

Examining perceived innovativeness of drone food delivery services:

The moderating role of gender and age

ABSTRACT

This study examined the importance and necessity of perceived innovativeness in the context of drone food delivery services. More specifically, this study proposed the effect of perceived innovativeness on attitude toward using drone food delivery services. In addition, it was hypothesized that attitude toward using drone food delivery services plays an important role in the formation of behavioral intentions including intentions to use, word-of-mouth intentions, and willingness to pay more. Lastly, the moderating role of gender and age was proposed during the theory-building process. Twelve hypotheses were tested using a total of 324 samples collected in Korea. The data analysis results showed that perceived innovativeness has a positive influence on attitude toward using drone food delivery services, which in turn positively affects intentions to use, word-of-mouth intentions, and willingness to pay more. Furthermore, this study found the important moderating role of gender and age.

Keywords: Drone food delivery services, perceived innovativeness, attitude, behavioral intentions, gender, age

1. Introduction

A drone is an unmanned aerial vehicle without human control, and its role in the era of the fourth industrial revolution has attracted a great deal of attention. According to National Defense (2017), the world market for drones will surge from about US 4.2\$ billion to US 10.3\$ billion in 2026. One of the important reasons for this is the diversity of drone uses. For example, in Japan, drones spray pesticides on farms and take photographs in the air

to check crop status (The Japan Times, 2018). In addition, in Australia, drones played an important role in rescuing two children in the sea (The Straits Times, 2018).

The role of drones in the food service industry is also attracting much attention, and many companies are making great efforts to develop and utilize drone food delivery services. Drone food delivery services have the advantage of being able to deliver quickly, avoiding traffic congestion and deliver anywhere regardless of location. For instance, Yogiyo, one of the largest food delivery service companies in Korea, successfully completed a food delivery test using drones (Digital Daily, 2016). In addition, in Reykjavik, Iceland, Tel Aviv-based drone supplier Flytrex started to provide a service for customers to deliver food through drones without having to visit an actual store (New York Post, 2017). At Kite Beach, Dubai in 2017, Costa Coffee began delivering ice coffee to customers on the beach using drones (The National, 2017). Although drone food delivery services are currently limited in certain areas, it is anticipated that drone food delivery services will be activated in many areas in the future.

Innovativeness that consumers perceive from a new product/service like drone food delivery services is very important for the success of the product/service because it has a significant impact on the adoption behavior for new technologies (Leckie et al., 2017; Yang, 2005). That is, if consumers perceive high levels of innovativeness from a new technology, they are more likely to use the new technology. From a consumer standpoint, perceived innovativeness is considered a corporate effort to meet the needs of consumers to crave something new (Stock, 2011). In particular, perceived innovativeness has a profound effect on the profitability of a company, so companies are necessary to understand how consumers perceive innovativeness from their products (Banerjee and Soberman, 2013; Eisend et al., 2016). However, despite the importance of perceived innovativeness, there is a lack of clarity about its role in the context of drone food delivery services.

Additionally, it is widely known that the adaptation of a new technology can be different based on gender and age, so companies need to develop different strategies according to gender and age (Koenigstorfer and Groeppel-Klein, 2012; Lin et al., 2017). For instance, if companies that provide drone food delivery services understand gender differences in adopting a new technology, they can provide suitable services for male and female customers, respectively, which leads to high levels of customer satisfaction. In particular, establishing a customer database according to personal characteristics such as gender and age is simple and easy (Yelkur and Chakrabarty, 2006), so it is meaningful to explore the moderating role of gender and age, which helps to effectively and efficiently manage customers in the context of drone food delivery services.

In summary, this study explored the importance and necessity of perceived innovativeness in the context of drone food delivery services for the first time. More specifically, the objectives of this study are to identify (1) the influences of perceived innovativeness on attitude toward using drone food delivery services, (2) the effect of attitude toward using drone food delivery services on behavioral intentions including intentions to use, word-of-mouth intentions, and willingness to pay more, and (3) the moderating role of gender and age in this process.

2. Literature review

2.1. Perceived innovativeness

Perceived innovativeness has received significant attention in academic research related to the adoption of a new technology (e.g. Fu and Elliott, 2013; Johnson et al., 2001; Kaplan, 2009). Perceived innovativeness is defined as “the degree to which consumers believe that the product possesses important attributes of innovation such as newness and uniqueness” (Watchravesringkan et al., 2010, p. 266). Perceived innovativeness indicated that

the product itself reflecting the novelty of the technology and the consumer aspect indicating the uniqueness in the market (Kleinschmidt and Copper, 1991). In addition, consumer innovativeness and perceived innovativeness have different meanings. The former is a consumer's innovative tendency (Roehrich, 2004), while the latter is the characteristic of the innovative product that consumers perceive (Falkenreck and Wagner, 2011).

Perceived innovativeness is a prerequisite for a company to be competitive as it has a great influence on the growth and development of the company (Ottenbacher and Harrington, 2009; Phau et al., 2015). Many empirical studies also showed a significant relationship between perceived innovativeness and firm performance (e.g. Danneels and Kleinschmidt, 2001; Langerak and Hultink, 2006), suggesting that when consumers perceive high levels of innovativeness from a certain product/service, they are more likely to use the product/service in the future. Furthermore, perceived innovativeness plays an important role in distinguishing a company from other companies, which helps to build competitive advantages (Ahlstrom, 2010; Seebode et al., 2012).

2.2. Effect of perceived innovativeness on attitude toward using drone food delivery services

First, this study hypothesized the effect of perceived innovativeness on attitude toward using drone food delivery services based on the following theoretical background. Many previous studies have focused on the concept of attitude in the field of consumer behavior for a long time and suggested that it is an important factor in predicting individuals' decisions or behaviors (Ajzen, 1985, 1991; Bagozzi et al., 2003; Fishbein and Ajzen, 1975; Kiatkawsin and Han, 2017a). Attitude refers to “the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior” (Ajzen, 1991, p. 188). That is, attitude is considered an evaluative response to conducting instrumental actions, reflecting a tendency

to react in a manner that is favorable or unfavorable for a particular behavior (Eagly and Chaiken, 1993), so this study defined attitude as an individual's psychological disposition of liking or disliking of using a new technology.

More importantly, although consumers have no experience using a certain product/service, an attitude can be formed through their knowledge or information about the product/service (Oliver et al., 1997). Ajzen and Fishbein (2000) also argued that an attitude toward a certain object can be generated by subjective values and beliefs. Therefore, it can be inferred that perceived innovativeness reflecting consumers' subjective values and beliefs plays a significant role in the formation of attitude. Previous studies also showed a positive relationship between perceived innovativeness and attitude. For example, Watchravesringkan et al. (2010) examined the effect of perceived innovativeness on attitude using 268 undergraduate students in the context of technological fashion products. They suggested that perceived innovativeness positively affects attitude toward using technological fashion products. In addition, Boisvert and Ashill (2011) analyzed a sample of 664 respondents in order to identify the relationship between perceived innovativeness and attitude in the service industry. They found that perceived innovativeness is an important predictor of attitude. Based on the literature review, this study proposes the following hypothesis:

H1: Perceived innovativeness positively affects attitude toward using drone food delivery services.

2.3. Effect of attitude toward using drone food delivery services on behavioral intentions

Next, this study hypothesized the relationship between attitude toward using drone food delivery services and behavioral intentions based on the following theoretical and empirical backgrounds. According to Oliver (1997), behavioral intentions can be defined as

“a stated likelihood to engage in a behavior” (p. 28). It is widely accepted that behavioral intentions include the following three concepts (e.g. Han et al., 2009; Lee et al., 2010): intentions to use, word-of-mouth intentions, and willingness to pay more.

First, the concept of intentions to use can be defined as “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). Intentions to use are formed after a customer’s favorable evaluation of the product/service (Al-Qeisi et al., 2014; Han et al., 2017). More importantly, since intentions to use directly affects actual consumption, several previous studies have sought to find the predictors of intentions to use (e.g. Han and Hyun, 2017; Jeon et al., 2018). In addition, word-of-mouth intentions are 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). Consumers tend to trust information from acquaintances more than commercial ads, so word-of-mouth intentions play a significant role in reducing the risk in selecting a new product/service (Fan and Miao, 2012; Yi and Gong, 2008). Lastly, willingness to pay more refers to the maximum amount customers intend to spend for their preferred brand products compared to other brands (Netemeyer et al., 2004). Empirical studies found a positive relationship between perceived quality and willingness to pay more (Fullerton, 2005; Keller, 1993; Nieto-García et al., 2017), suggesting that when customers perceive high levels of product/service quality, they are more likely to spend extra to use the product/service. From the standpoint of the company, willingness to pay more plays a very important role in the enhancement of sales and revenue (Homburg et al., 2005; Raje et al., 2002).

Many existing theories have demonstrated a significant relationship between attitude and behavioral intentions (e.g. theory of reasoned action, theory of planned behavior, and theory of repurchase decision-making (Ajzen, 1985; Fishbein and Ajzen, 1975, Han and Ryu,

2012). They suggested that attitude plays a critical role in the formation of behavioral intentions. Empirical studies also supported the relationship between attitude and behavioral intentions. For instance, Hung et al. (2006) investigated the effect of attitude on behavioral intentions in terms of the publics' acceptance of e-Government services using 1,099 usable responses. They found that attitude is an important predictor of behavioral intentions. In addition, Fu and Elliott (2013) collected data from 312 customers who had purchased a new technology product in order to identify the relationship attitude and behavioral intentions. The data analysis results revealed that when customers have a favorable attitude toward using a new technology product, they are more likely to use the product. Wu and Ke (2015) also examined how behavioral intentions are enhanced in the online shopping industry using total sample of 2,631. They suggested that when customers have a positive attitude, they tend to show positive behavioral intentions. Based on the theoretical and empirical backgrounds, it is expected that attitude toward using drone food delivery services has a positive impact on behavioral intentions.

H2: Attitude toward using drone food delivery services positively affects intentions to use.

H3: Attitude toward using drone food delivery services positively affects word-of-mouth intentions.

H4: Attitude toward using drone food delivery services positively affects willingness to pay more.

2.4. Moderating role of gender

Gender is defined as a set of characteristics that distinguish between males and females (Faqih and Jaradat, 2015). The gender schema theory firstly suggested the important

role of gender in consumer behavior (Bem, 1981). Theoretically, gender does not simply act as biological sex, but as psychological construct (Bem, 1981). Earlier studies have suggested that male and female have different kinds of socially constructed cognitive structures, so they show different decision-making processes (Ahuja, 2002; Venkatesh and Morris, 2000).

A host of previous studies have also tried to explore gender differences in adopting new technology in order to manage the development and utilization of new technology in diverse fields (e.g. Alksasbeh, 2012; Chou et al., 2011; Terzis and Economides, 2011; Venkatesh et al., 2000). Their results were different from each other and can be summarized as follows. First, males were more interested in adopting new devices than female. For example, Van Slyke et al. (2002) investigated gender differences in perceptions of Web shopping using 511 customers. They suggested that male customers are more favorable than females in perceptions of Web shopping. Ong and Lai (2006) analyzed data collected from 156 respondents including 89 male and 67 female in order to find gender differences in perceptions of e-learning acceptance. They showed that male respondents prefer to use e-learning compared to females. Wang and Wang (2010) collected data from 343 customers in order to identify the moderating role gender in the mobile internet industry. They found the moderating role of gender in the relationship between perceived value and behavioral intention to use mobile internet and suggested that if male mobile users have high levels of perceived value, they are more likely to use mobile internet than female mobile users. Chen et al. (2015) examined the moderating role of gender in the relationship between perceived benefit and re-purchase intention using 484 online shoppers. They found that gender plays a significant moderating role in the relationship between the two constructs. That is, males are more likely to have re-purchase intentions than females when they perceive high levels of benefit from online shopping.

On the contrary, the results of other previous studies have suggested that females are more likely to prefer to adopt new technology. For instance, Venkatesh et al. (2003) tested the moderating role of gender in the relationship between effort expectancy and behavioral intention using the partial least-squares (PLS) regression method. They found that gender moderates the relationship between effort expectancy and behavioral intention. That is, females are more likely to use information technology than males when they have high levels of effort expectancy. González-Gómez et al. (2012) examined gender differences in e-learning teaching using data collected from 1,185 students who took on-line class. They suggested that female students are more satisfied with e-learning teaching than male students. Fan and Miao (2012) collected data from 116 customers who have electronic word-of-mouth (hereafter eWOM) experiences in order to find the moderating role of gender in the relationship between perceived eWOM credibility and eWOM acceptance. The data analysis results showed that females are more likely to have eWOM acceptance than males when they perceive high levels of eWOM credibility. Joiner et al. (2012) investigated gender differences in the use of the Internet using 501 respondents. Their results indicated that females are more likely to use the Internet for communication and social network than males.

Although previous research has shown different results, they commonly argued the important moderating role of gender in adopting new technology. Therefore, based on the theoretical and empirical backgrounds, this study proposed the following hypotheses.

H5a: The effect of product innovativeness on attitude toward using drone food delivery services is moderated by gender.

H5b: The effect of attitude toward using drone food delivery services on intentions to use is moderated by gender.

H5c: The effect of attitude toward using drone food delivery services on word-of-mouth intentions is moderated by gender.

H5d: The effect of attitude toward using drone food delivery services on willingness to pay more is moderated by gender.

2.5. Moderating role of age

Age is another critical demographic factor that plays an important role in explaining consumer behavior (Lian and Yen, 2014; Nosek et al., 2002). It is widely known that younger people tend to be more enterprising and adventurous than older people (Koenigstorfer and Groeppel-Klein, 2012; Yousafzai and Yani-de-Soriano, 2012). In addition, younger people are fairly good with technological devices, so they are more likely to accept to use new technologies (Porter and Donthu, 2006; Wang et al., 2009).

Most previous studies have proved age differences in adopting new technology, suggesting that a negative relationship between increasing age and intention to adopt a new technology. For example, Zhou et al. (2014) investigated age differences in acceptance of new functions of mobile phones using 351 mobile phone users. Based on the data analysis results, they concluded that young people are more likely to adopt new functions of mobile phones than old people. Lian and Yen (2014) collected data from 820 customers in order to explore differences between younger and older customers in intention to use online shopping. The data analysis results revealed a significant difference in online shopping intention, suggesting that younger customers prefer to use online shopping than older customers. Kucukusta et al. (2015) examined an important role of age in the use of the Internet for booking online travel products using 213 online users. They suggested that when compared to old people, young people are more likely to use the Internet for booking online travel products because they felt that using internet to book online tourism product makes the book

easier and is easy to learn. Harris et al. (2016) tested age differences using 960 mobile bank customers. The results of the data analysis indicated that young customers are more interested in using mobile banking, while old customers prefer to use traditional, physical-based banking.

In summary, several previous studies suggested that young people are trying to accommodate more new technology, so it can be inferred that there are age differences in terms of using drone food delivery services. Based on the theoretical and empirical backgrounds, the following hypotheses are proposed:

H6a: The effect of product innovativeness on attitude toward using drone food delivery services is moderated by age.

H6b: The effect of attitude toward using drone food delivery services on intentions to use is moderated by age.

H6c: The effect of attitude toward using drone food delivery services on word-of-mouth intentions is moderated by age.

H6d: The effect of attitude toward using drone food delivery services on willingness to pay more is moderated by age.

2.6. Proposed model

Based on the hypotheses presented in the literature review part, this study proposes a research model as shown in Figure 1.

(Insert Figure 1)

3. Methodology

3.1. Measurement

In this study, each concept was measured based on the items that were proven to be reliable and valid in previous studies. First, perceived innovativeness was measured with three items adapted from Fu and Elliott (2013) and Watchravesringkan et al. (2010). Attitude was measured with three items used by Bagozzi et al. (2003) and Kiatkawsin and Han (2017b). Intentions to use were measured with three items borrowed from Zeithaml et al. (1996). Word-of-mouth intentions were measured using three items cited from Hennig-Thurau, Gwinner, and Gremler (2002). Willingness to pay more was measured with three items adapted from Han et al. (2009). All items were measured through a seven-point Likert-type scale, anchored from strongly disagree (1) to strongly agree (7).

3.2. Data collection

In order to check the reliability of the measurement items, a pretest was conducted with 50 actual restaurant patrons using an online questionnaire survey in Korea. Respondents began the survey after watching a video related to the drone food delivery services for about 2 minutes and 30 seconds. The video was designed to make it easy for anyone to understand the overall system and operation of the drone food delivery services (see the Appendix). The data analysis results showed the values of Cronbach's alpha for all of the constructs exceeded .70, suggesting high levels of reliability (Nunnally, 1978).

For the main survey, data were collected using an online company in Korea. In the same way as the pretest, respondents were shown videos related to drone food delivery service before the survey. An email survey was distributed to 2,794 respondents who have used food delivery services within the last six months, 346 of which responded. Among them, 22 outliers were excluded after checking multivariate outliers. Finally, statistical analysis was performed based on 324 samples.

4. Data analysis

4.1. Profile of the samples

Table 1 presents profile of the samples. Of the 324 respondents, 58.0% ($n = 188$) were male and 42.0% ($n = 136$) were female. The majority of respondents were 20s (38.0%, $n = 123$), followed by 30s (30.6%, $n = 99$), 40s (21.3%, $n = 69$), and over 50s (10.2%, $n = 33$). Their average age was 34.95 years old. With regard to participants' monthly household income, 22.8% ($n = 74$) reported that their income was between \$2,001 and \$3,000. In addition, the majority of respondents were single (56.8%, $n = 184$). Lastly, in terms of education, a majority showed that they held a bachelor's degree (58.0%, $n = 188$).

(Insert Table 1)

4.2. Measurement model

The measurement model was initially evaluated prior to structural equation modeling (SEM) analysis. Table 2 shows measurement model results. Findings from the confirmatory factor analysis (CFA) indicated that the measurement model satisfactorily fits the data ($\chi^2 = 209.716$, $df = 80$, $\chi^2/df = 2.621$, $p < .001$, NFI = .966, CFI = .979, TLI = .972, RMSEA = .071). All of the factor loadings were equal to or greater than .848, and all factor loadings were significant at $p < .001$.

(Insert Table 2)

Table 3 provides descriptive statistics and associated measures. A composite reliability was checked to investigate consistency among the measurement items for each

construct. The values of all composite reliability were greater than of .60 (Bagozzi and Yi, 1988), suggesting that measurement items in the proposed model were internally consistent and highly reliable for evaluating each variable. In addition, construct validity was confirmed as all AVE (average variance extracted) values were higher than cut-off of .50 (Fornell and Larcker, 1981). Lastly, AVE values exceeded the values of the squared correlations between a pair of variables, indicated that discriminant validity was statistically supported (Fornell and Larcker, 1981).

(Insert Table 3)

4.3. Structural model evaluation

SEM was used in order to assess the proposed model. The proposed model shows a good fit to the data ($\chi^2 = 200.173$, $df = 83$, $\chi^2/df = 2.412$, $p < .001$, NFI = .967, CFI = .981, TLI = .976, RMSEA = .066). In addition, the χ^2/df value of 2.412 indicated a good model fit as the value was below 3.00 (Kline, 1998). Of the four proposed hypotheses, all were statistically supported at $p < .05$. Table 4 presents a summary of the hypotheses testing results

(Insert Table 4)

4.4. Measurement-invariance assessment

A measurement invariance test was conducted before testing the moderating role of gender and age (Steenkamp and Baumgartner, 1998). First, respondents ($n = 324$) were separated by gender: male ($n = 188$) and female ($n = 136$). As shown in Table 5, non-restricted model ($\chi^2 = 314.418$, $df = 158$, $\chi^2/df = 1.989$, $p < .001$, NFI = .951, CFI = .975, TLI = .967, RMSEA = .055) and full-metric invariance model ($\chi^2 = 343.911$, $df = 173$, $\chi^2/df =$

1.987, $p < .001$, NFI = .946, CFI = .972, TLI = .967, RMSEA = .055) had satisfactory fit statistics. In addition, there is no significant difference between two models ($\Delta\chi^2 = 29.493 < \chi^2 = .01(df=15) = 30.580$), suggesting that full metric invariance was supported.

With regard to age, respondents ($n = 324$) were divided into two groups based on the median of 34 years old (a low age group = 163 and a high age group = 161). Two models including non-restricted model ($\chi^2 = 250.073$, $df = 158$, $\chi^2/df = 1.582$, $p < .001$, NFI = .961, CFI = .985, TLI = .980, RMSEA = .043) and full-metric invariance model ($\chi^2 = 269.315$, $df = 173$, $\chi^2/df = 1.556$, $p < .001$, NFI = .958, CFI = .984, TLI = .981, RMSEA = .042) had a good fit statistics. Furthermore, the chi-square difference tests showed that the two models were not significantly different. This can be interpreted such that full-metric invariance was supported for age.

(Insert Table 5 here)

4.5. Moderating role of gender and age

To empirically find the moderating role of gender and age, this study used multiple-group analyses. To evaluate the differential effects of moderator, the chi-square difference between the unconstrained and constrained models was assessed in terms of the difference in degrees of freedom (Byrne, 2001). First, gender played an important moderating role in the relationships between (1) product innovativeness and attitude ($\Delta\chi^2 = 4.108 > \chi^2 = .5(1) = 3.84$, $df = 1$) and (2) attitude and word-of-mouth intentions ($\Delta\chi^2 = 3.971 > \chi^2 = .5(1) = 3.84$, $df = 1$), supporting Hypothesis 5a and 5c. Specifically, both path coefficients for a female group were found to be greater than for a male group. However, Hypotheses 5b ($\Delta\chi^2 = 1.210 < \chi^2 = .5(1) = 3.84$, $df = 1$) and 5d ($\Delta\chi^2 = .846 < \chi^2 = .5(1) = 3.84$, $df = 1$) were not statistically supported.

Second, the results of multiple-group analyses revealed that age moderated the relationships (1) attitude and word-of-mouth intentions ($\Delta\chi^2 = 6.101 > \chi^2 = .5(1) = 3.84$, $df = 1$) and (2) attitude and willingness to pay more ($\Delta\chi^2 = 6.891 > \chi^2 = .5(1) = 3.84$, $df = 1$), so Hypotheses 6c and 6d were supported. More specifically, both path coefficients for a low age group were found to be higher than for a high age group. Contrary to expectations, hypotheses 6a ($\Delta\chi^2 = .124 < \chi^2 = .5(1) = 3.84$, $df = 1$) and 6b ($\Delta\chi^2 = .284 < \chi^2 = .5(1) = 3.84$, $df = 1$) were not statistically supported. Figure 2 shows the results of the structural-invariance tests.

(Insert Figure 2 here)

5. Discussion and implications

This study was designed to investigate the importance and necessity of perceived innovativeness in the context of drone food delivery services. More specifically, it was proposed that perceived innovativeness positively affects attitude toward using drone food delivery services. In addition, attitude toward using drone food delivery services was hypothesized to influence behavioral intentions including intentions to use, word-of-mouth intentions, and willingness to pay more. Lastly, the moderating role of gender and age was proposed during the theory-building process. The proposed hypotheses were tested using data collected from 324 samples in Korea. The results of the study have the following theoretical and practical implications.

5.1. Theoretical implications

First, perceived innovativeness was shown to significantly increase attitude ($\beta = .678$, $p < .05$). That is, people are more likely to have a favorable attitude toward using drone food

delivery services when they perceive that drone food delivery services are innovative. The result of this study largely agree with the results of previous studies related to new technologies (e.g. Boisvert and Ashill, 2011; Watchravesringkan et al., 2010), suggesting that perceived innovativeness is an important factor affecting attitude toward using a new technology. This study also found that, for the first time, perceived innovativeness has an important influence on attitude in the context of drone food delivery services. In this respect, this study expands the current literature by providing empirical evidence of the important role of perceived innovativeness in the formation of attitude toward using drone food delivery services.

Second, this research also identified how to enhance behavioral intentions in the context of drone food delivery services. More specifically, the results indicated that attitude toward using drone food delivery services aids to increase three dimensions of behavioral intentions such as intentions to use ($\beta = .946, p < .05$), word-of-mouth intentions ($\beta = .919, p < .05$), and willingness to pay more ($\beta = .536, p < .05$). It can be interpreted that if consumers have a positive attitude toward using drone food delivery services, they are more likely to (1) use drone food delivery services when ordering food, (2) recommend drone food delivery services to others, and (3) spend extra in order to use drone food delivery services. As explained in the literature review section, a great deal of the existing research has consistently suggested that attitude is a critical predictor of behavioral intentions (e.g. Ajzen, 1985; Hung et al., 2006; Wu and Ke, 2015). This study is the first attempt to empirically test the relationship between attitude and behavioral intentions in the context of drone food delivery services. In this regard, this study makes a significant theoretical contribution to the existing literature.

Third, the results of multiple-group analyses indicated that gender moderates the relationships between (1) perceived innovativeness and attitude toward using drone food

delivery services and (2) attitude toward using drone food delivery services and word-of-mouth intentions. These findings were consistent with the previous studies (e.g. Fan and Miao, 2012; González-Gómez et al., 2012; Venkatesh et al., 2003), suggesting females were more interested in adopting new devices than male. Overall, the present study implies that when females perceive that drone food delivery services are innovative, they are more likely to have a favorable attitude toward using such services and say positive things about them to others than males. Our findings validated the particular nature of the moderating role of gender in the adoption of new technology by empirically finding providing empirical evidence of gender differences in the context of drone food delivery services.

Forth, the data analysis results showed that age plays a significant role as a moderator in the relationships between (1) attitude toward using drone food delivery services and word-of-mouth intentions and (2) attitude toward using drone food delivery services and willingness to pay more. In other words, young consumers try to encourage others to use drone food delivery services and pay more for drone food delivery services when they have a positive attitude toward using drone food delivery services. In the history of new technology research, scholars and practitioners have strongly argued that younger people prefer to adopt new technologies than older people (e.g. Harris et al., 2016; Kucukusta et al., 2015; Lian and Yen, 2014; Zhou et al., 2014). Unlike previous studies, this study revealed age differences for the first time in the context of drone food delivery services. Considering the findings, this study replicated and further expanded the current literature by identifying the moderating role of age in adopting drone food delivery services.

5.2. Managerial implications

From the standpoint of food service companies, it is important to emphasize the innovativeness of drone food delivery services through advertising and publicity in order to

enhance attitude toward using drone food delivery services, which positively affects behavioral intentions. For instance, it is recommended to emphasize that drone food delivery services are far superior to traditional delivery services in that they can avoid traffic congestion, delivering food more quickly. In addition, about 1,500 people are injured and nearly 30 people die every year due to traffic accidents during delivery in Korea, and even more sadly, about 50% of victims who lose their lives are younger than 30 (Asia Economy, 2017). Therefore, it is necessary to inform that the introduction of drone food delivery services can reduce unfortunate victims. Lastly, most food service companies currently offer motorcycle or car delivery services, which have a significant impact on environmental pollution. As the drones are operated by electricity, drone food delivery services can also play an important role in protecting the environment, so food companies need to emphasize the role of environmental protection of drone food delivery services.

The results of this study revealed that gender and age differences in terms of drone food delivery services, suggesting the importance of focusing on a target market. A target market, a segment that needs to focus efficiently and effectively based on product characteristics, is considered an important marketing tool that has a significant impact on profits (Kotler et al., 2009, Lee et al., 2006). For example, food service companies are recommended to choose females as targets and promote drone food delivery services. By doing so, the companies would gain greater advertising effectiveness. In addition, it will be more efficient and effective if food service companies first aim at younger people when designing advertising or promotional materials, which makes younger people have higher levels of word-of-mouth intentions and willingness to pay more than older people.

6. Limitations and future research

Although this study provides important theoretical and practical implications, the following limitations remain. First, this study was conducted in Korea. Thus, in order to validate the models presented in this study, future studies may need to collect data from other regions. Second, the online survey was used for data collection in this study. However, the convenience sampling technique using an online survey can lead to selection biases (Wright, 2005), so future research needs to use different data collection methods in order to reduce biases. Lastly, since the background of this study is drone food delivery services, it is rather difficult to apply the results of this study to other delivery industries.

Appendix. Screenshot from videos



Source from Yogiyo (2018)

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Fig. 1. Proposed conceptual model

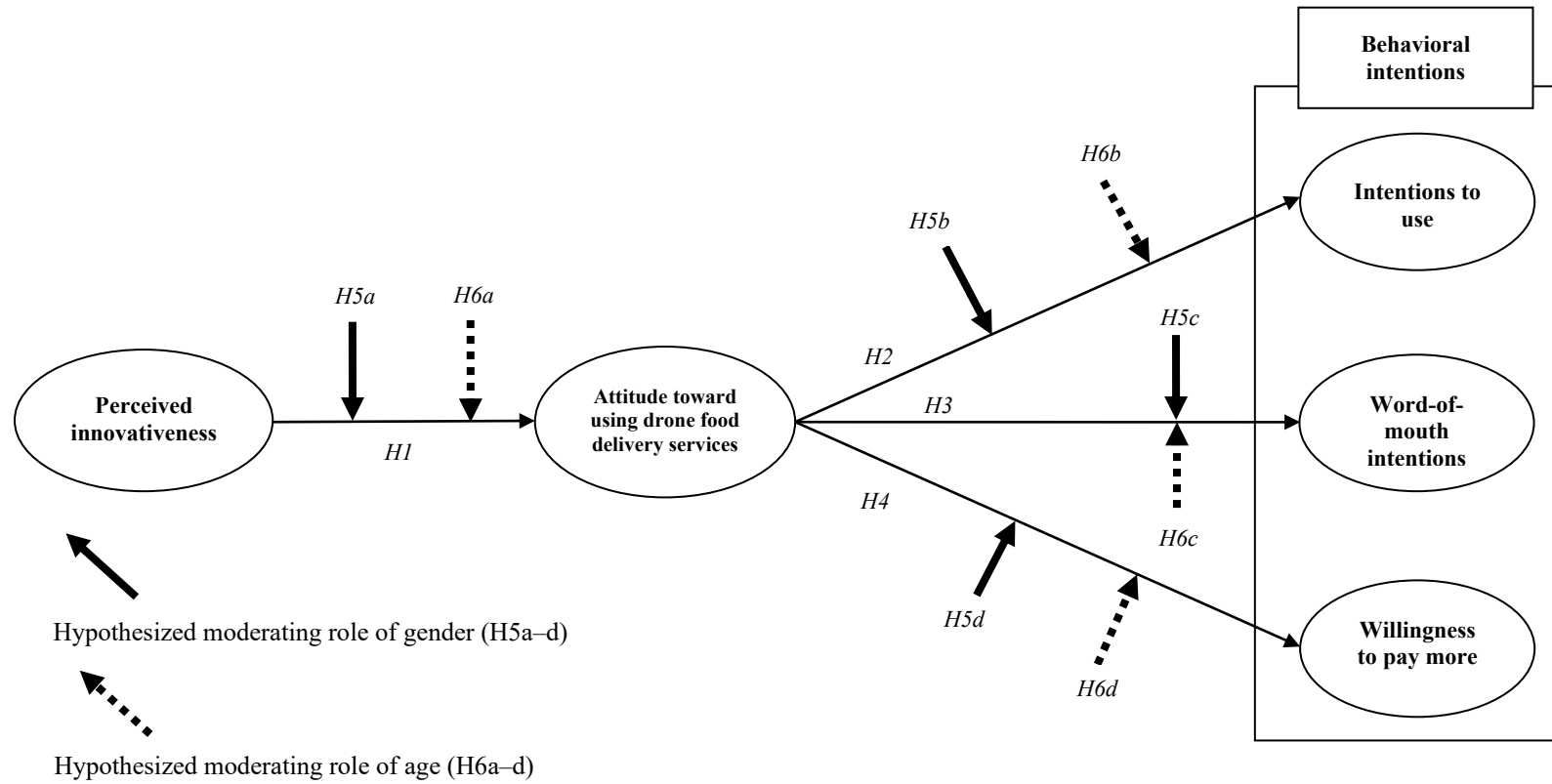
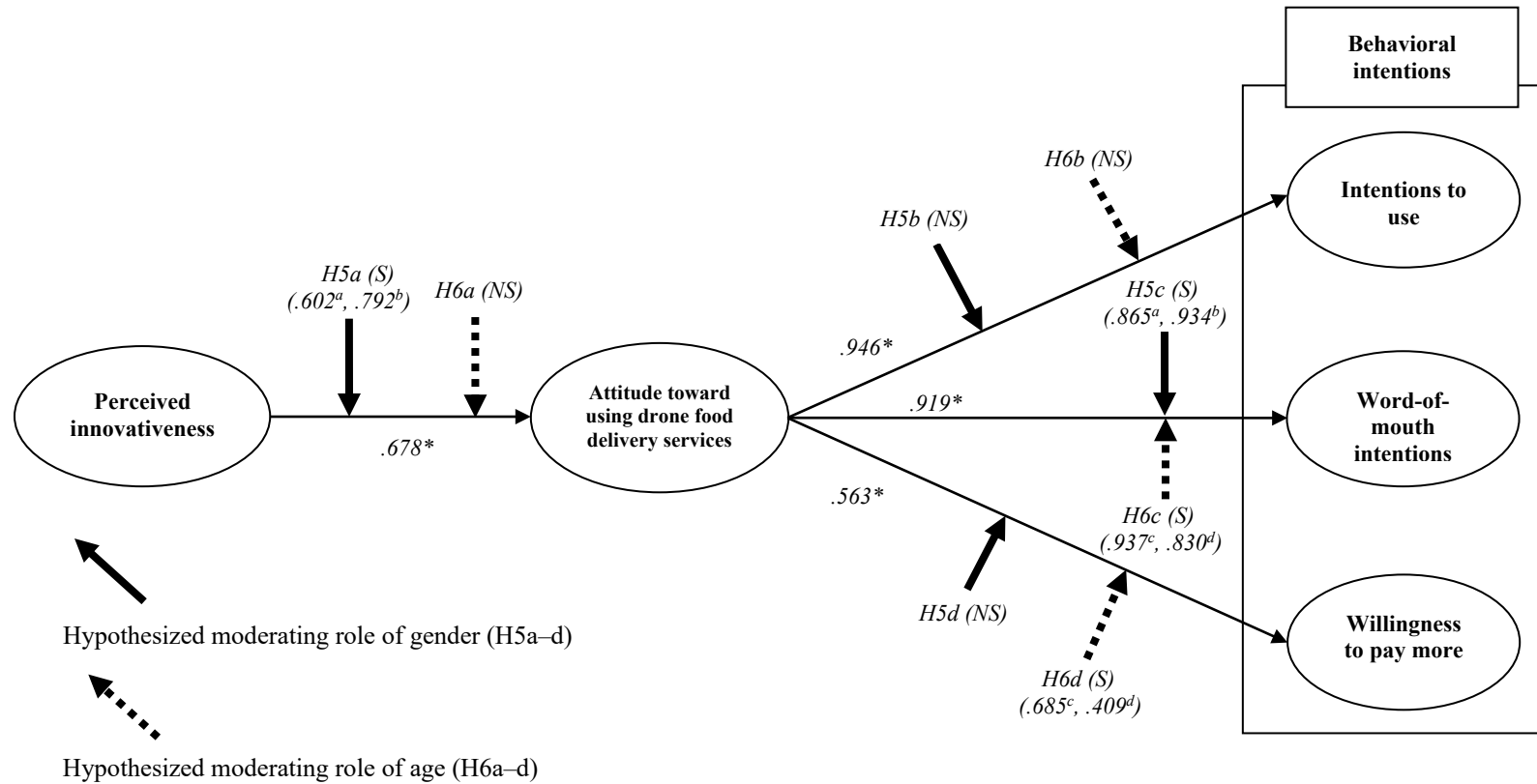


Fig. 2. Structural model results



Notes 1: $*p < .05$

Notes 2: S = Significant; NS = Not Significant

Notes 3: a. Path coefficient for male respondents, b. Path coefficient for female respondents

Notes 4: c. Path coefficient for a low age group, d. Path coefficient for a high age group

Table 1
Profile of the samples (*n* = 324)

| Variable | <i>n</i> | Percentage |
|---------------------------------|-----------------|-------------------|
| Gender | | |
| Male | 188 | 58.0 |
| Female | 136 | 42.0 |
| Age | | |
| 20s | 123 | 38.0 |
| 30s | 99 | 30.6 |
| 40s | 69 | 21.3 |
| Over 50s | 33 | 10.2 |
| Mean age = 34.95 years old | | |
| Monthly household income | | |
| \$6,001 and over | 60 | 18.5 |
| \$5,001-\$6,000 | 36 | 11.1 |
| \$4,001-\$5,000 | 48 | 14.8 |
| \$3,001-\$4,000 | 51 | 15.7 |
| \$2,001-\$3,000 | 74 | 22.8 |
| \$1,001-\$2,000 | 43 | 13.3 |
| Under \$1,000 | 12 | 3.7 |
| Marital status | | |
| Single | 184 | 56.8 |
| Married | 138 | 42.6 |
| Widowed/Divorced | 2 | .6 |
| Education Level | | |
| Less than high school diploma | 34 | 10.5 |
| Associate's degree | 52 | 16.0 |
| Bachelor's degree | 188 | 58.0 |
| Graduate degree | 50 | 15.4 |

Table 2
Confirmatory factor analysis: Items and loadings

| Construct and scale items | Standardized Loading ^a |
|--|-----------------------------------|
| Perceived innovativeness | |
| Drone food delivery services seem unique. | .904 |
| Drone food delivery services seem new. | .919 |
| Drone food delivery services seem creative. | .848 |
| Attitude toward using drone food delivery services | |
| Unfavorable – Favorable | .873 |
| Bad – Good | .928 |
| Negative – Positive | .931 |
| Behavioral intentions | |
| Intentions to use | |
| I will use drone food delivery services when ordering food. | .948 |
| I am willing to use drone food delivery services when ordering food. | .895 |
| I am likely to use drone food delivery services when ordering food. | .957 |
| Word-of-mouth intentions | |
| I am likely to say positive things about drone food delivery services to others. | .889 |
| I am likely to recommend drone food delivery services to others. | .974 |
| I am likely to encourage others to use drone food delivery services. | .942 |
| Willingness to pay more | |
| I am likely to pay more for drone food delivery services. | .950 |
| It is acceptable to pay more for drone food delivery services. | .963 |
| I am likely to spend extra in order to use drone food delivery services. | .973 |
| Goodness-of-fit statistics: $\chi^2 = 209.716$, $df = 80$, $\chi^2/df = 2.621$, $p < .001$, NFI = .966, CFI = .979, TLI = .972, RMSEA = .071 | |

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

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

Table 3
Descriptive statistics and associated measures

| | No. of Item | Mean (SD) | AVE | (1) | (2) | (3) | (4) | (5) |
|------------------------------|-------------|-------------|------|-------------------------|-------------------|-------------|-------------|-------------|
| (1) Perceived innovativeness | 3 | 5.55 (1.25) | .794 | .920^a | .601 ^b | .613 | .662 | .281 |
| (2) Attitude | 3 | 4.84 (1.33) | .830 | .361 ^c | .936 | .771 | .721 | .464 |
| (3) Intentions to use | 3 | 4.57 (1.35) | .872 | .376 | .594 | .953 | .774 | .524 |
| (4) Word-of-mouth intentions | 3 | 4.60 (1.36) | .875 | .438 | .520 | .599 | .955 | .547 |
| (5) Willingness to pay more | 3 | 3.26 (1.60) | .926 | .079 | .215 | .275 | .299 | .974 |

Notes 1: SD = Standard Deviation, AVE = Average Variance Extracted

Notes 2: a. Composite reliabilities are along the diagonal, b. Correlations are above the diagonal, c. Squared correlations are below the diagonal

Table 4
Standardized parameter estimates for structural model

| | | | Coefficients | t-value | Hypothesis |
|--|--------------------------|----------------------------|--------------|---------|------------|
| H1 | Perceived innovativeness | → Attitude | .678 | 11.375* | Supported |
| H2 | Attitude | → Intentions to use | .946 | 18.754* | Supported |
| H3 | Attitude | → Word-of-mouth intentions | .919 | 16.304* | Supported |
| H4 | Attitude | → Willingness to pay more | .563 | 10.106* | Supported |
| Goodness-of-fit statistics: $\chi^2 = 200.173$, $df = 83$, $\chi^2/df = 2.412$, $p < .001$, NFI = .967, CFI = .981, TLI = .976, RMSEA = .066 | | | | | |

Notes1: * $p < .05$

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

Table 5
Measurement-invariance models

| | Models | χ^2 | <i>df</i> | NFI | CFI | TLI | RMSEA | $\Delta\chi^2$ | Full-metric invariance |
|--------|------------------------|----------|-----------|------|------|------|-------|---|------------------------|
| Gender | Non-restricted model | 314.418 | 158 | .951 | .975 | .967 | .055 | $\Delta\chi^2(15) = 29.493, p > .01$ (insignificant) | Supported |
| | Full-metric invariance | 343.911 | 173 | .946 | .972 | .967 | .055 | | |
| Age | Non-restricted model | 250.073 | 158 | .961 | .985 | .980 | .043 | $\Delta\chi^2(15) = 19.242, p > .01$ (insignificant) | Supported |
| | Full-metric invariance | 269.315 | 173 | .958 | .984 | .981 | .042 | | |

Notes 1: NFI = Normed Fit Index, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, RMSEA = Root Mean Square Error of Approximation

Notes 2: $\Delta\chi^2(15) = 30.580, p > .01$