

Research Paper

How to enhance the image of edible insect restaurants: Focusing on perceived risk theory

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ABSTRACT

Although edible insects are getting attention all over the world, consumers are still reluctant to visit edible insect restaurants. Thus, the objective of this research is to explore what risks customers perceive in edible insect restaurants and how those risks affect the image of edible insect restaurants. More specifically, First, the results of principal components analysis showed that 21 perceived risk items were divided into seven factors: quality, psychological, health, financial, environmental, time-loss, and social risks. Second, five sub-dimensions of perceived risk had a negative effect on image, with the exception of financial and environmental risks. Lastly, image was found to increase intention to use, word-of-mouth intention, and willingness to pay more.

1. Introduction

According to the United Nations Educational, Scientific, and Cultural Organization (UNESCO; 2014), humanity will experience severe food and water shortages by 2050 due to population growth, the increasing cost of producing animal protein, man-made environmental pollution, and food and feed insecurity due to the current structure of agriculture. Edible insects have emerged and been recognized as one of the great food resources of the future, capable of contributing positively to the environment, human health, and livelihoods (UNESCO, 2014; Van Huis et al., 2013). Edible insects are high in nutrition value, are eco-friendly foodstuff, and help rural economies (Van Huis et al., 2013; Yen, 2009). For this reason, edible insects have been gaining ever-increasing interest from the media, research institutes, the food and restaurant industry, and policymakers (e.g. Clarkson et al., 2018; Ruby et al., 2015).

Nevertheless, many people are still reluctant to visit edible insect restaurants because they are unfamiliar with the concept and regard eating insects as an extremely high-risk activity (Baker et al., 2016). Scholars have indicated that improving the image of insect consumption and achieving consumer acceptance remain the biggest challenges (Orsi et al., 2019; Van Huis et al., 2013). Thus, the primary goal of this research is to discover what risks customers perceive in edible insect restaurants and how those risks affect the image of edible insect restaurants.

Previous studies on edible insect consumption have mainly

discussed the nutritional value and utilization of edible insects (e.g. Chen et al., 2009; Van Huis et al., 2013); consumers' expectations, acceptance, and preferences for edible insect products (e.g. Balzan et al., 2016; Clarkson et al., 2018); and cultural differences in the willingness to eat insects (Piha et al., 2018; Verneau et al., 2016). These studies were written from a food and nutrition perspective or food quality perspective. However, a few studies have done similar studies regarding edible insect restaurants from a restaurant management perspective. Particularly, no empirical studies have explored the relationships among perceived risk of an edible insect restaurant, image, and diners' behavioral intention formation to visit an edible insect restaurant.

In the current study, we defined an edible insect restaurant as a commercial property serving customers a specialty cuisine consisting of edible insects. More specifically, the objectives of the current study were to (1) explore the types of perceived risks of edible insect restaurants; (2) identify the casual relationships between these perceived risks and the image of edible insect restaurants; and (3) investigate the influence of image on intention to use, word-of-mouth intention, and willingness to pay more.

This study was conducted in South Korea; since edible insect restaurants are not yet popular here, there is a need to explore potential diners' perceived risk on an edible insect restaurant and investigate its impact on their perceptions and intentions. It is expected that findings of the current study will contribute to academia by providing new knowledge regarding perceived risks of an edible insect restaurant that

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have not been fully explored from previous studies. Furthermore, the findings of this study will contribute to industry by providing a more comprehensive picture for edible insect restaurant practitioners to establish their marketing strategies.

2. Literature review

2.1. Edible insect consumption

The consumption of insects is known as “entomophagy”. About 2000 species of insects are used for food, forming a part of the traditional food culture of approximately 2 billion people (Van Huis et al., 2013). The most widely consumed insects in the world are beetles, caterpillars, bees, wasps, ants, grasshoppers, locusts, and crickets (Van Huis et al., 2013). Innova Market Insights (2018) has predicted that edible insects will be one of the top food trends in 2019. Insect food festivals are regularly held, and the media introduces insect-based recipes to the public (Cunningham and Marcason, 2001). In addition, edible insects play an important role in the tourism industry. For example, insects sold in the Klong Toey market located in Bangkok, Thailand, are not only popular with locals but also with tourists who seek new culinary experiences. Tourists purchase live insects and enjoy eating them freshly cooked in the market (Yen et al., 2013).

Edible insect consumption has a number of benefits. First, edible insects are highly nutritious. For example, mealworms contain unsaturated omega-e and six fatty acids, which are essential nutrients for the human body, in similar levels to fish and even higher than pig and cow meat (Yen et al., 2013). Second, insects can help reduce environmental contamination because they emit fewer greenhouse gases and less ammonia than pigs and cows (Van Huis, 2015). Compared to livestock, insects require less land and water but still show high feed conversion efficiency (Yen et al., 2013). Third, typically small-scale producers are involved in collecting insects from wild habitats because this does not need special skills or big capital. In this regard, insect farming provides income and employment opportunities for rural households in many developing countries (Yen, 2009).

Although some African, Asian, and South American countries have a food culture tradition of consuming insects, consumption of edible insects is still not mainstream and is considered a very new phenomenon in many cultures (Yen et al., 2013), where it is considered risky, unacceptable, dangerous, and disgusting (Baker et al., 2016; Yen, 2009). Individuals tend to view insects as disease-transmitting “bugs,” which influences consumers to avoid entomophagy (La Barbera et al., 2018; Looy et al., 2014). In fact, insects that are considered dirty and disgusting are herbivores and therefore have cleaner eating habits than animals that are considered delicious such as lobster (Holt, 1885). From the historical perspective, aversion to insects is attributed to the change of human lifestyles from the hunter-gatherer to sedentary ways of life. It is considered that agriculture may have led to the perception of insects as unnecessary as a food source and even as a threat to crops (Van Huis et al., 2013).

In this sense, entomophagy has significant potential but encouraging consumers to adopt it in their eating habits is a very complicated issue (Clarkson et al., 2018). Hamerman (2016) also argued that the reason why consumers are reluctant to edible insect consumption is not just a matter of risk, but of various risks. To overcome consumers' concerns about edible insects, identifying the types of perceived risks and their effect on consumer responses is an important first step.

2.2. Edible insect restaurant

The number of edible insect restaurants is increasing (Van Huis et al., 2013). Edible insects can be enjoyed at restaurants that provide diverse insect dishes, often at high prices (Ramos-Elorduy, 2009; Yen et al., 2013). Edible insect restaurants are becoming popular worldwide. In Australia, edible insect restaurants are catching more people's

attention and attract diners to explore new menus (Boothroyd, 2014). For example, Chef Blackburn is the founder of the “Edible Bug Shop” in Australia and her business has grown significantly since she started experiments utilizing edible insects to please customers. Particularly, the chef invented a new orange and poppy seek cake utilizing edible insects and the recipe was shared by many star chefs in Australia (Boothroyd, 2014). The restaurant “Papillon’s Kitchen” is one of Korea’s first edible insect restaurants. The restaurant uses mealworm powder and syrup to make cuisine (Kim, 2016). The restaurant is not only popular for businessmen and officials who want to gain possible business ideas but also for children after the restaurant has been featured in a children’s science magazine. This shows the business potential of edible insect restaurants in Korea (Kim, 2016).

China has one of the oldest cultures of consuming insects and it is very popular at many restaurants, especially in Yunnan Province (Chen et al., 2009). Popular insects used in restaurants in China are grasshoppers, silkworm pupae, wasps, bamboo insects, and stink bugs (Chen et al., 2009). Meanwhile, many restaurants in Bangkok, Thailand, sell salads made of the eggs of giant water bugs or ants and *tom yam* soups containing silkworm pupae (Chen et al., 1998). The Fonda Don Chon restaurant in Mexico City allows customers to enjoy pre-Hispanic haute cuisine consisting of edible insects such as grasshoppers, ant larvae, water bugs, and maguey worms. The average price of a dish is around USD 20–25 (Bigurra, 2015). Archipelago Restaurant in London, England, serves dishes such as pan-fried crickets, bug salad, and caramel mealworms, in order to attract customers who seek new tastes and textures and also those who want fine cuisine with good flavors (Archipelago, 2019). Furthermore, edible insects are becoming popular and are served in a number of restaurants in Malaysia, Japan, Taiwan, and New Zealand (Yen et al., 2013). In sum, edible insect restaurants have achieved a significant reputation worldwide. Nevertheless, many customers still consider visiting edible insect restaurants as a high-risk activity because they are uncertain about the outcomes of such restaurant experiences.

It has been found that people are more likely to try edible insects in a restaurant when a waiter or chef explains how the food was prepared and how to eat it, thus reducing the perceived risks (Balzan et al., 2016). Previous studies have indicated that the visual appearance of insects, notably their legs and eyes, is a contributing factor to feelings of disgust and fear (Yen, 2009). Therefore, cooking is an important process by which these raw ingredients are transformed into dishes, reducing the perceived risk of eating insects (Chen et al., 2009; Hamerman, 2016). Eating edible insects at home is another option but this has been considered as a barrier to insect consumption due to a lack of recipes and lack of practice in preparation (Balzan et al., 2016). Consequently, it is very important to examine customers' perception of the risks of edible insect restaurants in order to activate their acceptance. However, very few studies have explored the multidimensional perceived risk of edible insect restaurants.

2.3. Perceived risk theory

Perceived risk is defined as “subjectively determined expectation of loss” (Mitchell, 1999, p. 168). In other words, risk is the possibility that the product will not offer the expected benefits (Roselius, 1971). Perceived risk theory has been widely used to explain consumer behaviors in the hospitality industry (Hwang and Choe, 2019; Zhang et al., 2018). Based on the literature, this study defines the perceived risk of edible insect restaurants as the subjectively determined expectation of loss as a result of visiting them. Bettman (1973) mentioned that the degree of risk perception is likely to be stronger when a product is new or when there is little available information about it. The level of perceived risk becomes even higher when products or services involve direct food consumption (Taylor, 1974). Therefore, studying the perceived risk of edible insect restaurants is critical because it relates to food consumption and the concept of eating insects is new to customers.

Perceived risk theory has been refined and developed by several scholars (Mitchell and Greatorex, 1988; Taylor, 1974) who argue that perceived risk has several facets and should be considered a multidimensional concept. For example, Mitchell and Greatorex (1988) explored the multidimensional risks that consumers perceived in wine consumption in restaurants and showed that perceived risks (e.g. functional, social, financial, and physical) were important. In addition, Olya and Al-Ansi (2018) examined Muslim tourists' perceived risks of eating *halal* food while traveling abroad. They suggested the following perceived risks: health, psychological, environmental, social, quality, financial, and time-loss risks. More recently, Hwang and Choe (2019) explored the types of perceived risk of using drone food delivery services and found that financial, time, privacy, performance, and psychological risks are important.

This study adopted the following seven types of perceived risks, which were suggested by previous studies either individually or collectively (e.g. Hwang and Choe, 2019; Mitchell and Greatorex, 1988; Olya and Al-Ansi, 2018): (1) financial risk, (2) social risk, (3) psychological risk, (4) time-loss risk, (5) health risk, (6) environmental risk, and (7) quality risk. Other types of perceived risks such as physical risk and performance risk were also considered from previous studies (e.g. Fuchs and Reichel, 2006). However, we found that quality risk includes some concepts of performance risk and environmental risk that can cover the meaning of physical risk in the edible insect restaurant context. Thus, we believe that the chosen seven types of perceived risks are appropriate to be applied in the current study.

First, financial risk is defined as the potential monetary outlay associated with the initial purchase price being lost due to undesired consequences (Grewal et al., 1994). Since edible insect restaurants are known to be often relatively more expensive than customers expect (Yen et al., 2013), customers could worry about money when visiting such restaurants.

Second, social risk represents a potential loss of social status as a result of adopting a product or service (Featherman and Pavlou, 2003). The literature indicates that many people reject insects as food because they think that insect consumption is not socially acceptable, meaning that consumers are greatly influenced by their families' and friends' opinions about insect consumption (Baker et al., 2016; Ruby and Rozin, 2019). For this reason, social risk is regarded as an important factor causing consumers to hesitate to go to edible insect restaurants.

Third, psychological risk is the possibility that the selection of a product will have a negative effect on the consumer's peace of mind or self-perception (Garner, 1986). Studies have noted that many perceive psychological risk, such as uncomfortableness and anxiety, at the idea of eating insects, which makes them reluctant to try it (Baker et al., 2016; Hamerman, 2016). In this regard, customers may have high levels of perceived psychological risk regarding edible insect restaurants.

Fourth, time-loss risk refers to consumers' concern that they may waste time learning how to use a product, and researching and making the purchase (Featherman and Pavlou, 2003; Mai, 2001). Consumers spend a lot of time looking for information before visiting edible insect restaurants (Yen et al., 2013). This is why people may be concerned that dining out in such locales would be a waste of time.

Fifth, health risk can be defined as the possibility that the performance of a product or service results in a health hazard to the consumer (Garner, 1986). As people are more particular about the healthiness of food, they are more suspicious about edible insects. When they think that eating insects is risky and transmits disease, they create a negative impression about insect consumption (Orsi et al., 2019). Therefore, customers may also perceive health risks in dining in edible insect restaurants.

Sixth, environmental risk refers to consumers' concerns about the environmental conditions of a product or service (Al-Ansi et al., 2019). Olya and Al-Ansi (2018) investigated the risk factors that affect customer responses to a *halal* restaurant and suggested that customers may have concerns about the environmental and physical conditions of the

restaurant in which *halal* items are produced and served. Similarly, customers who want to dine at edible insect restaurants may also perceive environmental risk because they are uncertain about the hygiene standards or physical conditions of such places.

Lastly, quality risk means consumers' concern that the quality of a product will be lower than their expectations (Al-Ansi et al., 2019). Usually, consumers make a "judgment resulting from comparison between expectations and the perception of the service performance" (Lewis and Chambers, 1989, p. 313). Since insect consumption is considered to be novel by the public in general (Looy et al., 2014), customers may be worried about edible insect restaurants failing to meet their quality expectations.

2.4. Effect of perceived risks on the image of edible insect restaurants

Image refers to the general perceptions, such as beliefs and impressions that consumers have of a particular product (Crompton, 1979). That is, the image of a product can be formed according to its detailed attributes (Bloemer and de Ruyter, 1998; Song et al., 2019). Previous food studies have shown that perceived risk and image of the food product is negatively associated (Bardin et al., 2017; Chen, 2017; Öz et al., 2018; Yoon and Chung, 2018). For example, Bardin et al. (2017) investigated the associations between risk perception and attitude toward the genetically modified foods and found out the higher the level of general risk perception consumers reported, the more negative their attitude towards GMOs. Similarly, Öz et al. (2018) explored the relationships between perceived risk of genetically modified foods and attitude and confirmed that there was a significantly negative relationship between them. Chen (2017) confirmed that an individual's perceived risk of consuming food with additives was found out to play an important role in forming image of the additive food. The more people perceived the risk, the more negative impression of addictive food people had (Chen, 2017). Furthermore, Yoon and Chung (2018) proved that hygienic and environmental risks were negatively related to consumer's image regarding food-truck dining.

In the context of edible insect consumption, Baker et al. (2016) found that the image of insect consumption differed according to four dimensions of risk: functional, social, physical, and psychological. They also found that functional and psychological risks have a negative impact on consumers' final decisions about consuming edible insect food products. In addition, Balzan et al. (2016) investigated Italian consumers' willingness to eat insect-based foods and found that social risk is one of the important determinants of trying insect food products. In experiments conducted by Verneau et al. (2016), Danish and Italian participants were shown videos on the benefits of insect consumption, reducing participants' perceived risks of insect consumption. As a result, respondents formed a positive image of edible insect consumption, which suggested that reducing the perceived risks helps to create a favorable image. Gmuer et al. (2016) explored how Swiss consumers evaluate cricket-containing snacks. The findings indicate that consumers showed a large number of diverse psychological risks regarding edible insect consumption. Similarly, Ruby et al. (2015) mentioned that attitude toward the insect consumption is greatly influenced by negative emotions that consumers have. Pambo et al. (2016) stated that when consumers perceive a low level of health risk regarding edible food products, they are more likely to form positive attitude toward the edible insect product but did not further empirically tested the relationship. More recently, Orsi et al. (2019) investigated the influencing factors for the acceptance of processed edible insects in Germany. They demonstrated that when people think that eating insects is risky, unhygienic and transmits diseases, they create negative impression about edible insect consumption (Orsi et al., 2019).

In sum, it is expected that consumers who perceive edible insect restaurants to involve high levels of risk are more likely to form a negative image of such restaurants. Conversely, if customers perceive a lower degree of risks, their overall impression of such restaurants is

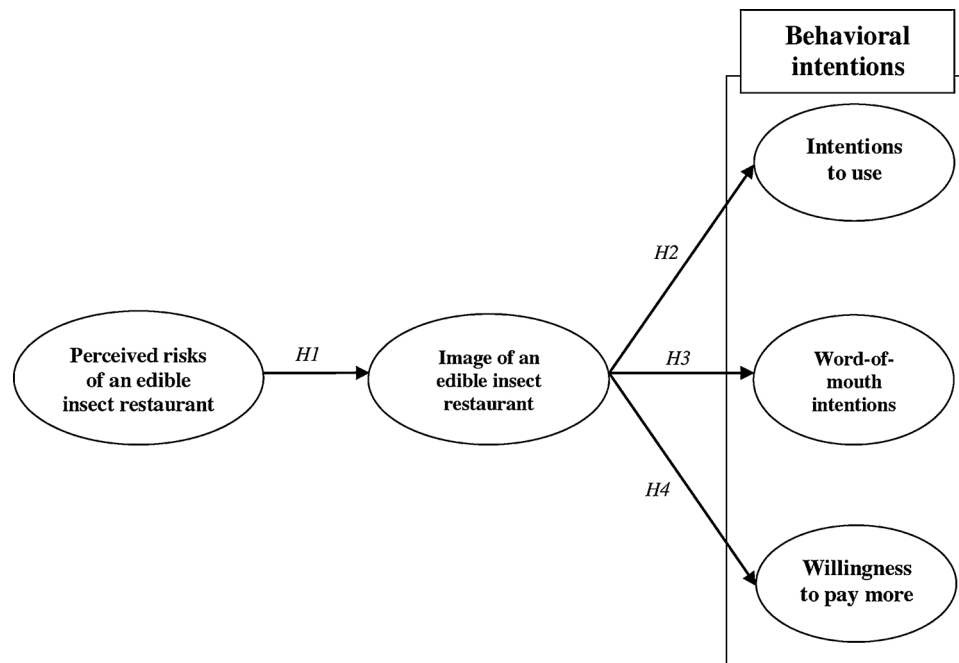


Fig. 1. Proposed conceptual model.

more likely to be positive. Therefore, the following hypothesis is proposed:

H1. The perceived risks of edible insect restaurants have a negative impact on their image.

2.5. Effect of image of edible insect restaurants on behavioral intentions

Behavioral intentions can be defined as people's beliefs about what they would do in a certain situation (Ajzen and Fishbein, 1980). Behavioral intentions frequently represent customer loyalty, which is an important goal in consumer marketing (Chen and Chen, 2010; Moon and Han, 2019). Prior research in consumer behavior has commonly suggested the following three sub-dimensions of behavioral intention: intention to use, WOM intention, and willingness to pay more (e.g. Hwang et al., 2019; Trang et al., 2019).

2.5.1. Effect of edible insect restaurants' image on intention to use

First, intention to use refers to "the degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (Warshaw and Davis, 1985, p. 214). Previous studies have demonstrated that the image that customers have of an edible insect product is positively related to their intention to eat it. For instance, Balzan et al. (2016) noted that when the overall evaluation of edible insects is positive, the likelihood of acceptance increases. Menozzi et al. (2017) investigated Italian consumers' behavioral intention to eat chocolate chip cookies containing cricket flour. They found that consumers' favorable evaluation of the food strengthens their intention to eat it. Thus, it is reasonable to infer that the image of edible insect restaurants will have a positive influence on consumers' intention to visit such restaurants. The following hypothesis is proposed:

H2. The image of edible insect restaurants has a positive impact on intention to use.

2.5.2. Effect of edible insect restaurants' image on word-of-mouth intention

Another behavioral intention used in this study is word-of-mouth (WOM) intention, which is defined as "informal, person to person

communication between a perceived noncommercial communicator and a receiver regarding a brand, a product, an organization or a service" (Harrison-Walker, 2001, p. 63). Saying positive things about a certain product to others is an important signal representing customer loyalty to a company or its product (Han et al., 2018, 2019; Reichheld and Sasser, 1990). A host of prior studies in many different fields have showed the positive relationship between product image and WOM intention.

Verneau et al. (2016) found that when consumers have a positive impression of insect consumption, they showed a higher level of WOM intention regarding it. In other industries, Choe and Kim (2018) found that if tourists generated a positive impression of a destination's food, they showed higher levels of intention to say positive things about the local food to their friends and families. As a result, it can be inferred that when consumers perceive the overall image of edible insect restaurants to be good, they are more likely to recommend them and to encourage others to visit them. Therefore, the following hypothesis is proposed:

H3. The image of edible insect restaurants has a positive impact on WOM intention.

2.5.3. Effects of edible insect restaurants' image on willingness to pay more

Willingness to pay more is one of the critical behavioral intentions that should be measured to anticipate an organization's financial success (Zeithaml and Bitner, 1996). The concept of willingness to pay more refers to the maximum amount a consumer intends to pay compared to other brands (Netemeyer et al., 2004).

A number of studies show that consumers are willing to pay a higher price for a product with a more favorable image. Pascucci and Magistris (2013) suggested that the image of an insect plays an important role in the formation of consumers' willingness to pay to eat it. In addition, Lombardi et al. (2019) suggested that if consumers evaluate insect-based food as inappropriate, this could reduce their willingness to pay for such products. In other fields, Namkung and Jang (2017) found that improving the green image of a restaurant positively affected consumers' willingness to pay more. Thus, it is assumed that once consumers have a positive image of edible insect restaurants, they are likely to be willing to pay more. The following hypothesis is proposed:

Table 1
Exploratory factor analysis for perceived risk of drone food delivery services.

Variables	Standardized factor loadings	Eigenvalue	Explained variance (%)	Cronbach's alpha
Quality risk		2.837	13.507	.967
I worry about the lower quality of an edible insect restaurant than I expected.	.850			
I worry because of the low quality of edible insect restaurants.	.842			
I am concerned with the quality of an edible insect restaurant.	.839			
Psychological risk		2.819	13.423	.930
The thought of dining out at an edible insect restaurant makes me feel psychologically uncomfortable.	.870			
The thought of dining out at an edible insect restaurant causes me to experience unnecessary tension.	.858			
The thought of dining out at an edible insect restaurant gives me a feeling of unwanted anxiety.	.823			
Health risk		2.763	13.158	.956
I worry that dining out at an edible insect restaurant is harmful.	.849			
I worry about my health after dining out at an edible insect restaurant.	.831			
I worry that dining out at an edible insect restaurant is unhealthy.	.817			
Financial risk		2.735	13.022	.929
I worry that the conception of dining out at an edible insect restaurant would be more expensive than I expected.	.897			
I worry that an additional fee must be paid for dining out at an edible insect restaurant.	.883			
I worry that dining out at an edible insect restaurant would involve unexpected extra expenses.	.789			
Environmental risk		2.648	12.608	.954
I am concerned about the cleanliness of an edible insect restaurant.	.830			
I am concerned about environmental conditions of an edible insect restaurant.	.817			
I am concerned about hygiene standards of an edible insect restaurant.	.792			
Time-loss risk		2.607	12.417	.925
I am worried that planning for dining out at an edible insect restaurant would take too much time.	.846			
I am worried that dining out at an edible insect restaurant would take a long time.	.831			
I am worried that dining out at an edible insect restaurant would be a waste of time.	.762			
Social risk		2.442	11.629	.908
I am worried that dining out at an edible insect restaurant would change how my friends think of me.	.820			
I am worried that dining out at an edible insect restaurant would not match my status in life.	.764			
I am worried that dining out at an edible insect restaurant would not be compatible with my self-image.	.754			

Note: Total explained variance = 89.764 %, KMO measure of sampling adequacy = .925, Bartlett's test of sphericity ($p < .001$).

H4. The image of edible insect restaurants has a positive impact on willingness to pay more.

2.6. Proposed model

Based on the previous studies and the above discussion, four hypotheses have been derived. Fig. 1 shows the conceptual model.

3. Methodology

3.1. Measures and questionnaire development

All of the variables were measured with multiple items that were adapted from the literature and modified to fit the context of edible insect restaurants. First, perceived risks were measured with 21 items drawn from Al-Ansi et al. (2019); Baker et al. (2016), and Klerck and Sweeney (2007). Second, image was measured with three items developed by Wang and Choe (2019). Third, intention to use was measured with three items employed by Zeithaml and Bitner (1996). Fourth, WOM intention was measured with three items adapted from Hennig-Thurau et al. (2002). Lastly, willingness to pay more was measured with three items cited from Homburg et al. (2005).

The first version of the survey questionnaire is composed of three sections: (1) a short description of this study, (2) all measurement items, and (3) questions seeking socio-demographic information. The questionnaire used a seven-point Likert-type scale, anchored between "strongly disagree" (1) and "strongly agree" (7). In order to enhance

content validity, three expert groups were invited to review the survey questionnaire: (1) two faculty members whose main research focus was the restaurant industry, (2) three graduate students with relevant work experience, and (3) two employees currently working in the restaurant industry. The experts' review confirmed that the survey questionnaire had no problems.

3.2. Data collection

A web-based survey was employed for the data collection in South Korea. Questionnaires were sent to 6479 panels using a market research company, one of the largest survey companies in South Korea. An edible insect restaurant has not been activated in Korea, so respondents were required to read two news articles and watch a video, which clearly explained the background of edible insect restaurants before starting the questionnaire. Ultimately, 450 respondents participated in the survey. Two samples were excluded from the statistical analysis due to multicollinearity problems. Finally, the statistical analysis was performed based on 448 samples.

4. Data analysis

4.1. Sample characteristics

Of the 448 respondents, 50.2 % were male and 49.8 % were female. The largest number of respondents was in their thirties (34.2 %) and the average age was 38.10. In terms of monthly household income, 29.2 % of the respondents indicated an income of between US \$1001 and US

\$2000. With regard to marital status, 52.2 % of the respondents were married. Lastly, regarding education level, 55.6 % of the respondents had completed a bachelor's degree.

4.2. Principal components analysis

In order to extract the perceived risks of edible insect restaurants, we conducted a principal components analysis (PCA). As explained in the literature review above, prior studies suggested seven sub-dimensions of perceived risks either individually or collectively, so we fixed the number of factors to seven for PCA. As suggested by the existing theoretical background, the results of PCA showed that seven factors with eigenvalues greater than 1.0 were extracted (i.e. quality, psychological, health, financial, environmental, time-loss, and social risks) (see Table 1). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .925, which indicated the useful validation of the factor model. Furthermore, the factor model explained 89.764 % of the variance. The factor loadings for all items exceeded .754. Lastly, the Cronbach's alpha values were higher than .70, which suggested a high level of reliability (Nunnally, 1978).

4.3. Proposed model revision

By extracting the seven factors from perceived risks of edible insect restaurants, the proposed model was modified (Fig. 2).

4.4. Confirmatory factor analysis

The results of the confirmatory factor analysis (CFA) showed that the model had acceptable fit statistics ($\chi^2 = 977.596$, $df = 440$, $\chi^2/df = 1.995$, $p < .001$, $NFI = .955$, $IFI = .977$, $CFI = .977$, $TLI = .972$, and $RMSEA = .047$) (see Table 2). The factor loadings were equal to or

higher than .833, and all factor loadings were significant at $p < .001$.

In addition, the composite reliabilities of the constructs were greater than .70, ranging from .908 to .974, suggesting that all constructs in the model had satisfactory internal consistency (see Table 3) (Bagozzi and Yi, 1988). All average variance extracted (AVE) estimates were higher than .05, which is the recommended threshold, ranging from .767 to .926 (Fornell and Larcker, 1981), indicating convergent validity. Lastly, as suggested by Fornell and Larcker (1981), discriminant validity was assessed by comparing the AVE values with the squared correlation for each pair of constructs. The results showed that the discriminant validity of the study variables was evident in that AVE values were higher than the values of the squared correlations.

4.5. Structural equation modeling

The result of structural equation modeling (SEM) showed that the model had an appropriate fit, demonstrating soundness of the conceptual model and providing a good basis for testing the proposed links ($\chi^2 = 1121.094$, $df = 463$, $\chi^2/df = 2.421$, $p < .001$, $NFI = .942$, $IFI = .965$, $CFI = .965$, $TLI = .960$, and $RMSEA = .056$). Fig. 3 presents the SEM results with standardized coefficients. Of the ten proposed hypotheses, eight were statistically supported at $p < .05$. Table 4 provides a summary of the hypotheses testing results. More specifically, quality risk ($\beta = -.119$, $p < .05$), psychological risk ($\beta = -.328$, $p < .05$), health risk ($\beta = -.121$, $p < .05$), time-loss risk ($\beta = -.129$, $p < .05$), and social risk ($\beta = -.133$, $p < .05$) were found to be significantly associated with image, so Hypotheses 1a, 1b, 1c, 1f, and 1g were supported. However, contrary to our expectations, Hypothesis 1d and 1e, which proposed the effect of financial and environmental risks on image, were not supported. In addition, the data analysis revealed that image positively affects intention to use ($\beta = .888$, $p < .05$), WOM intention ($\beta = .871$, $p < .05$), and willingness to pay more

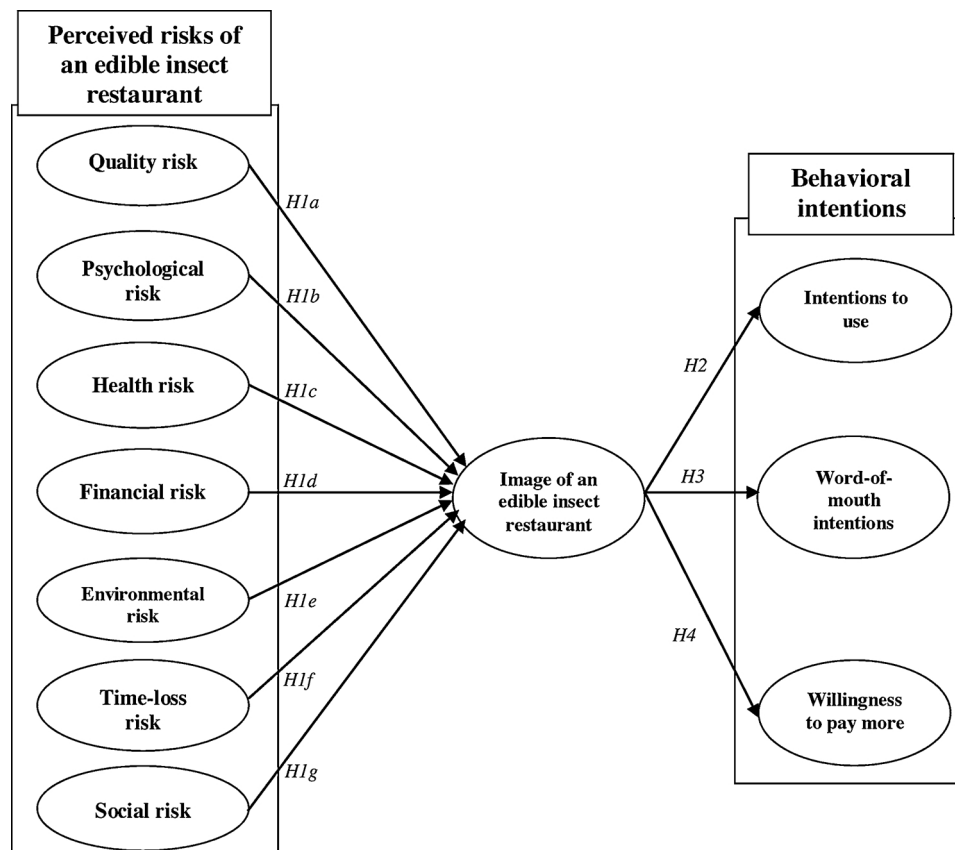


Fig. 2. Proposed model revision.

Table 2
Confirmatory factor analysis: Items and loadings.

Construct and scale item	Standardized loading ^a
Perceived risks of an edible insect restaurant	
Quality risk	
I worry about the lower quality of an edible insect restaurant than I expected.	.947
I worry because of the low quality of edible insect restaurants.	.941
I am concerned with the quality of an edible insect restaurant.	.974
Psychological risk	
The thought of dining out at an edible insect restaurant makes me feel psychologically uncomfortable.	.923
The thought of dining out at an edible insect restaurant causes me to experience unnecessary tension.	.895
The thought of dining out at an edible insect restaurant gives me a feeling of unwanted anxiety.	.894
Health risk	
I worry that dining out at an edible insect restaurant is harmful.	.945
I worry about my health after dining out at an edible insect restaurant.	.964
I worry that dining out at an edible insect restaurant is unhealthy.	.907
Financial risk	
I worry that the conception of dining out at an edible insect restaurant would be more expensive than I expected.	.865
I worry that an additional fee must be paid for dining out at an edible insect restaurant.	.964
I worry that dining out at an edible insect restaurant would involve unexpected extra expenses.	.882
Environmental risk	
I am concerned about the cleanliness of an edible insect restaurant.	.924
I am concerned about environmental conditions of an edible insect restaurant.	.947
I am concerned about hygiene standards of an edible insect restaurant.	.933
Time-loss risk	
I am worried that planning for dining out at an edible insect restaurant would take too much time.	.901
I am worried that dining out at an edible insect restaurant would take a long time.	.919
I am worried that dining out at an edible insect restaurant would be a waste of time.	.875
Social risk	
I am worried that dining out at an edible insect restaurant would change how my friends think of me.	.833
I am worried that dining out at an edible insect restaurant would not match my status in life.	.885
I am worried that dining out at an edible insect restaurant would not be compatible with my self-image.	.908
Image	
The overall image for dining out at an edible insect restaurant is good.	.931
The overall image of an edible insect restaurant is great.	.952
Overall, I have a good image about an edible insect restaurant.	.912
Intentions to use	
I will dine out at an edible insect restaurant.	.953
I am willing to dine out at an edible insect restaurant.	.959
I am likely to dine out at an edible insect restaurant.	.966
Word-of-mouth intentions	
I am likely to say positive things about an edible insect restaurant to others.	.891
I am likely to recommend an edible insect restaurant to others.	.979
I am likely to encourage others to dine out at an edible insect restaurant.	.939
Willingness to pay more	
I am likely to pay more for dining out at an edible insect restaurant.	.946
It is acceptable to pay more for dining out at an edible insect restaurant.	.971
I am likely to spend extra in order to dine out at an edible insect restaurant.	.967

Goodness-of-fit statistics: $\chi^2 = 977.596$, $df = 440$, $\chi^2/df = 1.995$, $p < .001$, $NFI = .955$, $IFI = .977$, $CFI = .977$, $TLI = .972$, and $RMSEA = .047$.

Notes 1: ^a All factors loadings are significant at $p < .001$.

Notes 2: $NFI =$ Normed Fit Index, $IFI =$ Incremental Fit Index, $CFI =$ Comparative Fit Index, $TLI =$ Tucker-Lewis Index, and $RMSEA =$ Root Mean Square Error of Approximation.

Table 3
Descriptive statistics and associated measures.

	Mean (SD)	AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Quality risk	3.89 (1.47)	.910	.968^a	.514 ^b	.528	.477	.705	.572	.532	-.563	-.420	-.485	-.377
(2) Psychological risk	4.32 (1.44)	.817	.264 ^c	.931	.567	.353	.498	.657	.436	-.574	-.647	-.550	-.452
(3) Health risk	2.93 (1.28)	.882	.279	.321	.957	.428	.637	.625	.575	-.580	-.483	-.495	-.329
(4) Financial risk	3.57 (1.37)	.818	.228	.125	.183	.931	.486	.485	.607	-.451	-.284	-.350	-.259
(5) Environmental risk	3.90 (1.51)	.874	.497	.248	.406	.236	.954	.574	.524	-.555	-.432	-.467	-.360
(6) Time-loss risk	3.16 (1.33)	.807	.327	.432	.391	.235	.329	.926	.625	-.610	-.556	-.533	-.355
(7) Social risk	3.55 (1.49)	.767	.283	.190	.331	.368	.275	.391	.908	-.539	-.450	-.459	-.324
(8) Image	4.06 (1.28)	.868	.317	.329	.336	.203	.308	.372	.291	.952	.796	.793	.655
(9) Intentions to use	3.65 (1.43)	.921	.176	.419	.233	.081	.187	.309	.203	.634	.972	.834	.760
(10) WOMI	3.76 (1.30)	.878	.235	.303	.245	.123	.218	.284	.211	.629	.696	.956	.716
(11) WPM	3.13 (1.30)	.926	.142	.204	.108	.067	.130	.126	.102	.429	.578	.513	.974

Notes 1: WOMI = Word-of-mouth intentions and WPM = Willingness to pay more.

Notes 2: SD = Standard Deviation, AVE = Average Variance Extracted.

Notes 3: a. composite reliabilities are along the diagonal, b. correlations are above the diagonal, c. squared correlations are below the diagonal.

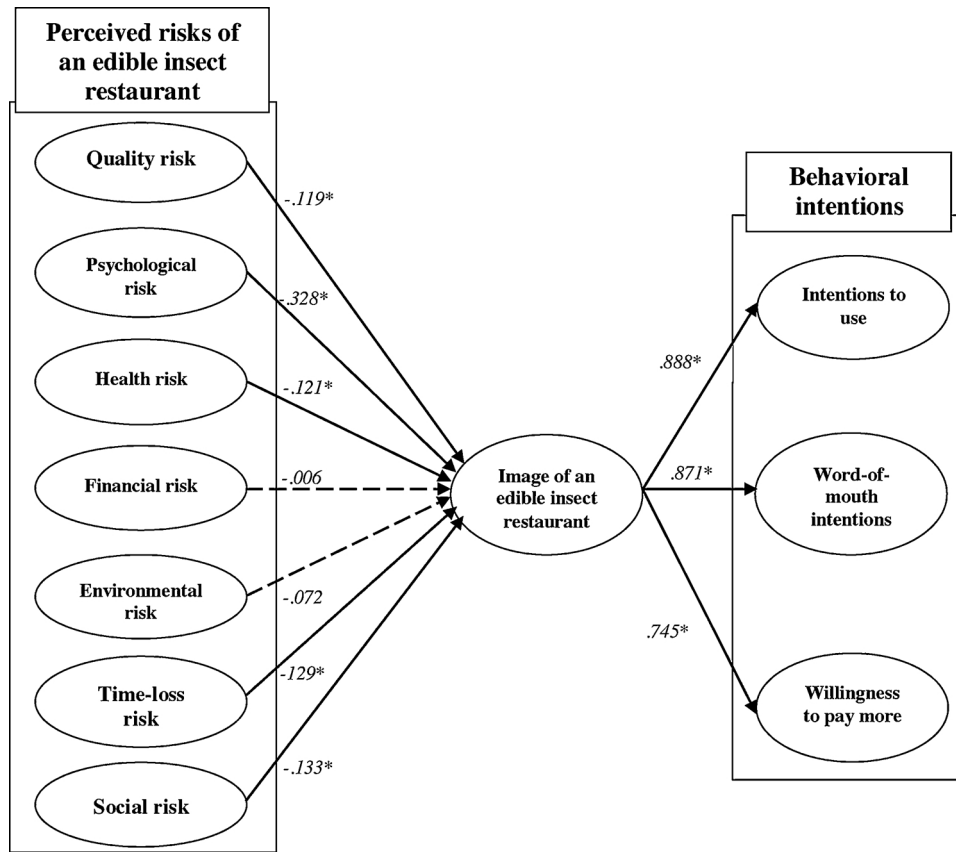


Fig. 3. Standardized theoretical path coefficients.

($\beta = .745, p < .05$). Hence, Hypotheses 2, 3, and 4 were supported.

5. Discussion and implications

5.1. Theoretical implications

This study is the first to identify the types of perceived risks in the field of edible insect restaurants. The PCA results indicated that seven factors of perceived risk were extracted (i.e. quality, psychological, health, financial, environmental, time-loss, and social risks). In addition, we conducted CFA in order to check the appropriateness of the measurement structure. The results of CFA showed high levels of reliability and validity. Previous studies have examined the perceived risks of *halal* food, modified food, and street food (e.g. Finucane and Holup, 2005; Olya and Al-Ansi, 2018), and suggested that it is important to identify the factors of perceived risk when new food services are introduced. In this regard, identifying the perceived risks in the context of edible insect restaurants is an important theoretical

implication of this study.

Second, this study examined the effect of perceived risks on image and found that five dimensions of perceived risk (quality, psychological, health, time-loss, and social risks) have a negative influence on the image of edible insect restaurants. These findings are somewhat similar to those of some prior studies (e.g. Baker et al., 2016; Orsi et al., 2019), indicating a negative effect of perceived risks on behavioral intentions. For example, Baker et al. (2016) found that functional and psychological risks negatively affect intent to purchase insect-based food products. In contrast to previous research, this study first confirmed and expanded the existing literature by empirically identifying the effect of five dimensions of perceived risk on image in the context of edible insect restaurants. This theoretical expansion is a significant theoretical implication of the present study.

Third, Hypotheses 4 and 5, which proposed the effect of financial and environmental risks on the overall image of edible insect restaurants, were not statistically supported. These results differ somewhat from those of previous studies (e.g. Al-Ansi et al., 2019; Verneau et al.,

Table 4
Standardized parameter estimates for structural model.

				Standardized Estimate	t-value	Hypothesis
H1a	Quality risk	→	Image	-.119	-2.151*	Supported
H1b	Psychological risk	→	Image	-.328	-6.051*	Supported
H1c	Health risk	→	Image	-.121	-2.196*	Supported
H1d	Financial risk	→	Image	-.006	-.134	Not supported
H1e	Environmental risk	→	Image	-.072	-1.214	Not supported
H1f	Time-loss risk	→	Image	-.129	-2.260*	Supported
H1g	Social risk	→	Image	-.133	-2.090*	Supported
H2	Image	→	IU	.888	22.959*	Supported
H3	Image	→	WOMI	.871	20.533*	Supported
H4	Image	→	WPM	.745	17.922*	Supported

2016; Yen et al., 2013), suggesting that financial and environmental risks are important factors affecting consumer decision-making in the food service industry. The results of the present study can be attributed to the fact that, generally, edible insect restaurants are full-service restaurants with high prices around USD 20–25 per dish (Bigurra, 2015). It is possible that consumers are already aware that insect restaurants are relatively expensive. Perhaps, consumers consider it worth trying edible insect restaurants because it represents a new experience. Therefore, consumers may not perceive a high risk of losing money or fear paying extra fees when visiting edible insect restaurants. On the other hand, the features or ambiance of edible insect restaurants, shown to the respondents in the two news articles and the video, were indeed very clean, modern, and sleek. Therefore, it is possible that consumers are not concerned about the hygiene status of edible insect restaurants.

Fourth, another important theoretical implication of this study is the identification of the outcome variables of image in the context of edible insect restaurants. When consumers have a favorable image of edible insect restaurants, they are more likely to (1) dine out at such restaurants, (2) say positive things about them to others, and (3) pay more to dine in them. These findings are consistent with prior research (e.g. Choe and Kim, 2018; Namkung and Jang, 2017; Menozzi et al., 2017), which found image to be a critical factor forming behavioral intentions. In this respect, the current study has verified and extended the significant role of image by empirically identifying its impact on intention to use, WOM intention, and willingness to pay more in the context of edible insect restaurants for the first time, which is considered a key theoretical implication.

5.2. Managerial implications

First, the results of the data analysis indicated that when consumers are concerned about the quality of edible insect restaurants, they are not likely to have a positive image of such restaurants. This result indicates the importance of quality. Previous studies offered some important insights that can be applied to the context of edible insect restaurants. For example, ethnic restaurant consumers used to trade off inferior service or atmosphere for experiencing a new food (Liu and Jang, 2009; Shaw, 2008). However, this is no longer true. Contemporary consumers wish to have an excellent overall dining experience. In a similar vein, the quality of edible insect restaurants in unfashionable streets or markets may have a negative impact on overall image. Edible insect restaurant marketers should remember that the overall standard of consumer dining experience has risen continuously. As mentioned previously, Archipelago Restaurant in London is renowned for providing fine dining-quality food and an excellent dining experience (Archipelago, 2019). In fact, many edible insect restaurants are upscale which is a good strategic direction in terms of reducing quality risk perceived by consumers. It is recommended that edible insect restaurants emphasize that their food is of high quality through advertising; this would give consumers a favorable image of edible insect restaurants.

Second, if the thought of dining out at edible insect restaurants makes consumers feel psychologically uncomfortable, the overall image of such restaurants is not positive. Thus, edible insect restaurants are required to reduce the psychological risk when customers dine there. First of all, edible insect restaurant managers should identify customers who have more neophilic/neophobic tendencies. Food neophobia is defined as a reluctance to try novel food and is a known and distinctive personality trait that cannot be changed suddenly (Pliner and Hobden, 1992). It is recommended that neophilic consumers be targeted first since they are not afraid of trying novel food and may enjoy the exotic features of edible insect restaurants. However, it is also important to examine the characteristics of neophobic consumers and to target them with marketing efforts as well. According to previous studies, continuous exposure to new foods can gradually reduce the fear/uncomfortableness/negative feelings that neophobic consumers feel when

faced with unfamiliar foods (Olabi et al., 2009). Thus, edible insect restaurant managers should continuously inform neophobics that insect food is good and should attract them through various promotions such as free tastings and discounts so that such consumers can have a chance to become familiar with the edible insect restaurant experience. Furthermore, providing insects as one of the food ingredients of cuisines may reduce psychological risk for customers at insect edible restaurants, rather than providing actual insects in their natural shape as food.

Third, this study found when consumers worry about the health consequences of dining out at edible insect restaurants, they have a negative overall image of such restaurants. It is true that many consumers have the erroneous view that edible insects are transmitters of disease (La Barbera et al., 2018). Edible insect restaurant managers should emphasize that edible insects are totally different from biological vectors such as mosquitoes, ticks, and fleas (Van Huis et al., 2013). In fact, edible insects reared under controlled conditions do not pose any hazards, unlike traditional animal products (Belluco et al., 2015). A good way to deal with suspicious consumers is to provide scientific facts to resolve misunderstandings about edible insect restaurants and reduce perceived health risks.

Edible insect restaurants should actively communicate to consumers that the nutritional value of insect-based food is high. For instance, insects are very nutritious because they contain more protein, minerals, vitamins, and fiber than beef (Yen et al., 2013). Furthermore, insect restaurant managers should also try to educate their staff so that employees can explain the health benefits of insect-based food to customers who are unaware of it.

Fourth, the data analysis revealed that time-loss risk negatively affects image, which suggests that if consumers are worried that dining out at an edible insect restaurant would take a long time, overall, they have a bad image of such restaurants. In fact, edible insect restaurants are not yet active in South Korea, so the respondents perceived time risk in finding such restaurants. Thus, it can be inferred that if edible insect restaurants are widespread, as they are in the US, Thailand, and Australia, time-loss risk will not be high.

Fifth, consumers worry about the eyes of others around them when eating at edible insect restaurants. Consumers think that eating at such restaurants will negatively affect their self-image. It is therefore necessary to emphasize to consumers that edible insect restaurants do not have a bad image. For example, it is recommended to use a famous celebrity as a promotional model to enhance the image of edible insect restaurants. Similarly, edible insect restaurant managers should actively utilize social media influencers' positive comments. Promotional messages should aim to improve the social status of consumers. Photos and promotional images should include social gatherings and people dining with families and friends to reduce the perceived social risk of edible insect restaurants. In addition, it is widely accepted that edible insects are considered eco-friendly foods that reduce greenhouse gas emissions (Van Huis, 2015), so promoting edible insect restaurants in conjunction with an eco-friendly image can reduce the social risk of consumers.

6. Limitations and future research

This study is significant and important in that it is the first to reveal the antecedents and consequences of edible insect restaurants' image, but also has the following limitations. First, since the data were collected only in South Korea, there are limitations to generalizing the results to other regions. Similarly, there are some difficulties in applying the results to other fields because this study focused only on edible insect restaurants. Therefore, in future research, it is necessary to apply the research model proposed in this study in other regions or fields. Second, the respondents had not actually used edible insect restaurants because they are not commercialized yet in South Korea. In order to overcome this limitation, two newspaper articles and a video

were shown before the beginning of the survey, but future research needs to be conducted with customers who have actually used edible insect restaurants.

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