AVE = average variance extracted.

Table 4. Correlation and discriminant validity

	Construct	Mean	SD	Correlation of Constructs				
				(1)	(2)	(3)	(4)	(5)
(1)	Anxiety about infectious diseases	5.212	1.020	0.842				
(2)	Trust in hotel service robot	4.784	0.809	.343**	0.720			
(3)	Desire for contactless service	4.770	1.291	.386**	.569**	0.956		
(4)	Avoidance of contact with human	4.922	1.187	.446**	.621**	.702**	0.946	
(5)	Visit intention	4.692	1.267	.330**	.589**	.793**	.757**	0.934

Note: Diagonal elements (in bold) in the matrix are the square root of the average variance extracted (AVE). For adequate discriminant validity, the diagonal elements should be greater than the corresponding off-diagonal elements.

5.4 Structural Model

In this study, structural model analysis was conducted in steps. First, we conducted hierarchical component modeling to remove the distortion that may occur because the trust in a hotel service robot construct is composed of second-order factors. And predictive relevance was analyzed through Q^2, and then the structural path was estimated.

5.4.1 Hierarchical Component Modelling

Trust in a hotel service robot is conceptualized as a second-order factor measurement model. For this, we applied hierarchical component modeling suggested by Wold (1980). Specifically, hierarchical component modeling means that a second-order factor is measured directly by an observed variable for all the first-order factors, and this approach is one of the easiest procedures (Reinartz et al., 2004, p. 298). Since Smart PLS directly provides estimating component scores, it is suitable for verifying a research model that includes trust in a hotel service robot, a formative second-order construct conceptualized in this study.

5.4.2 Predictive Relevance

Besides R2 analysis (see the circle in Figure 4), we can assess the predictive relevance of the proposed model by employing Stone-Geisser's Q2 value (Geisser, 1974; Stone, 1974). Stone-Geisser's Q2 value can be assessed by a blindfolding procedure in Smart PLS (Wong, 2013). This Q2 value explains how well the collected data can be reconstructed with the help of the model and PLS parameters produced in the initial analysis (Lee et al., 2020, p. 6). If the value of A is calculated to be greater than 0, the model is

interpreted as having predictive relevance (Hair et al., 2017). Q2 for the desire for contactless service, avoidance contact with humans, and visit intention were 0.355, 0.522, and 0.610, respectively. Thus, our model has acceptable predictive relevance.

5.4.3 Structural Model Test

Figure 4 shows the results of the structural model. The structural models were tested for their explanatory power and path significance using the bootstrapping technique. The size of the bootstrapping sample that was applied in the PLS analyses was 5,000. Table 5 summarizes the results of the hypothesis tests. Hypotheses 1 and 2 assume a positive relationship between anxiety about infectious diseases and desire for contactless service and avoidance contact with humans. Supporting these hypotheses, anxiety about infectious diseases is found to have a positive impact on the desire for contactless service (β = 0.216, t = 3.941) and avoidance contact with humans (β = 0.173, t = 2.766). Also, Hypotheses 3 and 4 postulate a positive relationship between trust and diseases and desire for contactless service and avoidance contact with humans. Trust is found to have a positive effect on desire for contactless service (β = 0.522, t = 7.439) and avoidance contact with humans (β = 0.309, t = 3.562). The test for Hypothesis 5 implies that desire for contactless service has a positively significant impact on avoidance contact with humans (β = 0.452, t = 4.912). Thus, Hypothesis 5 was supported. Finally, intention to visit an AI hotel is found to be affected by a desire for contactless service (β = 0.518, t = 5.331) and avoidance contact with humans (β = 0.392, t = 3.991). Therefore, Hypotheses 6 and 7 were supported.

Table 5. Standardized structural estimates and tests of the hypotheses

Hypotheses	Path			Estimates	t-Value	Results
Hypothesis 1	Anxiety about infectious diseases	→	Desire for contactless service	0.216	3.941	Supported
Hypothesis 2	Anxiety about infectious diseases	→	Avoidance of contact with human	0.173	2.766	Supported
Hypothesis 3	Desire for contactless service	→	Avoidance of contact with human	0.452	4.912	Supported
Hypothesis 4	Trust in hotel service robot	→	Desire for contactless service	0.522	7.439	Supported
Hypothesis 5	Trust in hotel service robot	→	Avoidance of contact with human	0.309	3.562	Supported
Hypothesis 6	Desire for contactless service	→	Visit intention	0.518	5.331	Supported
Hypothesis 7	Avoidance of contact with human	→	Visit intention	0.392	3.991	Supported
R2	Desire for contactless service				0.394 (39.4%)	
	Avoidance of contact with human				0.592 (59.2%)	
	Visit intention				0.711 (71.1%)	

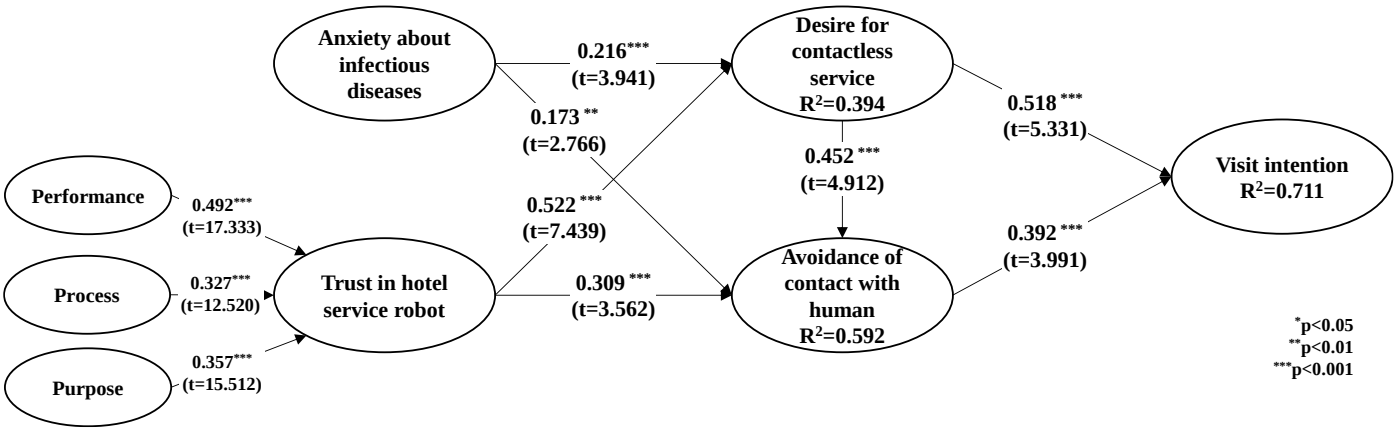

Fig. 4. Results of hypothesis testing

6. Discussion

The behavioral immune system is validated because the results show a positive relationship among anxiety about infectious diseases, desire for contactless service, and avoidance contact with humans. Desire for contactless service and avoidance contact with humans also have a positive impact on visit intention. These results indicate that hotel guests' anxiety about infectious diseases is directed towards people with potential infections rather than the pathogen itself. As a result, hotel guests are more likely to use services through technology rather than interpersonal interaction to avoid infection.

Furthermore, the results show that service robot trust influences desire and behavioral intentions toward contactless service and hotels. Thus, if hotel guests trust a service robot, they will have a desire for contactless service and positive behavioral intention toward contactless service and, in turn, have the intention to visit. This result is similar to previous studies verifying that trust is a significant predictor of acceptance of new technologies (Ul Hassan et al., 2020; Johnson et al., 2008; Kaushik et al., 2015). Interestingly, even in the COVID-19 pandemic, trust in hotel service robots (β = 0.309) has a greater influence on behavioral intention toward contactless service than anxiety about infectious diseases (β = 0.173). Therefore, no matter how much contact with human employees increases the likelihood of contracting infectious diseases, it can be interpreted that hotel customers are less likely to use technology if they cannot trust service robots.

7. Conclusion

7.1 Implications

This paper recognized two limitations of previous contactless service (or service robots) related to COVID-19 studies: (1) a lack of research on hotel guests' detailed psychological mechanism for contactless service, and (2) limited research on trust in service robots in the context of COVID-19. We attempted to overcome these limitations by extending and integrating trust in the

framework of the behavioral immune system. By doing so, the present study provides theoretical and practical implications as follows.

Historically, there has been no research on the behavioral immune system in tourism and the hospitality sector. Several researchers have undertaken research on the intentions of future tourism behavior to understand the psychology of tourists' anxiety caused by COVID-19 (e.g., Bae & Chang, 2020). However, no study has examined the psychological mechanisms of these individuals through theories. The behavioral immune system explains the psychological mechanisms of anxiety and social reactions to the person who is the target of the pathogen (Schaller & Park, 2011; Tsai et al., 2020). Noting that hotel customers' anxiety about infectious diseases and their consequent desire for, and behavioral intention toward, contactless service are strengthened, this paper introduced a different theory on tourism and the hospitality industry. This fresh approach of employing the behavioral immune system reveals useful insights about the role of new technology in the hotel sector and sheds light on hotel guests' psychological mechanism for contactless service.

The results of this paper fill the gap left by previous studies on contactless service in the tourism and hospitality sector. Existing research on contactless service or post COVID-19 customers has focused only on their psychological responses. Hence, this paper investigates more closely hotel guests' perception of contactless service and behavioral intention toward AI hotels by integrating trust in the framework of the behavioral immune system.

As a practical implication, hotel managers and service robot developers can employ this paper in designing contactless service for post COVID-19 hotel guests. Certainly, COVID-19 has created anxiety about infectious diseases among hotel guests, and consequently planted a positive perception relating to contactless service. As stated in the introduction, prior to the COVID-19 outbreak, negative perceptions of service robots were rife in the hotel industry due to the poor performance of service robots. However, the results of this study indicate that hotels should have specific plans in place for contactless service. Many of the changes caused by COVID-19 have a stronger impact than other previous infectious diseases (Bae & Chang, 2020). Therefore, demand from hotel customers for contactless service is highly likely to continue. Therefore, hotel managers must gradually increase the number of hotel customers and service robot encounters and collect useful data for complete and sophisticated contactless service, that is, service automation in the future.

Moreover, service robot developers must consider the trust in service robots. As the results of this study show, the desire for, and behavioral intention toward, contactless service are more strongly influenced by trust than by anxiety. In other words, trust engendered by the service robot has a greater influence on the formation of positive behavioral intentions than the psychological anxiety of hotel guests about infectious diseases. Therefore, continuous development is required so that service robots can successfully deliver services to customers.

7.2 Limitations

Despite these implications, this paper has some limitations. First, this study used only Korean data to verify the research model. Korean customers have a higher intention to accept contactless service compared to customers in other countries. Therefore, in future studies, it is necessary to extend the country data and increase the possibility of generalization. Further, this study examined post COVID-19 customers' psychological mechanism about contactless service only in the context of the hotel industry. However, issues related to contactless service and service robots are mentioned in various other service industries, such as the restaurant industry. Therefore, future research needs to look at the psychological mechanisms of customers in the context of other service industries.

Declaration of competing interests

The author(s) declared no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

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