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# Application of internal environmental locus of control to the context of eco-friendly drone food delivery services

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## ABSTRACT

This study was designed to apply the concept of internal environmental locus of control (INELOC) to the context of eco-friendly drone food delivery services. In particular, this study examined how four subdimensions of INELOC, namely, green consumers, activists, advocates, and recyclers, affect anticipated emotions, such as positive and negative anticipated emotions. In addition, the effects of positive and negative anticipated emotions on intention to use were proposed. A research model with 10 hypotheses was developed and tested on the basis of theoretical relationships using 324 samples collected in South Korea. Data analysis results indicated that all four subdimensions of INELOC significantly affect positive anticipated emotions. Meanwhile, only green consumers and advocates significantly affect negative anticipated emotions. Lastly, significant relationships were found between anticipated emotions and intention to use.

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## KEYWORDS

Eco-friendly; Drone food delivery services; Internal environmental locus of control; Anticipated emotions; Behavioral intention

## Introduction

The role of drones in the Fourth Industrial Revolution has elicited attention because of the high utilization of drones in various industries, such as agriculture, broadcasting, distribution, military, and fire detection (Bamburly, 2015; CBS News, 2018). The expanding application of drones is based on advancements in their capabilities that involve widespread accessibility, high-quality imaging and live streaming, and respectable speed (CBS News, 2018; Shavarani et al., 2018). Thus, drones are regarded as a disruptive innovation that is reshaping the way business is conducted.

The food service industry is not exempted from the significance of drones. In the food service industry, drones are used for food delivery, and because they bypass traffic congestion, drone food delivery services can deliver quickly to customers (Hwang et al., 2019). According to Hwang and Kim (2019, p. 872), drone food delivery services refer to “a service that uses drones to deliver food to a place where the customer wants it.” Furthermore, numerous experiments have been conducted to test drones in food delivery services, and their superiority in many aspects, such as cost, efficiency, and safety, has been confirmed (Doole et al., 2018; Park et al., 2018). Moreover,

many recent studies have shown that drone-based delivery services play an important role in protecting the environment because in contrast with current delivery methods, such as cars and motorcycles, drones are powered by electricity (Hwang & Kim, 2019). Figliozzi (2017) proved that drone-based delivery is crucial for reducing energy consumption and carbon dioxide (CO<sub>2</sub>) emissions. Stolaroff et al. (2018) argued that drone-based delivery helps decrease greenhouse gas (GHG) emissions. Although drone food delivery services facilitate environmental protection, only a few studies have focused on this topic.

The concept of internal environmental locus of control (INELOC) is stemming from internal locus of control, which refers to the degree that people believe they have control over the outcome of events (Rotter, 1966). People with a strong internal locus of control consider that the results are attributed to their efforts and capabilities. For example, when individuals receive the great performance appraisal, their own actions take the credit for the results rather than other external factors such as market demands or competitions. Mirroring the concept of internal locus of control, INELOC refers to individuals' beliefs that influence their environmental outcomes (McCarty & Shrum, 2001); it includes the following four subdimensions: green consumers, activists, advocates, and recyclers (Cleveland et al., 2012). The group of people who possess a sense of INELOC devote themselves to creating eco-friendly environment by conducting or participating related activities. That is, people with high INELOC levels tend to exhibit responsible environmental behavior than those with low INELOC levels (Hines et al., 1987). Cleveland et al. (2012) asserted that INELOC captures a consumer's multifaceted attitudes pertaining to his/her personal ability to affect environmental outcomes and individual responsibility toward sustainability. In addition, these authors argued that an individual's environment-friendly creeds are not translated into pro-environmental deeds and cannot address the needs of INELOC in predicting consumer pro-environmental behavior/intention. For this reason, identifying the potential INELOC of consumers is critical for predicting whether they use eco-friendly services.

An individual's behavioral intention is affected by the emotion that arises during actual experience and the positive or negative anticipation of such emotions (Baumgartner et al., 2008; Ha, 2018). Various customer behavior models in the environmental context have been built on existing theories, such as theory of planned behavior (TPB) and the norm activation model (NAM), which are derived from social psychology. Thus, as pointed out by Kals and Maes (2002), these studies frequently exclude the role of emotions. Thereafter, emotions and forward-looking emotions, namely, anticipated emotions, have been adopted in studies that explicate consumer behavior in diverse settings (Ahn & Kwon, 2020; Hwang et al., 2019; Rezvani et al., 2017; Xie et al., 2015). For example, Perugini and Bagozzi (2001) asserted that an individual's prospect-based emotions are a critical predictor of customer intentions to use. To the best of our knowledge, however, anticipated emotions have not been considered in explaining the associations between INELOC and customer ecological behavioral intention in drone food delivery services.

Recognizing a range of environmental challenges, people at present have increased their attention toward current patterns of food consumption (Koenig-Lewis et al., 2014; Siddiqui et al., 2018). In this respect, drones are part of the progression of refining ways of food delivery in the age of technological innovation, and the role of eco-friendly drones is inevitable in the current marketplace. Accordingly, studies have been performed in the context of drone-based delivery (Bambrury, 2015; Doole et al., 2018; Hwang & Kim, 2019; Stolaroff et al., 2018). However, these studies have focused on the benefits of using drone food delivery services to consumers. By contrast, research on the eco-friendly role of such services is highly insufficient. Distinct from prior research, the current study examines potential consumer propensity to eco-friendly drone food delivery services using INELOC because understanding consumer propensity is significant for developing an effective marketing strategy (Hwang & Hyun, 2017).

Accordingly, the current study aims to fill the research gaps by being the first to empirically examine INELOC and its outcomes in the context of eco-friendly drone food delivery services for the first time. In particular, the objectives of this study are to explore (1) the effects of the four

subdimensions of INELOC, namely, green consumers, activists, advocates, and recyclers, on anticipated emotions, including positive and negative emotions; and (2) the causal relationships between the two anticipated emotions on behavioral intention. Likewise, the proposed framework of the present research links the multi-dimensional INELOC, which is an essential personal trait, with anticipated emotions in understanding customer pro-environmental behavioral intention. More specifically, it illustrates the direct impact of multifaceted INELOC on positive and negative anticipated emotions which, in turn, influence intention to use drone food delivery services. This approach is relatively infrequent in the current literature and it is thereby unique and differentiated from prior studies. The findings of this study are accordingly expected to provide empirical evidence for explaining the intricate associations among INELOC, anticipated emotions, and intention to use eco-friendly drone food delivery services which have not been discovered to date. These findings have meaningful implications for theory and practice.

## Literature review

### *Drone food delivery services*

Food delivery services are changing the landscape of food consumption. The growing demand for food delivery services has been related to different factors, such as an increased number of single households and dual-income families, changing lifestyles, new generations, and new eating patterns (Forbes, 2018; UBS, 2018). The use of doorstep food delivery has been further accelerated by technological progress, including a platform-to-consumer business model (Ray et al., 2019). That is, the advancement of digital technology is one notable impetus for developing food delivery services by enabling customers to purchase online through applications or websites to bring food to their doorstep. Food delivery services are considered a fast-growing sector, and food delivery sales can rise annually by more than 20%, resulting in estimated sales of US\$365 billion worldwide by 2030 (UBS, 2018).

Drones are currently considered innovative delivery tools because of their many advantages, such as cost, time, and effort. Doole et al. (2018) conducted an experiment in the field of fast-food delivery and confirmed that drone food delivery can cut the unit cost of traditional food delivery services in half. Thus, drone-based delivery is regarded as a promising solution to increasing traffic on the ground and a system for minimizing total costs (Shavarani et al., 2018). Moreover, drone food delivery services have been proven to play a significant role in reducing environmental footprint by minimizing CO<sub>2</sub> emissions and global warming (Goodchild & Toy, 2018; Koiwanit, 2018). Park et al. (2018) assessed the environmental impact of drones versus current delivery modes and demonstrated the substantial contributions of a drone delivery system. Similarly, the eco-friendly roles of drone food delivery services were comprehensively described by Kim and Hwang (2020); that is, drones can play an initiating and central role in the advancement of sustainability in the context of food delivery services.

Considering the high potential of drones, numerous companies have entered the drone food delivery service market. Wing, a subsidiary of Google's parent company, Alphabet Inc., was granted permission to fly drones to deliver food in Canberra, Australia (Reuters, 2019). An Uber Eats delivery drone design was revealed at the Forbes Under 30 Summit in Detroit, USA, and the company announced plans to test meal delivery using this new design in San Diego, USA in summer 2020 (Forbes, 2019). Recently, Manna, an Irish drone startup company, and its partnerships with food ordering company Flipdish and Cubic Telecom were addressed in CES 2020 (CNET, 2019). The deal will connect drones through a 5G network, allowing customers to track their order and know exactly when the drone will "drop" it at their door. In particular, the drones' use of an electric power system with zero carbon emissions was highlighted. A system for drone food delivery services is due to be installed in Europe.

Health, Safety, Environment, and Quality (HSEQ) is a well-known discipline that organizations are encouraged to or must comply with to ensure that their activities will not cause any harm (Rahimi, 1995). It involves developing safe and eco-friendly processes and building a systematic approach to abide by environmental regulations from the health and environment perspectives. HSEQ is a management trend in modern society that will certainly be accentuated further. Moreover, HSEQ is no longer limited to a certain industry but is also applied to the food service industry. For example, Siddiqui et al. (2018) introduced examples of innovative packaging of fruits and vegetables that contribute to HSEQ. In this respect, eco-friendly drone food delivery services must be exemplary in HSEQ as a disruptive innovation in the field of food delivery services.

### ***Explanation of each construct***

#### ***INELOC***

The environment-friendly behavior/intention of individuals has been extensively studied, and many scholars have conducted research that focused on existing theories, such as theory of reasoned action, TPB, NAM, and value-belief-norm (VBN) theory. For example, Fielding et al. (2008) incorporated TPB to examine an individual's behavioral intention in contributing to sustainability. Their results confirmed that people with a more favorable attitude toward and a stronger sense of environmental activism exhibit a greater intention to engage in eco-friendly behavior. Kim and Hwang (2020) focused on the pro-environmental role of drone-based food delivery services and incorporated NAM and TPB into explaining the formation of consumer behavioral intention toward drone food delivery services. Their analysis results based on 401 samples provided empirical evidence that each construct of NAM (i.e., problem awareness, ascribed responsibility, and personal norm) and TPB (i.e., attitude, subjective norm, and perceived behavioral control) is a strong indicator of individual behavioral intention. Meanwhile, the premise of VBN theory is that personal values contribute to building beliefs, and consequently, personal norm; this theory has been proven to be powerful in predicting an individual's environmentally responsible behavior/intention (Han & Hwang, 2017; Van Riper & Kyle, 2014). A stream of these studies has validated the key constructs stemming from current theories in explaining consumer pro-environmental behavioral intention. However, additional attempts have been made to extend existing theories by adopting other variables and providing new insights of prominent variables, such as personality traits, in explaining consumer eco-friendly behavior/intention with improved predicting power.

Studies have investigated the roles of self-efficacy, self-esteem, and environmental consciousness level on the basis of several concepts related to individual psychological mechanisms (Kornilaki et al., 2019; Martínez García de Leaniz et al., 2018). In this regard, Bradley and Sparks (2002) recognized locus of control as the most enduring and predictive construct among various personality traits identified in the social science literature. Locus of control is described as the degree to which individuals believe or perceive that they can affect outcomes through their behavior; it is categorized into internal and external loci of control (Rotter, 1966). The former refers to people who hold control and perceive that outcomes depend on their input; the latter describes people who believe that they are powerless and that outcomes are beyond their control (Cleveland et al., 2012; Lefcourt, 1991; Rotter, 1966; Yang & Weber, 2019). In line with the notion of internal locus of control, INELOC is defined as "a construct that captures individuals' multifaceted attitudes pertaining to personal responsibility toward and ability to affect environmental outcomes" (Cleveland et al., 2012, p. 293). Similarly, INELOC has been proposed as an important variable for building consumer intention toward pro-environmental behavior (Aguilar et al., 2008; McCarty & Shrum, 2001). Despite studies adopting Rotter's locus of control (1966) in the field of environmental behavior, Guagnano (1995) argued that locus of control should be

regarded as multifaceted because subtleties will not be articulated in the environmental context. Accordingly, Cleveland et al. (2012) addressed the necessity for multidimensional characteristics of INELOC and presented four underlying dimensions: green consumers, activists, advocates, and recyclers.

Green consumers refer to a group of individuals who live by a personal ethic and have complete confidence in their ability to make a difference toward sustainable development by using pro-environmental products or services and boycotting environmentally unfriendly companies. By contrast, Dono et al. (2010) described activists as people who are committed to public actions to improve the environmental quality of a policy/system and influence the broader population. Similarly, participating in demonstrations and providing financial support are frequently exemplified as their active involvement in sustainability (Fielding et al., 2008). Compared with activists, advocates engage in environmental movements that are less public and require lower commitment (Larson et al., 2015). Hence, advocates typically persuade families, friends, or colleagues to participate in environmentally responsible activities. Lastly, recyclers refer to people with a routine recycling behavior. The effort and time or inconvenience of recycling is part of individual volition; thus, recyclers are recognized as citizens who have a relatively simple and affordable environmental commitment (Iyer & Kashyap, 2007). This multidimensional INELOC, which distinguishes customers' propensity, has been adopted in the ecological context; its superior predicting power was articulated by Cleveland et al. (2012) and Colebrook-Claude (2019). Cleveland et al. (2012) argued that a unidimensional conceptualization of INELOC fails to capture the fine details in the context of sustainability. By contrast, multidimensional INELOC provides a more comprehensive understanding because it illustrates individual expressions of control over the environment.

### ***Anticipated emotions***

Emotions are the affective responses of individuals to the perception of a certain situation (Clore et al., 1987). Emotions exert a significant impact and account for differences in individual sustainable behavior (Kals & Maes, 2002). Numerous studies on emotions have regarded emotions as informative cues that induce customer behavior/intention. For example, Xie et al. (2015) studied corporate green actions and investigated the mediating role of moral emotions on individual characteristics in consumer responses toward pro-environmental behavior. Their results showed significant associations among varied individual characteristics, moral emotions, and consumer responses. In particular, negative moral emotions (i.e., contempt, anger, and disgust) generate negative responses, such as negative word of mouth and complaints, among consumers. By contrast, positive emotions lead to positive responses, such as positive word of mouth and investment, among consumers. Nonetheless, this stream of research fails to assess the relevance of anticipation of the affective outcome of future decisions. In addition, the concept of prospect-based emotions, which refers to an individual's anticipated post-behavioral affective responses, was proposed.

Considering that drone food delivery services are not yet fully commercialized at present, the current study adopted the notion of anticipated emotions. Mellers and McGraw (2001) conceptualized anticipated emotions as guides to consumer decision-making. These authors presented decision affect theory and claimed that individuals anticipate emotions of future outcomes when they make decisions, which, in turn, influences the choice of options. That is, people generally predict the emotional consequences of their future decisions prior to making decisions, and these anticipated emotions influence their decision-making. Similarly, Baumgartner et al. (2008) asserted that anticipated emotions will encourage the formation of an individual's behavioral intention to engage in a certain behavior. Furthermore, numerous scholars have proposed anticipated emotions that consist of positive anticipated emotions (e.g., delighted, excited, happy, and

proud) and negative anticipated emotions (e.g., depressed, disappointed, guilty, and uncomfortable) (Ahn & Kwon, 2020; Han et al., 2018; Onwezen et al., 2013; Perugini & Bagozzi, 2001). In this regard, Bagozzi et al. (2016) explained that people's decisions are generally influenced by the pursuit of positive emotions or the avoidance of negative emotions.

Following this line of research, the role of anticipated emotions in eco-friendly behavioral intention and innovative product adoption has been supported in diverse settings (Baumgartner et al., 2008; Han & Hwang, 2017; Han et al., 2018; Hwang et al., 2019; Piçarra & Giger, 2018). Onwezen et al. (2013) conducted analyses to examine the function of anticipated pride and guilt in environment-friendly behavior within the NAM model and an integrated NAM–TPB framework. The results based on 617 Dutch respondents indicated the mediating role of anticipated pride and guilt on the link between personal norm and behavior. Han et al. (2017) explored the progression of customers' eco-friendly behavior and developed a value–belief–emotion–norm framework based on the VBN model. They found that perceived ability exerts a significant impact on reducing the threat to an anticipated feeling of pride; they also confirmed that emotional states play an important role in generating intention. Rezvani et al. (2017) examined consumer adoption of sustainable products, and their analysis results demonstrated the direct influence of anticipated emotions on consumer adoption of pro-environment products. Similarly, anticipated emotions have been found to play a significant role in technology adoption. For example, Piçarra and Giger (2018) adopted a goal-directed model to assess the level of customer intention to work with robots. Their results confirmed the significance of anticipated emotions in the formation of an intention to work with robots.

### ***Intentions to use***

Behavioral intention refers to the likelihood of individual engagement with a specific behavior (Chua et al., 2019; Moon & Han, 2019; Oliver, 1997); it has been measured using various subdimensions, such as intention to use, word-of-mouth intention, and willingness to pay a higher price (Han et al., 2018; Hwang et al., 2019; Kim & Hwang, 2020; Zeithaml et al., 1996). Among the proposed underlying dimensions of behavioral intention, intention to use has been examined as a strong indicator in the context of sustainability (Han et al., 2019; Hwang & Kim, 2019; Meng et al., 2020; Rezvani et al., 2017). In addition, customer intention to use has been extensively studied as an important predictor of actual behavior in the field of technology adoption (Han et al., 2019; Hwang et al., 2019; Hwang et al., 2019; Okumus & Bilgihan, 2014; Trang, Lee, & Han, 2019). In particular, many studies have adopted the technology acceptance model, and customer intention to use has been widely utilized to measure consumer adoption and willingness to try new technology once it becomes available. For example, Okumus and Bilgihan (2014) tested intention to use to investigate the utilization of smartphone applications as innovative tools for promoting healthy eating behavior among customers when ordering food in restaurants.

### ***Hypothesis development***

#### ***Effect of INELOC on anticipated emotions***

Extant studies on eco-friendly behavior/intention are abundant, and the significant association between consumer belief in environmental protection and emotions has been demonstrated in a number of studies. For example, Moons and De Pelsmacker (2012) centered on sustainable value of electric car usage and recognized the different customer segment. They categorized 1,202 Belgians into environmental concern, environmental behavior, opinion leadership, and personal values and the significant role of emotions was illustrated in more environment-oriented groups. Koenig-Lewis et al. (2014) tested consumer emotional evaluations of ecologically responsible packaging, and their results confirmed that individual concern with environmental issues



significantly influences positive emotions. Powell and Bullock (2014) explored the relationships among individuals' predispositions toward nature, emotional experience, and conservation mindedness based on 408 pieces of data collected in New York. They measured individuals' propensity toward nature by questioning their level of interests and commitment to conservation efforts or organization and reported the significant association between the dispositions of the people toward nature and emotional responses. Jang et al. (2015) conducted an online survey among 312 coffee customers to examine the moderating role of green consciousness. Their results found that consumers with a high degree of green consciousness displayed stronger emotional attachment and responded more positively to green practices than those who are less environmentally conscious. Xie et al. (2015) examined the role of the individual characteristics of people, such as demonstrating a high value for social justice and having high morals in the relationship between green activities conducted by enterprises and consumer emotional reactions. The results reliably supported the notion that individuals who are empathetic tend to exude positive emotions that induce favorable word of mouth. Gravante and Poma (2016) carried out a series of in-depth interviews with four self-organized environmental groups in Mexico. Their findings described how and where environmental activism begins and its association with emotions which influence the organizational choices. Han et al. (2018) studied biospheric value, environmental concern, awareness of consequences, and ascription of responsibility as cognitive drivers of green behavioral intention. Their analysis results based on 302 samples from US cruise passengers indicated the statistically supported association between cognitive triggers and affective drivers (i.e., positive and negative anticipated emotions) in an environmentally responsible manner. In particular, these researchers confirmed that environmental concerns influence the formation of positive and negative anticipated emotions. Chiang et al. (2019) reported the significant relationship between locus of control and emotional stability in inducing customer pro-environmental behavior through an empirical analysis of 473 responses collected in Taiwan. The aforementioned studies imply that INELOC is related to anticipated emotions, and the following hypotheses are proposed accordingly.

Hypothesis 1a: Green consumers will relate significantly to positive anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 1b: Green consumers will relate significantly to negative anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 2a: Activists will relate significantly to positive anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 2b: Activists will relate significantly to negative anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 3a: Advocates will relate significantly to positive anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 3b: Advocates will relate significantly to negative anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 4a: Recyclers will relate significantly to positive anticipated emotions toward eco-friendly drone food delivery services.

Hypothesis 4b: Recyclers will relate significantly to negative anticipated emotion toward eco-friendly drone food delivery services.

### ***Effect of anticipated emotions on intention to use***

Numerous attempts have been made to involve positive and negative anticipated emotions in explaining customer pro-environmental behavior/intention; and significant associations have been supported by empirical evidence (Koenig-Lewis et al., 2014; Perugini & Bagozzi, 2001; Piçarra & Giger, 2018). Mellers and McGraw (2001) examined how anticipated emotions are



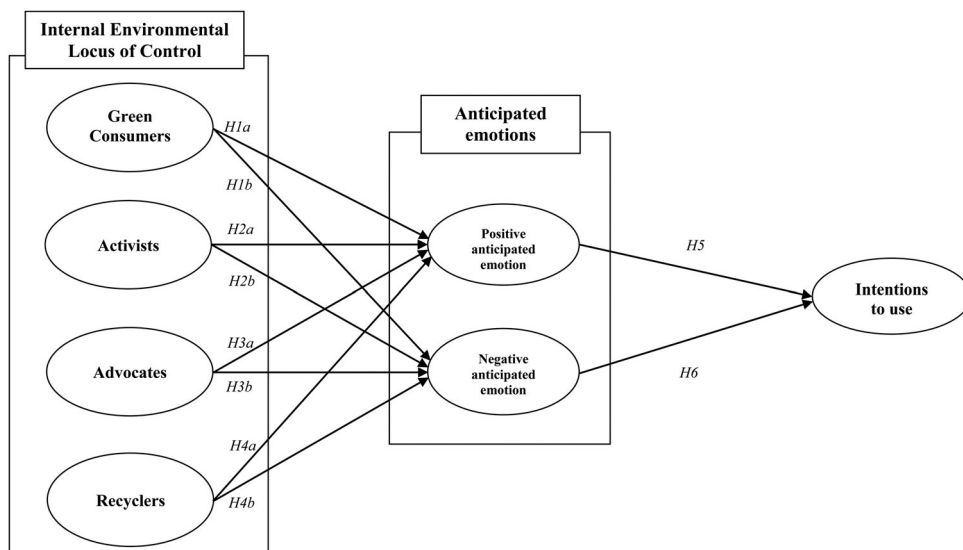


Figure 1. Proposed conceptual model.

related to the choices people make through laboratory and real-world studies. They found a significant relationship between anticipated emotions and decision-making, and they explained that people tend to choose the option with greater average pleasure. Kals and Maes (2002) tested the association between emotions and behavioral intention; they demonstrated the prominent role of emotions in predicting an individual's pro-environmental willingness. In particular, their data analysis based on 281 German samples indicated that anger and affinity are related to behavioral intention. Baumgartner et al. (2008) explored the impact of future-oriented emotions on motivating goal-directed behavior. Their results provided evidence that positive and negative anticipated emotions influence behavioral intention. Ha (2018) built a framework based on regret theory and analyzed 805 samples to predict consumer behavior in the field of new technology. The analysis results indicated that anticipated regret affected customer adoption level of innovative technology. Ahn and Kwon (2020) focused on green practices in the hotel industry and confirmed the salient impact of positive and negative anticipated emotions on environment-friendly behavioral intention toward green hotels. Accordingly, we present the following hypotheses.

Hypothesis 5: Positive anticipated emotions will relate significantly to intention to use eco-friendly drone food delivery services.

Hypothesis 6: Negative anticipated emotions will relate significantly to intention to use eco-friendly drone food delivery services.

## Research model

By integrating the aforementioned theoretical background and empirical evidence, the current study developed a conceptual model for exploring the associations among INELOC, anticipated emotions, and intention to use eco-friendly drone food delivery services (Figure 1).

## Methodology

### Measurement items

The present study used multiple-item scales adopted from prior studies. First, INELOC included four sub-dimensions: green consumers, environmental activists, environmental advocates, and

recyclers. These subdimensions were measured using 16 items from Cleveland et al. (2005) and Cleveland et al. (2012). Second, anticipated emotions consisted of two subdimensions: positive and negative anticipated emotions. These subdimensions were measured using six items from Perugini and Bagozzi (2001, 2004) and Hwang et al. (2019). Lastly, intention to use was measured using three items from Hwang and Lyu (2018) and Zeithaml et al. (1996). All measurement items were measured with a seven-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

The questionnaire was thoroughly reviewed by two groups of experts: (1) three faculty members with a major research focus on the restaurant industry and (2) individuals holding a remote pilot certificate. After confirming that the questionnaire items exhibited no problems, a pretest was conducted among 50 restaurant customers through an online survey in South Korea. To enable the respondents to clearly understand the importance of drone food delivery services in protecting the environment, a 2 min newspaper article on the environmental benefits of drone-based delivery services was provided to the respondents before the survey began. The data analysis results indicated that the Cronbach's alpha values for all the constructs were greater than 0.70, suggesting a high level of reliability (Nunnally, 1978).

### **Data collection**

Data collection was achieved using an online survey company, which is one of the biggest companies in South Korea. This study is related to food delivery services, so the survey was conducted among restaurant customers who had used food delivery services within the last 6 months. The respondents filled the survey form after reading the newspaper article that was used on the pretest before starting the survey. The newspaper article used in the pretest explained the eco-friendly role of the drone food delivery service compared to the current delivery services. The survey company sent an invitation email to 4,525 panelists. Among them, 442 participated in the survey. It showed a participation rate of about 10%. In addition, 37 samples were deleted due to multicollinearity problems and visual inspections. In particular, because these outliers distort the statistical results (Agresti & Finlay, 2009), we exclude them from statistical analysis. Finally, 405 samples were used for statistical analysis.

### **Data analysis**

#### **Profile of survey respondents**

Table 1 provides the profile of the survey respondents. Among the respondents, 200 were males (49.4%) and 205 were females (50.6%). In terms of monthly household income, 27.7% of the respondents indicated that their household income ranged from US\$1,001 to US\$2,000. In addition, 50.4% of the respondents were single and 48.6% were married. With regard to education level, most of the respondents held a bachelor's degree (63.7%,  $n = 258$ ). Lastly, mean age was 37.81 years old.

#### **Confirmatory factor analysis (CFA)**

Table 2 presents the CFA results. CFA was used to evaluate composite reliability, convergent validity, and discriminant validity. The CFA model provided a suitable fit for the data, i.e.,  $\chi^2 = 383.849$ ,  $df = 168$ ,  $\chi^2/df = 2.285$ ,  $p < 0.001$ , normed fit index (NFI) = 0.960, incremental fit index (IFI) = 0.977, comparative fit index (CFI) = 0.977, Tucker–Lewis index (TLI) = 0.971, and root mean square error of approximation (RMSEA) = 0.056. All factor loadings were  $\geq 0.813$  ( $p < 0.001$ ).

Table 1. Profile of survey respondents ( $n = 405$ ).

Variable	<i>n</i>	Percentage
<b>Gender</b>		
Male	200	49.4
Female	205	50.6
<b>Monthly household income</b>		
US\$6,001 and over	23	5.7
US\$5,001-US\$6,000	14	3.5
US\$4,001-US\$5,000	36	8.9
US\$3,001-US\$4,000	51	12.6
US\$2,001-US\$3,000	109	26.9
US\$1,001-US\$2,000	112	27.7
Under US\$1,000	60	14.8
<b>Marital status</b>		
Single	204	50.4
Married	197	48.6
Widowed/Divorced	4	1.0
<b>Education level</b>		
Less than High school diploma	48	11.9
Associate's degree	62	15.3
Bachelor's degree	258	63.7
Graduate degree	37	9.1
<b>Mean age = 37.92 years old</b>		

As presented in Table 3, the composite reliability values ranged from 0.930 to 0.964, which were higher than the recommended level of 0.600 (Bagozzi & Yi, 1988). Thus, all the constructs have acceptable internal consistency. In addition, the average variance extracted (AVE) values fell within the range of 0.792–0.899; thus, they were greater than the suggested cutoff of 0.500 (Hair et al., 2006), signifying high convergent validity levels. Lastly, the AVE values for all the constructs were greater than all of the squared correlations ( $R^2$ ) between all possible pairs of constructs, indicating adequate discriminant validity.

**Structural equation modeling (SEM)**

SEM was conducted to validate the proposed hypotheses. The overall evaluation of model fit exhibited an acceptable fit of the model to the data ( $\chi^2 = 410.410$ ,  $df = 173$ ,  $\chi^2/df = 2.372$ ,

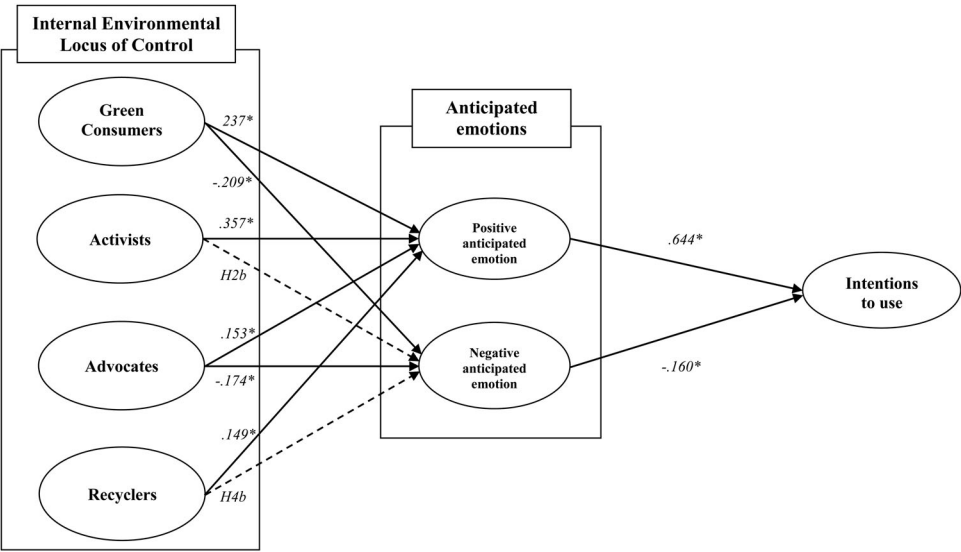


Figure 2. Standardized theoretical path coefficients.

**Table 2.** Confirmatory factor analysis: Items and loadings.

Construct and scale items	Standardized Loading <sup>a</sup>
<b>Green consumers</b>	
The sooner consumers start buying greener products, the sooner companies will transform to respond to their demands.	.929
The more I buy 'green' products, the more I help persuade companies to become 'friendlier' to the environment.	.941
By buying greener products, I can make a difference in helping the environment.	.887
<b>Activists</b>	
Any donation to environmental groups helps it attain its goals.	.878
The efforts deployed by environmental groups have an impact on the end result of many ecological challenges.	.930
By making donations to pro-environmental groups, I can help make a positive difference on the state of the environment.	.920
<b>Advocates</b>	
I am able to convince a friend to change his/her conservation habits.	.926
I am able to convince some of my friends to take some kind of action with regards to environmental challenges.	.913
If willing, people can generally influence their friends' transportation habits.	.827
<b>Recyclers</b>	
By recycling, I am helping to reduce pollution.	.939
By recycling, I am doing my part to help the state of the environment.	.953
By recycling, I am saving valuable natural resources.	.952
<b>Anticipated emotions</b>	
<b>Positive anticipated emotion</b> If I use an environmentally friendly way, such as drone food delivery services, I will feel ...	
Excited	.870
Delighted	.930
Happy	.931
<b>Negative anticipated emotion</b>	
If I use an environmentally friendly way, such as drone food delivery services, I will feel ...	
Disappointed	.813
Depressed	.944
Uncomfortable	.947
<b>Intentions to use</b>	
I will use drone food delivery services when ordering food.	.947
I am willing to use drone food delivery services when ordering food.	.940
I am likely to use drone food delivery services when ordering food.	.952

Goodness-of-fit statistics:  $\chi^2 = 383.849$ ,  $df = 168$ ,  $\chi^2/df = 2.285$ ,  $p < .001$ , NFI = .960, IFI = .977, CFI = .977, TLI = .971, RMSEA = .056.

Notes 1: <sup>a</sup>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.

$p < 0.001$ , NFI = 0.957, IFI = 0.975, CFI = 0.975, TLI = 0.969, RMSEA = 0.058). The SEM results showed that eight of the ten hypotheses were statistically accepted, but two hypotheses were rejected (see Figure 2 and Table 4). In particular, green consumers ( $\beta = 0.237$ ,  $p < 0.05$ ), activists ( $\beta = 0.357$ ,  $p < 0.05$ ), advocates ( $\beta = 0.153$ ,  $p < 0.05$ ), and recyclers ( $\beta = 0.149$ ,  $p < 0.05$ ) exerted a positive effect on positive anticipated emotions. Thus, Hypotheses 1a, 2a, 3a, and 4a were supported. In addition, green consumers ( $\beta = -0.209$ ,  $p < 0.05$ ) and advocates ( $\beta = -0.174$ ,  $p < 0.05$ ) exerted a negative effect on negative anticipated emotions; hence, Hypotheses 1b and 3b were supported. However, activists and recyclers had no effect on negative anticipated

**Table 3.** Descriptive statistics and associated measures.

	No. of Items	Mean (SD)	AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Green consumers	3	5.39 (1.00)	.845	<b>.942<sup>a</sup></b>	.643 <sup>b</sup>	.498	.663	.635	-.363	.561
(2) Activists	3	5.08 (1.04)	.827	.413 <sup>c</sup>	<b>.935</b>	.424	.548	.651	-.273	.528
(3) Advocates	3	4.67 (1.03)	.792	.248	.180	<b>.919</b>	.536	.492	-.330	.507
(4) Recyclers	3	5.34 (1.05)	.899	.440	.300	.287	<b>.964</b>	.581	-.327	.467
(5) Positive anticipated emotion	3	4.48 (1.12)	.830	.403	.424	.242	.338	<b>.936</b>	-.253	.677
(6) Negative anticipated emotion	3	2.80 (1.27)	.816	.132	.075	.109	.107	.064	<b>.930</b>	-.323
(7) Intentions to use	3	4.51 (1.30)	.896	.315	.279	.257	.218	.458	.104	<b>.963</b>

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.

			Standardized Estimate	t-value	Hypothesis
H1a Green consumers	→	Positive anticipated emotion	.237	3.970*	Supported
H1b Green consumers	→	Negative anticipated emotion	-.209	-2.713*	Supported
H2a Activists	→	Positive anticipated emotion	.357	6.676*	Supported
H2b Activists	→	Negative anticipated emotion	-.017	-.254	Not supported
H3a Advocates	→	Positive anticipated emotion	.153	3.241*	Supported
H3b Advocates	→	Negative anticipated emotion	-.174	-2.840*	Supported
H4a Recyclers	→	Positive anticipated emotion	.149	2.737*	Supported
H4b Recyclers	→	Negative anticipated emotion	-.086	-1.215	Not supported
H5 Positive anticipated emotion	→	Intentions to use	.644	14.485*	Supported
H6 Negative anticipated emotion	→	Intentions to use	-.160	-3.988*	Supported

Goodness-of-fit statistics:  $\chi^2 = 410.410$ ,  $df = 173$ ,  $\chi^2/df = 2.372$ ,  $p < .001$ , NFI = .957, IFI = .975, CFI = .975, TLI = .969, RMSEA = .058.

Notes 1: \* $p < .05$ .

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

emotions. Therefore, Hypotheses 2 b and 4 b were not supported. Lastly, the data analysis results also indicated that positive anticipated emotions ( $\beta = 0.644$ ,  $p < 0.05$ ) and negative anticipated emotions ( $\beta = -0.160$ ,  $p < 0.05$ ) help enhance intention to use, supporting Hypotheses 5 and 6.

## Discussions and implications

Building a sustainable environment in the food service industry has apparently become a social issue, and it is addressed as a primary concern among today's increasingly knowledgeable and mature consumers (Koenig-Lewis et al., 2014; Siddiqui et al., 2018). Home cooking can disappear by 2030, and most meals will instead be ordered by consumers by making arrangements with central kitchens or restaurants to have their food delivered (UBS, 2018). Advancements in innovative technologies have enabled us to consume food conveniently and wisely in many aspects. In particular, drones have emerged as a disruptive innovation in the field of food delivery services, and many experiments have proven the premium value of drones in various areas, particularly in the environment (Goodchild & Toy, 2018; Koiwanit, 2018; Park et al., 2018). Accordingly, drone-based food delivery services have been recognized as a possible solution to achieving the highest HSEQ standards that incorporate the principles of sustainability in modern times.

Customer propensity is prominent, and INELOC has been examined as a salient indicator for explaining customer pro-environmental behavioral intention (Aguilar et al., 2008; Cleveland et al., 2012). In this regard, understanding how INELOC is linked to customer responses in an eco-friendly manner in drone food delivery services is a worthy undertaking. The present study is the first attempt to explore the associations among INELOC, anticipated emotions, and intention to undertake pro-environmental behavior when ordering food delivery services. Moreover, this work focused on drone-based delivery, which is an emerging issue as a disruptive innovation in food

delivery services. A relatively smaller number of studies have connected INELOC and anticipated emotions; however, these two variables have not been used to articulate customer ecological behavior/intention in the context of drone food delivery services. Given that minimal information is available, the present study provides rich theoretical originality and lays the foundation for future research in the field of eco-friendly drone food delivery services. To be specific, a total of ten hypotheses were examined in the current study and eight proposed links were statistically supported. Green consumers were found to be significantly related to positive and negative anticipated emotions which, in turn influence intentions to use. It is interpreted that individuals who have a strong confidence in their pro-environmental actions to improve sustainability consider drone food delivery services in building the optimal emotional experience through increased positive anticipated emotions and decreased negative anticipated emotions, and consequently inducing intention to use. Similarly, advocates showed the significant associations with both positive and negative anticipated emotions which subsequently influence intention to use drone-based food delivery services. That is, drone food delivery services are easily regarded for advocates to motivate the people around them and that lead to the perfect emotional status in increasing intention to use. On the other hand, activists exhibited the significant associations with positive anticipated emotions but not with negative anticipated emotions in the formation of intention to use. These results are construed that, because activities are committed to develop the public morals and create systems to improve sustainability rather than the personal ecological practices, they are not necessarily affecting the negative anticipated emotions in using drone food delivery services. Recyclers displayed the similar results regarding the impact on anticipated emotions, which the influence on positive anticipated emotions was statically supported and the effect on negative anticipated emotions was rejected. We interpret it is due to the fact that drone-based food delivery services are not directly linked to recycling behaviors.

The present study provides empirical evidence for the relationships between multifaceted INELOC and anticipated emotions in the context of drone food delivery services. Bohlen et al. (1993) emphasized the importance of identifying consumers with green consciousness for organizations to communicate their environmental effort to the appropriate group of people. In addition, consumer segmentation depending on environment-specific variables is more adequate and stable than that based on demographic criteria (Cleveland et al., 2012; Straughan & Roberts, 1999), suggesting the superiority of INELOC in consumer segmentation in sustainability. By contrast, Hwang and Hyun (2017) asserted that understanding how different personality traits evoke varying affective responses is helpful for practitioners in developing marketing strategies. In this regard, our work is distinguished from previous studies by determining how customers' multifaceted perceptions of control over the environment are connected with customers' anticipated emotions as a result of their future behavior. These findings are similar to those of prior studies (Chiang et al., 2019; Jang et al., 2015; Koenig-Lewis et al., 2014), suggesting that the close relationship between INELOC and anticipated emotions includes positive and negative anticipated emotions. Hence, our study validated the high levels of rationality for using INELOC to explain an individual's anticipated emotions in the domain of eco-friendly drone food delivery services. Furthermore, our results will be helpful for practitioners in establishing marketing strategies depending on each distinct customer propensity in implementing drone food delivery services. Similarly, food service companies should understand the different propensity of consumers and establish differentiated marketing strategies depending on various segments in contributing to the environmental footprint with greater value return.

Green consumers relate significantly to positive and negative anticipated emotions in using drone food delivery services (Hypotheses 1a and 1b). A green consumer is described as a believer who has a decisive effect on environmental improvement through his/her eco-friendly behavior. Such individuals abide by environmental ethics and tend to refuse harmful processes or products to the environment (Cleveland et al., 2012; Moisander & Pesonen, 2002). Our results indicated that green consumers increased their positive anticipated emotions, but decreased

their negative anticipated emotions through drone-based food delivery services, as exemplified by an environment-friendly mode of food delivery. Thus, using drones for food delivery is appropriate for green consumers. At present, a substantial number of food delivery orders are made via mobile applications. Thus, we suggest that a default option of drone-based delivery be used rather than a menu selection of delivery tools for green consumers. An option to use other delivery modes, such as motorcycles, can be provided, but these choices should be available with an additional charge that will be considered a penalty or cost to reduce environmental damage caused by the selected alternative delivery tool. That is, using an eco-friendly delivery method, namely, drone food delivery services, should be the norm among green consumers, simultaneously enhancing their anticipated positive emotions and reducing their anticipated negative emotions.

The results indicated that activists and positive anticipated emotions ( $\beta = 0.357, p < 0.05$ ) are closely related (Hypothesis 2a). By contrast, activists did not exhibit a correlation with negative anticipated emotions (Hypothesis 2b). That is, activists relate to anticipated positive emotions toward drone food delivery services as an ecologically responsible behavior, but they do not relate to anticipated negative emotions. We inferred that these results are attributed to the characteristics of activists. Activists are typically depicted as individuals who influence people at large to improve infrastructure or systems (Dono et al., 2010; Fielding et al., 2008), and they may be insensitive to the direct negative consequences of relatively small actions. However, activists are still related to positive anticipated emotions through drone food delivery services; thus, food service companies should encourage activists to contribute to inspiring public support and confidence to use drone food delivery services. For example, food delivery service companies can organize informative campaigns that are supported by activists to raise awareness of the environmental roles of drones in food delivery services. Furthermore, collecting donations from activists to roll out complete drone-based food delivery services for small-scale or startup food service companies is recommended as a viable alternative. Thus, activists will be able to reduce their environmental footprint and enhance their anticipated positive emotions by using eco-friendly drone food delivery services.

Advocates and anticipated emotions are deeply involved with each other. In particular, advocates are related significantly to positive and negative anticipated emotions (Hypotheses 3a and 3b). Hence, practitioners should direct advocates to inspire people around them to preserve the environment by using drone-based food delivery services and avoid the use of environmentally harmful delivery tools. When advocates practice “working green” in food delivery services, they should be continuously encouraged to remind people of green deeds and convince those around them to use eco-friendly drone food delivery services. For example, practitioners in food delivery services may run a reward program for advocates who post influential stories or videos on their social networking sites. Meanwhile, the analysis results confirmed that a close association ( $\beta = 0.149, p < 0.05$ ) exists between recyclers and positive anticipated emotions (Hypothesis 4a). By contrast, the relationship between recyclers and negative anticipated emotions was not statistically supported (Hypothesis 4b). Drone-based food delivery services are not directly linked to recycling behavior, possibly explaining why recyclers are not related to negative anticipated emotions. However, consumers with recycling habits exhibit a higher probability of positive anticipated emotions toward ecological food delivery services, and food service companies should pay attention to enhancing this relationship. As previously explained, food delivery services are growing substantially, and an increasing number of customers are using food delivery services for their daily food consumption. Therefore, we suggest that consumers should be led to believe that recyclers’ routine participation in drone food delivery services is part of the effort to protect the environment. That is, having recyclers become fully aware of the environmental roles of drone food delivery services is recommended to build their practices.

Lastly, anticipated emotions exerted a salient influence on intention to use (Hypotheses 5 and 6). These results supported those of previous studies (Hwang et al., 2019; Piçarra & Giger, 2018), suggesting the positive impact of positive anticipated emotions and the negative impact of negative anticipated emotions on intention to use. As we postulated, when individuals anticipate



positive emotions, such as excitement and delight, they demonstrate favorable behavioral intention toward drone food delivery services. By contrast, when people anticipate negative emotions, such as disappointment and depression, their intention to use drone food delivery services is reduced. Our study enhanced the understanding of such relationship by providing an empirical evidence that increasing positive anticipated emotions and reducing negative anticipated emotions will build overall high intention to use drone food delivery services. Therefore, food service companies should understand that people anticipate the emotions that they might experience in the future as a result of the choices they make and recognize the influence of anticipated emotions on customer decisions. Moreover, an effort to increase positive anticipated emotions is necessary. Environmental certifications are regarded as useful tools because they are related to customer behavior in the hospitality context (Martínez García de Leaniz et al., 2018). Similarly, acquiring certifications to formalize the environmental roles of drones in food delivery services may be considered to induce positive anticipated emotions.

### Limitations and future study

Although the objectives of this study were successfully accomplished through extensive literature review and empirical analyses, the findings of this research exhibit the following limitations. First, applying the findings of this study to other regions is difficult because this study collected data only from South Korea. Second, given that drone food delivery services have not been fully commercialized, we failed to measure actual behavior. Pro-environmental behavior is frequently considered not directly connected with intention, and future studies are suggested to measure actual behavior once services become fully available in the market. Another limitation of the current research is that no control variables were included in the data analysis. A number of studies addressed that individuals' attitudes in adopting novel technology were depending on their demographic characteristics (e.g. Hwang & Kim, 2019; Hwang et al., 2019), and therefore it is recommended to include the demographic profiles such as gender and age as control variables in examining the relationships among proposed constructs to increase the predicting power. Last, technical barriers or potential risks are other areas of concern when a new innovative technology is adopted (Okumus & Bilgihan, 2014). Thus, effort to understand consumer unfavorable perception and challenges in accepting drones as food delivery tools will be meaningful.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

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