

Application of consumer innovativeness to the context of robotic restaurants

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Jinkyung Jenny Kim

School of Hotel and Tourism Management, Youngsan University – Haeundae Campus, Busan, Republic of Korea

Ja Young (Jacey) Choe

Faculty of Business Administration, University of Macau, Taipa, Macao, and

Jinsoo Hwang

The College of Hospitality and Tourism Management, Sejong University, Seoul, Republic of Korea

Abstract

Purpose – The purpose of this paper is to apply the concept of consumer innovativeness to the robotic restaurants field.

Design/methodology/approach – A research model including 13 hypotheses is examined using a sample of 409 subjects gathered.

Findings – The results indicate that four underlying dimensions of consumer innovativeness have a positive effect on overall image, which, in turn, increases desire. In addition, desire aids to enhance the two dimensions of behavior intentions.

Practical implications – Robotic restaurant managers are required to focus more on quality experience-seeking, hedonic experience-seeking, venturesomeness and social distinctiveness using automated systems, which aid to enhance the image of robotic restaurants.

Originality/value – Consumer innovativeness is regarded as a significant concept in the domain of a novel technology-based product and service, but it has not been explored in the restaurant context. Thus, this study tried to apply consumer innovativeness to the robotic restaurant industry for the first time and explained how to form consumer behavioral intentions based on the concept.

Keywords Behavioral intentions, Consumer innovativeness, Overall image, Desire, Robotic restaurants

Paper type Research paper

Introduction

Technology has revolutionized the industrial world, and the restaurant industry is no exception (Ivanov *et al.*, 2017). In particular, robotics has been repeatedly described as a disruptive technology in operating a restaurant (Berezina *et al.*, 2019; Webster and Ivanov, 2020). The applications of robotics in restaurants cover a wide range of activities, both front of house and back of house. For example, Spycy in Boston's downtown is a robot-powered restaurant where seven automated cooking pots simultaneously prepare complex meals on-demand (Forbes, 2018). In Merry-Go Kitchen, South Korea's first robotized restaurant, in Seoul, customers place an order via their personal mobile device and navigating robots provide service (The Korea Herald, 2019). Robots are now a reality in the field of restaurant operations.



Consumer innovativeness is a concept stemming from the theory of innovation diffusion (Rogers, 2003). It has been often examined in the domain of consumer behavior as it illustrates an individual's propensity or willingness to try novel products and services (Roehrich, 2004). To be more specific, consumers with a high degree of innovativeness are intrinsically curious, enjoy creative exploration, and consequently tend to embrace new products/services (Choo *et al.*, 2014). Thus, consumer innovativeness has been regarded as a variable of considerable importance to hospitality and tourism practitioners and recent studies identified consumer innovativeness as a vital factor of the successful diffusion of innovative products and services in the restaurant industry (Jin *et al.*, 2016; Wang *et al.*, 2018). Nonetheless, individuals' innovativeness has not been studied enough in the restaurant context and the roles of each underlying dimension of consumer innovativeness have not been investigated. Hence, it raises the fundamental research questions of what and how the multi-dimensional consumer innovativeness elicits the consumer responses toward the robotic restaurants. Efforts in responding these research questions through the course of study could determine the core facets of consumer innovativeness in the context of robotic restaurants and offer a clear direction for the strategic establishment of target markets in line with psychological needs. Likewise, this study would be meaningful as a foundation to answer the consequences of the consumer innovativeness in greater detail by treating individual innovativeness as a multi-faceted construct and leverage it to transform the robotic restaurants successfully.

Image is an essential indicator of quality (Semeijn *et al.*, 2004), and the overall image of a restaurant refers to the sum of the beliefs, impressions, and thoughts that consumers associate with it (Han and Hyun, 2017). Accordingly, the image of restaurant products and services has been confirmed as an important predictor of customers' responses, which include desire and behavioral intentions (Espinosa *et al.*, 2018; Hwang and Choe, 2019). Also, the prominent role of desire in decision-making processes was articulated based on the model of goal-directed behavior (MGB), which is the model of goal-directed behavior (Perugini and Bagozzi, 2001). They asserted that social psychology should take motivational factors into consideration to better comprehend human behavior, and they suggested desire as a prominent construct for understanding individuals' motivation (Perugini and Bagozzi, 2001). Therefore, it is likely that the image of a robotic restaurant will reinforce desire, which will support individuals' behavioral intentions. As such, this study will bring additional research questions if the significant association between the image and the desire exists in the robotics restaurants context and if this occurs, how will it affect the consumer behavior?

The adoption of robots in restaurant operations is increasing around the world and many industry experts envision that robots will become integral members of the labor force (Cheong *et al.*, 2016). Various robots are employed to accomplish different tasks from kitchen prep to seating and serving customers, and often substitute for humans in dangerous or routine tasks (Ivanov *et al.*, 2017). The literature pertaining to robotic restaurants explains the possible use, implementation and usability of robots (Huang and Lu, 2017; Pieska *et al.*, 2013). Cheong *et al.* (2016) developed a prototype of a waiter robot for a casual dining restaurant and suggested using the robot operating system framework and a modular robot design. Huang and Lu (2017) demonstrated how to build a smart unmanned restaurant with multiple mobile robots and Ivanov *et al.* (2017) asserted that industry practitioners should conduct a comprehensive cost-benefit analysis prior to adopting robots into their operations. On the other hand, few attempts have been made to explore how the adoption and the implementation of robotic technologies in a restaurant will be perceived by the consumers.

Robots are becoming more common in the restaurant environment, but there is a limited understanding of how consumers perceive robotic restaurants in conjunction with their

personal innovativeness and the subsequent outcomes. Furthermore, empirical research on the formation of consumers' behavioral intentions that is driven by consumer innovativeness is rather rare. Given the importance of consumer innovativeness in robotic restaurants, the purposes of the current research are to provide a clear understanding of:

- the influence of each underlying dimension of consumer innovativeness on the overall image of a robot-powered restaurant;
- the impact of the overall image on desire and behavioral intentions, which encompass intentions to use and word-of-mouth intentions (hereafter WOMI); and
- the association between desire and behavioral intentions.

On the basis of the study results, this research would successfully respond to the research questions outlined above, and it would advance our knowledge of the business potential of the technology-powered restaurants in connection with the personal innovativeness.

Literature review

The robotic restaurant and its characteristics

The robotic restaurant emerged as a result of the current technology revolution (Berezina *et al.*, 2019; Cheong *et al.*, 2016). There is no clear definition of the robotic restaurant in the extant literature; it is rather a practical industry term, which refers to the new model of restaurant operating with a wide range of robots. At robotic restaurants, customers interact with chatbots which assist in reservation inquiries and provide information about the menu and the restaurant (Berezina *et al.*, 2019). Customers are welcomed by a robot greeter at the entrance and they are guided to the table by a service robot (Pieska *et al.*, 2013). Customers can also place their order directly via their smartphone or a tablet app, which avoids waiting for service staff (Ivanov *et al.*, 2017). Robotic restaurants offer automated food delivery and robotic chefs prepare food and drinks, so service automation is another key characteristic of robotic restaurants distinguishing them from other restaurants (Ivanov *et al.*, 2017). Moreover, robotic restaurants operate with fewer or no human encounters, which has emerged as a new customer service trend (Cheong *et al.*, 2016).

Consumer innovativeness

Consumer innovativeness has been described as the tendency to adopt new products or services relatively quickly (Midgley and Dowling, 1978). A clearer definition was provided by Steenkamp *et al.* (1999), who explained that it refers to consumers' predisposition to try new or different products/services rather than remain with current and previous choices. In other words, consumers with a strong inclination to accept new products and services for their needs are regarded as innovative. Therefore, consumer innovativeness has been widely examined as a notable personal trait that helps to predict the success of an innovation (Midgley and Dowling, 1978). Consequently, it is expected that consumer innovativeness indicates the potential success of robotic restaurants.

Researchers recognize innovativeness as an important personality trait in consumer behavior. Numerous studies treated consumer innovativeness as a one-dimensional construct but these studies showed the different levels of reliability and validity (Roehrich, 2004; Wang *et al.*, 2018). Thus, there were several attempts to predict consumer innovativeness by means of different underlying dimensions (Wang *et al.*, 2018). Likewise, Vandecasteele and Geuens (2010) asserted that the approach of a multi-dimensional innovativeness scale better accounts for the relation between consumer and product/service. In this respect, Wang *et al.* (2018) endeavored to conceptualize and develop a measurement

to predict consumer innovativeness in the airline industry through qualitative interviews and field and online surveys. They presented eight preliminary underlying dimensions for consumer innovativeness: novelty-seeking, eagerness, vigilance, openness, quality experience-seeking, hedonic experience-seeking, venturesome and social distinctiveness.

Novelty-seeking is the first dimension proposed by Wang *et al.* (2018). Consumers who are impatient for new experiences are generally described as highly novelty-seeking (Leavitt and Walton, 1975). Thus, novelty-seeking refers to an individual's positive predisposition toward innovation in the domain of consumption (Im *et al.*, 2003). Meanwhile, Crowe and Higgins (1997) noted that eagerness and vigilance are focused on two opposite aspects, promotion and prevention, respectively. Consumers focused on promotion to seek positive outcomes, whereas individuals focused on prevention seek to avoid negative outcomes (Higgins, 1998). Eagerness refers to the degree of willingness to attain advancement and gain, and vigilance concerns individuals' state to assure safety and avoid losses (Crowe and Higgins, 1997). Following this conceptualization, Wang *et al.* (2018) described consumers characterized by eagerness as passionate about trying new products and services. On the other hand, consumers characterized by vigilance are cautious and evaluate the trustworthiness of information before acquiring new products and services (Wang *et al.*, 2018).

Regarding openness, it has been frequently studied as a crucial factor, which leads an individual or a firm to be more innovative (Wang *et al.*, 2018). For instance, Nordlund *et al.* (2011) dealt with openness to innovativeness from the viewpoint of consumers and articulated that consumers with a high level of openness manifest the willingness to innovate. Next, quality experience seeking refers to individuals who are attracted by the functional performance of new products/services. These consumers place great value on productivity, using new products or services that improve comfort, ease and efficiency (Vandecasteele and Geuens, 2010). In other words, if new products and services are more functional, consumers characterized by quality experience seeking are likely to try them. Moreover, studies have included hedonism as an essential component of consumers' exploratory acquisition of new products/services (Wang *et al.*, 2018). For example, Baumgartner and Steenkamp (1996) showed that consumers with a high degree of hedonic experience seeking tend to seek stimulation such as enjoyment, excitement, and pleasure in the consumption experience through innovative product choices.

With respect to venturesomeness, Ostlund (1974, p. 24) conceptualized it as a "willingness to take risks in buying new product." In the study, it was described as one of the personal characteristics that positively influence consumer innovativeness. Bowden and Corkindale (2005) defined venturesomeness as trying new products or services despite their unfamiliarity and, thus, it is one of the distinct attributes of consumer innovativeness. Last, social distinctiveness reflects the need for uniqueness, which is the trait of pursuing differentness relative to others (Tian *et al.*, 2001). Therefore, social distinctiveness is generally defined as a self-reported innovativeness that is motivated by the self-assertive social need for differentiation (Vandecasteele and Geuens, 2010). Likewise, social distinctiveness is exemplified by being unique and having opinion leadership or symbolism (Roehrich, 2004; Tian *et al.*, 2001). The present study encompasses these eight underlying dimensions, which were proposed in the field of the tourism industry, and aims to validate the roles of each sub-dimension in the context of robotic restaurants.

The influence of consumer innovativeness on the overall image

Image was illustrated as the total of individuals' beliefs, ideas and impressions about a brand, company, product or service (Kotler *et al.*, 1993). The image of robotic restaurants

thus reflects the cognitive and affective state of a robotic restaurant and its attributes that are salient to evaluation. Many studies have been conducted to identify the antecedents and consequences of the overall image of restaurants (Espinosa *et al.*, 2018; Hwang and Choe, 2020; Jin *et al.*, 2016), suggesting the essential role of restaurant image in consumer behavior.

The diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread (Rogers, 2003). Under the circular theory of human values, the willingness to change is one of the higher-order categories of motivationally distinct values (Schwartz, 1992). Likewise, the consumer innovativeness can be regarded as a prominent construct to understand the individuals' motivation. Furthermore, the motivation theory explicated how the individuals' internal psychological needs aid to build the image (Madden *et al.*, 2016). Hence, these theories support the positive relationship between the consumer innovativeness and the overall image of the smart products/services.

As more smart technologies have entered our lives, many studies have tested how consumers respond to technology-powered innovations in the service sector depending on their level of innovativeness. For instance, Kang and Gretzel (2012) conducted a field experiment using MP3 players for podcast tours as a novel technology at Padre Island National Seashore and they discovered the meaningful impact of consumer innovativeness on perceptions of podcast tours. Jin *et al.* (2016) analyzed 398 responses obtained from upscale and luxury restaurant patrons and confirmed that consumer innovativeness exerts significant influence on restaurant image. They demonstrated that if consumers are satisfied with the need for novel experience in the restaurant industry, innovative consumers tend to have a favorable restaurant image. Cui *et al.* (2018) explored the significance of consumer innovativeness in the tourism industry and their analysis results revealed the intricate associations among consumers with a stronger innovativeness, trust and the image of travel websites. Lamidi and Rahadhini (2020) conducted a case study about one specific restaurant in Indonesia, and their results revealed that the consumer innovativeness positively influenced the overall image of the restaurant. Thus, we proposed the following hypotheses:

- H1. Novelty-seeking has a positive influence on the overall image of robotic restaurants.
- H2. Eagerness has a positive influence on the overall image of robotic restaurants.
- H3. Vigilance has a positive influence on the overall image of robotic restaurants.
- H4. Openness has a positive influence on the overall image of robotic restaurants.
- H5. Quality experience seeking has a positive influence on the overall image of robotic restaurants.
- H6. Hedonic experience seeking has a positive influence on the overall image of robotic restaurants.
- H7. Venturesomeness has a positive influence on the overall image of robotic restaurants.
- H8. Social distinctiveness has a positive influence on the overall image of robotic restaurants.

The influence of the overall image on desire and behavioral intentions

Many efforts have been made to comprehend the formation of behavioral intentions in the presence of motivational factors and Perugini and Bagozzi (2001) proposed the concept of

desire in the MGB. The term of desire is regarded as a mental condition in which an individual has strong positive feelings or thoughts about a particular action (Perugini and Bagozzi, 2001). Thus, a lot of work has been dedicated to identifying the antecedents of desire to boost behavioral intentions.

Numerous studies have determined that overall image plays a crucial role in building strong desire across different settings. For instance, Yüksel and Akgül (2007) stressed that image is an essential factor in travelers' destination choice and examined how image affected travelers' emotions and desire. Their results based on 163 hotel customers' responses in Turkey revealed that a favorable image is associated with greater desire to travel to a particular destination. Destination image was investigated by Hudson *et al.* (2011), who identified the salient influence of destination image on the desire to travel. Concretely, they conducted an experiment with a film featuring South America and their analysis found that after watching the film, built destination image increased the desire to visit South America. An extensive range of restaurants is one of the key features of a cruise ship, and the significant linkage of the value-image-desire was discovered in the consumers' cruising behavior (Han and Hyun, 2017). Also, the authors asserted the importance of increasing the positive image for the firm to succeed. Hwang and Choe (2019) investigated the overall image of drone-based delivery in the foodservice industry and found that consumers who had a positive overall perception of such services exhibited the desire to use them. In light of the above, it is likely that the image of robotic restaurants generates desire to visit them:

H9. The overall image of robotic restaurants has a positive influence on desire.

Behavioral intentions describe the possibility that an individual tend to engage in a specific behavior (Oliver, 1997). On the basis of this conceptualization, behavioral intention in the field of the restaurant industry has been described as the likelihood that consumers will pay a visit to a particular restaurant and/or spread positive WOM about a specific restaurant (Hwang and Choe, 2020).

Prior studies have verified the overall image that consumers perceive toward a particular product/service or a brand built on consumers' behavioral intentions across different settings. For example, Jin *et al.* (2016) posited and empirically tested the role of the perceived image of upscale/fine dining restaurants on behavioral intentions. They analyzed 398 data samples and showed the significant influence of restaurant image on behavioral intentions encompassing visit intentions and WOMI. Espinosa *et al.* (2018) examined the associations among overall restaurant image, loyalty, satisfaction and behavioral intentions in a franchised casual dining restaurant context. They utilized a mixed-method approach involving both qualitative and quantitative procedures and found that overall restaurant image affected intention to recommend and intention to visit a casual dining restaurant through loyalty and satisfaction. More recently, Hwang and Choe (2020) attempted to identify the risks affecting the image of restaurants featuring dishes with edible insects and the role of image on consumers' behavioral intentions. Their results showed that the overall image of restaurants affected every aspect of intention, including intention to use, to generate positive WOM and to pay even more. Consistent with these theoretical backgrounds and empirical evidence, the following hypotheses were formulated:

H10. The overall image of robotic restaurants has a positive influence on intention to use.

H11. The overall image of robotic restaurants has a positive influence on WOMI.

The effect of desire on behavioral intentions

A significant association between desire and individuals' intentions has been found in the various settings of the hospitality industry (Perugini and Bagozzi, 2001; Piçarra and Giger, 2018). As previously explained, desire within MGB provides the motivational force for individuals' intention to perform a specific behavior. In addition to the mediating role of desire in MGB, desire has been identified as an important motivational construct, which also directly influences consumers' intentions. For example, Shin *et al.* (2018) dealt with the consumers' sustainable behaviour in the restaurant context and validated that the individuals' environmental concern positively influenced the desire, which, in turn, increased the intentions to visit a locally sourced restaurant. Piçarra and Giger (2018) incorporated MGB to predict consumers' behavioral intentions regarding a social robot and their results revealed that desire influences the formation of behavioral intentions. As such, their results underline the importance of motivational factors in understanding consumer behavior. Hwang and Choe (2019) examined how desire affects consumers' behavioral intentions and the results of their analysis of 331 data samples revealed that desire is a vital factor inducing intention to use services and willingness to pay premium. As a result, they asserted that desire is a potentially meaningful construct to more fully comprehend the consumers' acceptance of a novel technology in the hospitality sector:

H12. Desire has a positive influence on intention to use.

H13. Desire has a positive influence on WOML.

Proposed model

Our theoretical framework involves 12 latent constructs and 13 hypotheses. Figure 1 depicts the proposed conceptual model.

Methods*Measurement*

Multi-item scales employed by prior research were adopted and modified to fit the robotic restaurant setting. First, consumer innovativeness included eight sub-dimensions measured with 24 items adapted from Wang (2014) and Wang *et al.* (2018). Wang (2014) conducted a qualitative study to conceptualize the concept of consumer innovativeness in the hospitality industry. Since then, Wang *et al.* (2018) applied the measurement items suggested by Wang (2014) to the airline industry. Considering the research background of previous studies, it is considered appropriate to cite the measurement items in this study. Second, the concept of overall image was measured with three items drawn from Han *et al.* (2019). Third, desire was measured using three items from Perugini and Bagozzi (2001). Fourth, the concept of intentions to use and intentions to generate WOM were assessed by three items each cited from Zeithaml *et al.* (1996) and Hennig-Thurau *et al.* (2002) respectively. All items were evaluated using a seven-point Likert's scale, which ranges from (1) greatly disagree and (7) greatly agree.

Data collection

The data were gathered on the basis of the convenience sampling technique using M company, which is the largest survey company in South Korea. As robotic restaurants have not been activated in Korea yet, we presented two videos before the survey that clearly explained the robotic restaurant system to enhance respondents' understanding. In addition, the system was built so the respondents could participate in the survey after watching two

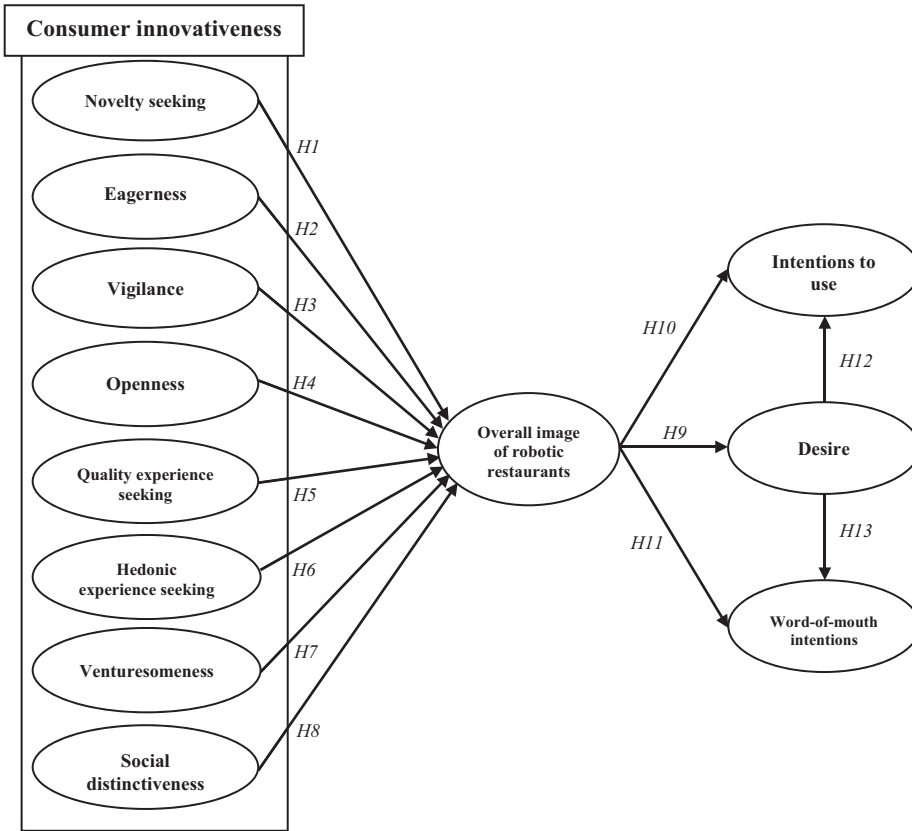


Figure 1.
Proposed conceptual
model

videos. The first video presented cooking robots; the second video showed robots taking orders and serving food. A total of 1,798 people were initially surveyed by the company, but only 465 completed the survey. This study used a Mahalanobis distance check and visual inspection to check multivariate outliers. As a result, 56 outliers were removed and 409 usable data were used for further analysis.

Analysis and results

Sample characteristics

The proportion of male (50.4%, $n = 206$) and female (49.6%, $n = 203$) participants was almost the same. The mean average age of the respondents was 36.70. Regarding the income level, 26.7% ($n = 109$) reported a monthly income of between \$1,001 and \$2,000. With regard to marital status, 55.5% ($n = 227$) of the respondents were married. Lastly, the majority of respondents had a bachelor’s degree (55.7%, $n = 228$).

Confirmatory factor analysis

The results of confirmatory factor analysis (CFA) confirmed an acceptable fit to the data of the proposed measurement model in the robotic restaurant field ($\chi^2 = 1,105.292$, $df = 528$,

$\chi^2/df = 2.093$, $p < 0.001$, RMSEA = 0.052, NFI = 0.935, IFI = 0.965, CFI = 0.965, and TLI = 0.958, and). The factor loadings were greater than or equal to 0.776 and all of them were significant ($p < 0.001$) (Table 1).

The reliability values of each construct were higher than 0.70, which indicated that all study variables had adequate internal consistency according to Hair *et al.* (2006). Furthermore, the values of the AVE for each construct exceeded the 0.50 cutoff (Bagozzi and Yi, 1988), which suggested good convergent validity. Finally, the values of AVE of each construct were higher than each squared correlation (R^2) between a pair of constructs, which indicated adequate discriminant validity (Fornell and Larcker, 1981) (Table 2).

Structural equation modeling

Structural equation modeling (SEM) in using a maximum likelihood estimation (MLE) method was conducted to test the 13 hypotheses. The generated structural model that included 12 constructs had an adequate fit to the data ($\chi^2 = 1,187.521$, $df = 553$, $\chi^2/df = 2.147$, $p < 0.001$, RMSEA = 0.053, NFI = 0.931, IFI = 0.962, CFI = 0.962 and TLI = 0.956). Nine of the 13 proposed hypotheses were statistically confirmed at $p < .05$. The details of the structural analysis are given in Figure 2 and Table 3.

More specifically, *H1*, *H2*, *H3* and *H4*, which, respectively, proposed the effect of novelty-seeking ($\beta = 0.062$, $p > 0.05$), eagerness ($\beta = 0.091$, $p > 0.05$), vigilance ($\beta = 0.021$, $p > 0.05$) and openness ($\beta = 0.040$, $p > 0.05$) on overall image, were not statistically supported. However, overall image was significantly affected by quality experience seeking ($\beta = 0.188$, $p < 0.05$), hedonic experience seeking ($\beta = 0.260$, $p < 0.05$), venturesomeness ($\beta = -0.242$, $p < 0.05$) and social distinctiveness ($\beta = 0.116$, $p < 0.05$). Thus, *H5*, *H6*, *H7* and *H8* were supported. In addition, overall image increased desire ($\beta = 0.813$, $p < 0.05$), Hintention to use ($\beta = 0.225$, $p < 0.05$), and WOMI ($\beta = 0.400$, $p < 0.05$). Hence, *H9*, *H10*, and *H11* were supported. Finally, desire enhanced intentions to use ($\beta = 0.765$, $p < 0.05$) and WOMI ($\beta = 0.547$, $p < 0.05$), Hsupporting *H12* and *H13*.

Discussion and conclusions

Conclusions

The current study examines the effects of a multi-dimensional consumer innovativeness on the overall image. In addition, it explores the effects of the image of robotic restaurants on desire and behavioral intentions. Finally, this study investigates whether desire influences behavioral intentions in the field of robotic restaurants. The results successfully determined the core facets of consumer innovativeness and their associations with critical variables in forming individuals' behavioral intentions in the robotic restaurants context. Likewise, this study would be meaningful in the theoretical aspect. Moreover, the findings provide multiple insights for practitioners to establish a strategy to appeal their potential customers and strength their competitiveness.

Theoretical implications

First, this research is one of the very few studies to empirically examine consumer innovativeness as a multi-faceted construct and its impact in the formation of individuals' behavioral intentions. The existing studies pertaining to the robotic restaurant discuss the benefits, functionality and potential application of robotics in the restaurant industry (Huang and Lu, 2017; Ivanov *et al.*, 2017), but only a handful research has been conducted in the consumer behavior in light of the individual innovativeness (Cha, 2020; Hwang *et al.*, 2020). In other words, even though numerous studies determined that consumer innovativeness is a critical factor in the diffusion of innovative products/services, the

Construct and scale item	Standardized loading ^a
<i>Consumer innovativeness</i>	
<i>Novelty seeking</i>	
I like to try new products	0.881
I enjoy trying unusual products	0.906
I like purchasing novel products	0.895
<i>Eagerness</i>	
I am passionate about trying new products	0.949
I am eager to find out about new products	0.947
<i>Overall image</i>	
I am enthusiastic about buying new products.	0.922
<i>Vigilance</i>	
I make careful decisions about what I want to buy	0.937
I do extensive research before acquiring new products	0.911
I do not make unplanned decisions when buying new products	0.822
<i>Openness</i>	
I am open to a variety of product options	0.805
I prefer to have many alternatives when deciding what to buy	0.789
I would like to experience new products of different kinds	0.885
<i>Quality experience seeking</i>	
If a new product is more functional than an existing product, I usually buy it	0.776
If the product I have does not work well, I try to buy a new product	0.835
I often consider buying products that are more effective than the current options	0.875
<i>Hedonic experience seeking</i>	
Using new products gives me a sense of personal enjoyment	0.861
Acquiring new products makes me happier	0.927
I feel good when using new products	0.920
<i>Venturesomeness</i>	
I cope well with the risks associated with trying new products	0.854
I am fine with the uncertainty of using new products	0.936
I anticipate uncertainty when using new products	0.779
<i>Social distinctiveness</i>	
It is necessary to buy new products to impress others	0.792
I enjoy using new products that make me a visionary leader	0.935
Using new products makes me a trendsetter	0.894
The overall image for using a robotic restaurant is good	0.924
The overall image of a robotic restaurant is great	0.956
Overall, I have a good image about a robotic restaurant	0.927
<i>Desire</i>	
I desire to use a robotic restaurant when dining out	0.951
My desire of using a robotic restaurant when dining out is strong	0.891
I want to use a robotic restaurant when dining out	0.961
<i>Intentions to use</i>	
I will use a robotic restaurant when dining out	0.949
I am willing to use a robotic restaurant when dining out	0.916
	(continued)

Table 1.
Confirmatory factor
analysis: Items and
loadings

Construct and scale item	Standardized loading ^a
I am likely to use a robotic restaurant when dining out	0.962
<i>Word-of-mouth intentions</i>	
I am likely to say positive things about a robotic restaurant to others	0.901
I am likely to recommend a robotic restaurant to others	0.962
I am likely to encourage others to use a robotic restaurant	0.929

Notes: Goodness-of-fit statistics: $\chi^2 = 1105.292$, $df = 528$, $\chi^2/df = 2.093$, $p < 0.001$, $NFI = 0.935$, $IFI = 0.965$, $CFI = 0.965$, $TLI = 0.958$ and $RMSEA = 0.052$; ^a All factors loadings are significant at $p < 0.001$; $NFI =$ normed fit index, $IFI =$ incremental fit index, $CFI =$ comparative fit index, $TLI =$ Tucker-Lewis index and $RMSEA =$ root mean square error of approximation

Table 1.

consideration of personal innovativeness is seldom associated with behavioral intentions in the robotic restaurants context. Adopting the conceptualization of multi-dimensional consumer innovativeness from the study which was conducted by Wang *et al.* (2018), the present study contributes in the domain of robotic restaurants with an attempt to explore consumer innovativeness in detail and examine its impact on the overall image for the first time.

Second, *H1*, *H2*, *H3* and *H4*, which predicted the effects of novelty-seeking, eagerness, vigilance and openness on the image of robotic restaurants, were not deemed significant. These outcomes are rather different from the findings of existing studies (Cui *et al.*, 2018; Jin *et al.*, 2016) and indicate that other aspects of consumer innovativeness are more critical to the image of robotic restaurants. Quality experience seeking is shown to have a significant and positive effect on the overall image of robotic restaurants. Prior studies suggested that if new products/services provide appropriate functional values, such as comfort, ease and efficiency, consumers tend to try them (Vandecasteele and Geuens, 2010). In the context of robotic restaurants, functional could mean the easy procedure of ordering food, the effective procedure of paying the bill and convenient procedure of making any request. Thus, if consumers think that robotic restaurants offer the high quality, they tend to generate a positive image of them. Moreover, hedonic experience seeking was examined to exert a meaningful impact on the image of robotic restaurants. It is generally accepted that hedonic experience seeking is an important indicator of consumer innovativeness (Wang *et al.*, 2018). This study also confirms that hedonism is an essential factor in diners' perception regarding robotic restaurants. The activity of eating itself reflects hedonic aspects since diners obtain positive hedonic experiences, such as excitement and happiness. The current results suggest that these hedonic experiences can be more intense when customers dine at robotic restaurants because customers who have more hedonic experience seeking tendencies were found to have a positive perception of robotic restaurants.

Third, the results of this study demonstrated that venturesomeness has weakened the overall image of robotic restaurants. The relationship between these two factors is significant but the finding goes against our expectations. Previous studies have stated that venturesomeness in trying new and unfamiliar products or services is an important component of consumer innovativeness (Bowden and Corkindale, 2005). However, in our study, diners who anticipate uncertainty when using new products were shown to have a negative image of robotic restaurants. This means that innovative customers who take risks when they buy new products can be conservative when it comes to food services. Maybe this is because consumers who have a high degree of venturesomeness are well aware of

Variables	Mean (SD)	AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Novelty seeking	4.49 (1.20)	0.799	0.923a	0.779b	0.539	0.553	0.592	0.642	0.220	0.410	0.411	0.431	0.451	0.442
(2) Eagerness	4.10 (1.29)	0.882	0.607c	0.957	0.589	0.516	0.549	0.612	0.146	0.488	0.433	0.465	0.460	0.433
(3) Vigilance	4.53 (0.91)	0.795	0.291	0.347	0.920	0.405	0.631	0.541	0.414	0.227	0.282	0.273	0.318	0.284
(4) Openness	5.05 (0.93)	0.685	0.306	0.266	0.164	0.867	0.513	0.614	0.321	0.338	0.273	0.241	0.286	0.272
(5) Quality experience seeking	5.10 (0.92)	0.688	0.350	0.301	0.398	0.263	0.869	0.585	0.637	0.120	0.281	0.238	0.309	0.321
(6) Hedonic experience seeking	4.99 (0.94)	0.816	0.412	0.375	0.293	0.377	0.342	0.930	0.381	0.342	0.404	0.400	0.432	0.399
(7) Venturesomeness	5.35 (1.01)	0.737	0.048	0.021	0.171	0.103	0.406	0.14	0.893	0.106	-0.012	-0.027	-0.015	-0.023
(8) Social distinctiveness	3.52 (1.36)	0.767	0.168	0.238	0.052	0.114	0.014	0.117	0.011	0.908	0.312	0.349	0.351	0.361
(9) Overall image	4.26 (1.22)	0.876	0.169	0.187	0.080	0.075	0.079	0.163	0.001	0.097	0.955	0.708	0.739	0.738
(10) Desire	3.72 (1.40)	0.874	0.186	0.216	0.075	0.058	0.057	0.160	0.001	0.122	0.501	0.954	0.744	0.763
(11) Intentions to use	4.02 (1.36)	0.888	0.203	0.212	0.101	0.082	0.095	0.187	0.001	0.123	0.546	0.554	0.960	0.795
(12) Word-of-mouth intentions	4.09 (1.27)	0.867	0.195	0.187	0.081	0.074	0.103	0.159	0.001	0.130	0.545	0.582	0.632	0.951

Notes 1: SD = standard deviation, AVE = average variance extracted; a. composite reliabilities are along the diagonal, b. correlations are above the diagonal and c. squared correlations are below the diagonal

Table 2.
Descriptive statistics
and associated
measures

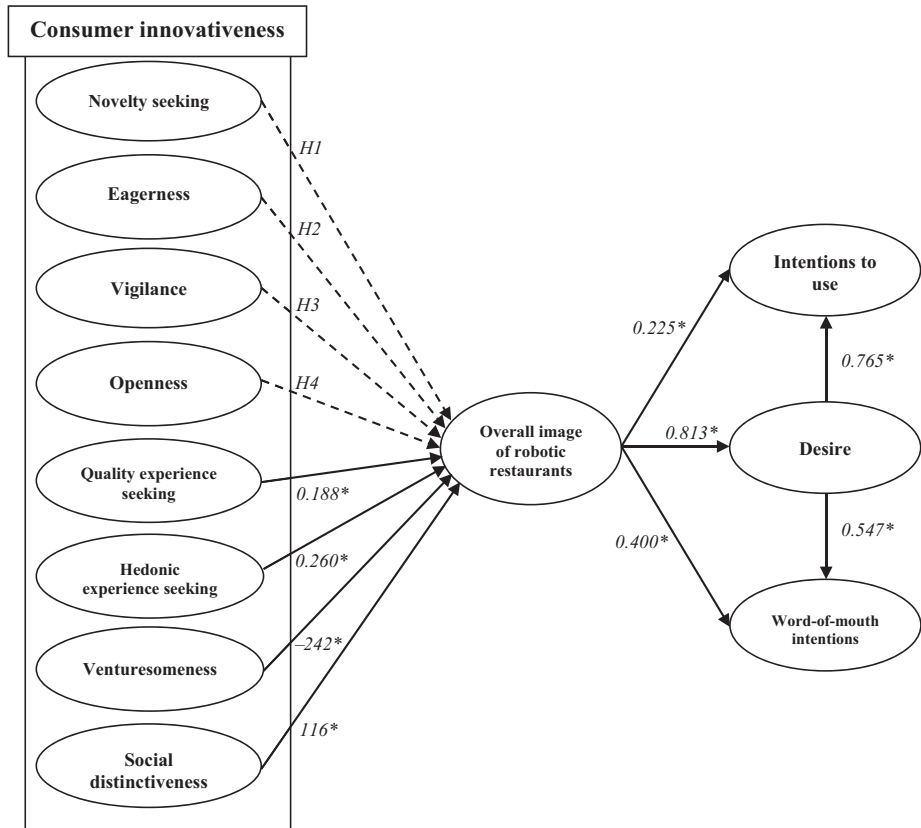


Figure 2.
Standardized
theoretical path
coefficients

Notes: * $p < 0.05$; The dashed line indicates non-significant path ($p > 0.05$)

awkward aspects of robotic restaurants that need to be improved. For example, some early versions of robots in restaurants were imperfect in many ways (Mishraa *et al.*, 2018). Customers themselves have to press a button to stop the robot and pick up the food themselves. Sometimes robots block the path of customers and staff, creating inconvenience. Furthermore, regardless of the rapid advances in robotic kitchens, people still doubt that human chefs will be replaced by robot chefs (Albrecht, 2020). For example, complex food preparation or creating a new recipe based on the customers' needs cannot be entirely done by robot chefs, and the customers may be aware of these facts. That is, the negative influence of venturesomeness on image can be attributed that there is a possibility that the innovative consumers, who would bear uncertainty when buying a new product, would still doubt the idea of a robotic restaurant.

Fourth, social distinctiveness is shown to enhance the image of a robot-powered restaurant. This result echoes the previous findings that self-reported innovativeness is motivated by a social need for differentiation (Vandecasteele and Geuens, 2010). In the tourism literature, social distinctiveness is a similar concept to social value, which refers to improving the way a person is perceived by others or giving a good impression to other

Table 3.
Standardized
parameter estimates
for the structural
model

			Standardized Estimate	t-value	Hypothesis
H1	Novelty seeking	→ Overall image	0.062	0.501	Not supported
H2	Eagerness	→ Overall image	0.091	0.937	Not supported
H3	Vigilance	→ Overall image	0.021	0.300	Not supported
H4	Openness	→ Overall image	0.040	0.602	Not supported
H5	Quality experience seeking	→ Overall image	0.188	1.981*	Supported
H6	Hedonic experience seeking	→ Overall image	0.260	3.533*	Supported
H7	Venturesomeness	→ Overall image	-0.242	-3.533*	Supported
H8	Social distinctiveness	→ Overall image	0.116	2.046*	Supported
H9	Overall image	→ Desire	0.813	21.825*	Supported
H10	Overall image	→ Intentions to use	0.225	6.267*	Supported
H11	Overall image	→ WOMI	0.400	8.417*	Supported
H12	Desire	→ Intentions to use	0.765	19.904*	Supported
H13	Desire	→ WOMI	0.547	11.380*	Supported

Notes: Indirect effect: β (Overall image – Desire – Intentions to use) = 0.621; Total effect on intentions to use: β = 0.846; Indirect effect: β (Overall image – Desire – Word-of-mouth intentions) = 0.444; Total effect on word-of-mouth: β = 0.844; Goodness-of-fit statistics: $\chi^2 = 1187.521$, $df = 553$, $\chi^2/df = 2.147$, $p < 0.001$, NFI = 0.931, IFI = 0.962, CFI = 0.962, TLI = 0.956 and RMSEA = 0.053; * $p < 0.05$; NFI = normed fit index, IFI = incremental fit index, CFI = comparative fit index, TLI = Tucker-Lewis index and RMSEA = root mean square error of approximation

people through consumption of a tourism experience (Williams and Soutar, 2009). Social value is demonstrated to play a significant role in shaping consumers' evaluation of their tourism experience. For example, sharing local food-related memories of a destination with friends can enhance people's social status and differentiate them from others because they have "been there" and "eaten novel food" in a particular destination (Chang *et al.*, 2010). Likewise, "has been to a robotic restaurant" and "has eaten food served by robots" can be critical components of consumer innovativeness in robotic restaurants.

Fifth, our findings prove that the overall image of robotic restaurants has a significant impact on desire and behavioral intentions which include intentions to use and intentions to generate WOM. The desire to use robotic restaurants was also found to have a positive effect on both intentions. Similarly, the literature indicates the significant role of image in affecting outcome variables (Hwang and Choe, 2019; Piçarra and Giger, 2018). This means that when individuals consider the image of robotic restaurants to be positive, they tend to have a greater desire to visit a robotic restaurant. Furthermore, consumers with a strong level of desire are more likely to use robotic restaurants and recommend them to others.

Managerial implications

First, it should be stressed that novelty-seeking, eagerness, vigilance and openness, which were not found to influence the overall image of robotic restaurants, are associated with the concept of a "personal trait" or "inherent preference" for novelty. Meanwhile, quality experience-seeking, hedonic experience-seeking, venturesomeness and social distinctiveness, which were proven to have a significant effect on the overall image of robotic restaurants, are more focused on the perceived utility or benefits of using novel products. Based on these findings, it is recommended that managers of robotic restaurants should not emphasize only the "novelty" aspects of robotic restaurants. In fact, some automated systems in restaurants might not even be new to consumers. Therefore,

promotional videos and advertising materials should not focus only on the “novelty” of robotic restaurants but on what that novelty can bring to customers.

Second, *H5*, which posited a positive association between quality experience seeking and the image of robotic restaurants, was supported by the results. This finding reminds us that robots and automated systems should be used as tools to provide better service quality to customers, to make them feel that a robotic restaurant is more functional in terms of food, service and atmosphere. For example, in a robotic restaurant, the procedure of ordering and paying the bill could be easier and more convenient for the customers, which could save time and energy. Hence, it is recommended to emphasize functional aspects in promotional materials that customers may experience better food and more efficient service in robotic restaurants, which in turn will increase positive views of a robot-powered restaurant.

Third, the outcome of data analysis shows the meaningful role of hedonic experience seeking in building the overall image of robotic restaurants (*H6*). Given that hedonic experience seeking is one of the most significant contributors to overall image, managers of robotic restaurants may create the message that experiencing robotic restaurants can generate happiness, excitement and positive mood to potential customers. Thus, it is suggested that the managers of a robotic restaurant consider how their robots can be used as gamification tools to entertain the customers. It is believed that the application of the game-design elements in a robotic restaurant can stimulate the customers’ hedonic experience seeking. For example, the customers can play quiz games about the food they have ordered with the robot. The customers can evaluate the robot’s performance as a form of playing games. Through these attempts, the customers may feel excitement, change their mood positively and be entertained, which ultimately affecting the image of the restaurant.

Fourth, the data analysis reveals that social distinctiveness positively affected the overall image of robotic restaurants (*H8*). Based on this finding, it is suggested that managers of robotic restaurants emphasize social distinctiveness through marketing messages by stressing that robotic restaurants are special and that consumers may boast of the experience to others, making them unique and differentiating them from others. Restaurant marketers can emphasize the value of social distinctiveness through social networking sites and other forms of media with the message. For example, a robotic restaurant can give rewards, such as a free drink or a discount coupon to the customers if they take photos with robots while they dine in a restaurant and upload the photos to their Instagram or Facebook accounts with the name of the restaurant hash tagged. This is a good marketing strategy that can motivate customers to become trendsetters.

Fifth, the findings indicate the essential role of the overall image of robotic restaurants in forming desire, intentions to use, and WOMI (*H9, H10 and H11*). As previously suggested, a focus on the four aspects of consumer innovativeness (quality experience-seeking, hedonic experience-seeking, venturesomeness, social distinctiveness) should improve the overall image of robotic restaurants. Moreover, desire was found to be the most powerful indicator to predict intention to use and WOMI (*H12, H13*). It is recommended that robotic restaurant managers bear this in mind and recognize the importance of making consumers desire to use robotic restaurants. They should make efforts to manage the aspects of consumer innovativeness and the image of robotic restaurants. Collecting data is very important to a robotic restaurant. What types of consumer innovativeness and what kinds of corresponding strategies are effective to operate robotic restaurants? What are the problems the restaurant managers faced while implementing the strategies that are mentioned above?

All the data should be collected for the further development of robotic restaurants, which could provide better products and services for the customers.

Limitations and future research

Despite of the originality of the current paper, it has some limitations. First, the current study gathered data from South Korean only, so it is rather hard to apply our findings to other areas. Second, robot restaurants in South Korea have not been activated, so the respondents do not have a lot of understanding about these types of restaurants. To overcome this, the study showed the respondents two videos that are related to robot restaurants, however, the results can be different depending on the respondents' actual experiences. Thus, the future research requires collecting data from areas where the robot restaurants are actually functional. Third, the robotic restaurants are fairly new to some extent in many places around the world. Hence, it would be meaningful to conduct the qualitative approach in future studies to comprehend the consumers' motives, expectations, and value perceptions toward the robotic restaurants through in-depth interviews. Finally, all the variables including the independent and the dependent variables were measured at the same period, so it could cause a common method bias. To solve this problem, the future research needs to gather data during different time periods (Podsakoff *et al.*, 2003).

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Corresponding author

Jinsoo Hwang can be contacted at: jhwang@sejong.ac.kr