A study on motivated consumer innovativeness in robotic golf caddies

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Article Info

ABSTRACT

The current study examined the antecedents and consequences of image in the field of robotic golf caddy. Data were collected from 393 golfers in Korea. The data analysis revealed that functionally, hedonically, and cognitively motivated consumer innovativeness are the key factors that affect image. It was also found that image helps in regard to enhancing desire, and then it positively affects intentions to use and WOM intention. Perceived price unfairness of caddy fees additionally moderated the relationship between functionally motivated consumer innovativeness and image. This study is significant from a theoretical perspective as it is the first to identify consumer motivations in the field of robotic golf caddies. From a practical standpoint, the findings offer important implications for the development of marketing strategies for robotic golf caddies, which are currently at the commercialization stage.

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1. INTRODUCTION

Golf is known as an expensive sport, because it requires the purchase of items, such as golf clubs and clothes, and golf is particularly known as an expensive sport, which is due to green fees costing approximately US$150 to US$200 in Korea. Caddy fees have also increased, which makes it a burden to golfers [1]. A golf caddy has the role of helping and serving the needs of their assigned golfers [2]. For example, a golf caddy delivers the golf clubs to the golfer or gives advice about the course strategy. The caddy fees for Korean golf courses are currently approximately US$110, which are up by about 20% compared to before COVID-19. It took 10 years for the caddy fees to increase by 20%, which were US$70 in 2010. However, they rose 20% compared to the existing caddy fee in two years after COVID-19 [3]. Another problem is the quality of the caddies. Caddies who have not received adequate training are only given simple training before they are assigned to golfers. As a result, the quality of the caddy services does not meet the necessary standards, which has led to a significant increase in dissatisfaction among golfers [4].

A robotic golf caddy (hereafter RGC) is being introduced as a potential solution to this issue, but very few golf courses in Korea operate with robotic golf caddies on a trial basis [5]. RGC is a device that carries a golfer's bag and clubs around the golf course. RGC is typically controlled by a remote or an app, and it uses sensors and algorithms in order to navigate the course and avoid obstacles [6]. RGC currently is not commercialized in Korea, so the accessibility of these devices for golfers is limited. RGC is considered a new technology service for this reason. In addition, it is important to study consumer motivation for new technology-based services, such as RGC when they are released, because consumer motivation is considered

to be an internal factor as well as an external factor, which leads future behavior in order to achieve a consumer's goal [7]. There has been no research conducted about how to encourage consumers to use RGC despite the imminent commercialization of robotic golf caddies. It is therefore of great significance to investigate the motivations of the potential consumers in regard to RGC, which has not been previously explored.

In summary, the objective of this paper is to identify the significance of motivated consumer innovativeness (MCI) in the context of RGC for the first time. The results of the paper would offer a critical marketing strategy that is based on consumer motivation in order to commercialize robotic golf caddies.

2. METHOD

A hypothetico-deductive approach was used in the current paper. It carried out a thorough theoretical review for each construct and developed hypotheses based on established theoretical foundations. Following this, data collection and a quantitative approach were implemented, with the details provided in the subsequent sections.

2.1. Literature review
2.2.1. Robotic golf caddy

RGC is an automated device that integrates multiple technologies from an engineering perspective. First, it is equipped with a suspension system to enable stable and smooth movement over hills and uneven terrain [8]. Furthermore, RGC is operated by a remote control with Bluetooth capability that a golfer could attach to their belt/pocket, so they can control the speed and the direction of the caddy using the buttons on the remote [6]. In addition, RGC is equipped with a lithium-ion battery, which can last up to 36 holes on a single charge [9]. Lastly, RGC is equipped with cutting-edge technologies, which include deep learning-based image recognition technology, motion direction control technology, a waterproof function, and a location-based service (GPS), so the price is about US$ 4,000 [10].

2.2.2. Motivated consumer innovativeness (MCI)

Motivated consumer innovativeness is a term that combines motivation and consumer innovativeness. Hwang *et al.* [11] defined MCI as "internal and external factors that lead to consumers' innovative buying behavior", which is based on both definitions. The previous studies identified the four theoretical sub-dimensions of MCI that are related to adopting new technology (i.e., FMCI, HMCI, CMCI, and SMCI) [12]. First, FMCI can be defined as "consumer innovativeness motivated by the functional performance of innovations and focuses on task management and accomplishment improvement" [12]. Second, HMCI refers to "consumer innovativeness motivated by affective or sensory stimulation and gratification" [12]. Next, CMCI is defined as "consumer innovativeness motivated by the need for mental stimulation" [12]. Lastly, SMCI is defined as "consumer innovativeness motivated by the self-assertive social need for differentiation" [12].

2.2.3. The influence of motivated consumer innovativeness on image

Image can be defined as the overall perception, which includes beliefs and impressions that consumers hold towards a specific product [13]. The theoretical framework for this argument is based on the taxonomy of human goals, which explains that beliefs, norms, and behavior are influenced by goals [14]. This means that people's perception of a particular subject is driven by the motivations they pursue. This implies that MCI plays a vital role in regard to shaping their overall perception of the product/service. The prior empirical papers have also supported the link between MCI and image. For example, Lien and Cao [15] found that strong motivations, which include entertainment, sociality, and practicality, help in regards to forming a positive image of new technologies. The recent research by Phang *et al.* [16] showed that FMCI, HMCI, and CMCI are crucial predictors of image.

Hypothesis 1 (H1). FMCI significantly affects the image.
Hypothesis 2 (H2). HMCI significantly affects the image.
Hypothesis 3 (H3). CMCI significantly affects the image.
Hypothesis 4 (H4). SMCI significantly affects the image.

2.2.4. The influence of image on desire

Desire refers to "a state of mind whereby an agent has a personal motivation to perform an action or to achieve a goal" [17]. It is more importantly widely known that when people have a good image, their desire is high [18]. In addition, the previous studies argued that image is an important predictor of desire. For

example, Hudson *et al.* [18] observed that if consumers have a good image toward a destination, their desire to visit it is strong. Zhang *et al.* [19] revealed that consumers who have a positive image of food expressed a stronger desire to eat it.

Hypothesis 5 (H5). Image significantly affects desire.

2.2.5. The influence of image on behavioral intentions

First, intentions to use refers to "the degree that a person has formulated conscious plans to perform or not perform some specified future behavior" [20]. Second, WOM intentions are defined as "informal communication directly at other consumers about the ownership, usage, or characteristics of particular goods and services and/or their sellers" [21]. The current paper proposed the influence of image on BI, which was supported by prior studies. Jin *et al.* [22] indicated that when customers perceive the restaurant's image as innovative, they show a high level of BI. Another study conducted by Tavitiyaman *et al.* [23] focused on the impact of image on BI in the field of smart tourism.

Hypothesis 6 (H6). Image significantly affects intentions to use.
Hypothesis 7 (H7). Image significantly affects WOM intention.

2.2.6. The influence of desire on behavioral intentions

The link between desire and BI can be explained by the model of goal-directed behavior [24], which suggests that the most significant factor that influences intention/behavior is the level of desire to participate in a specific behavior. The consumer behavior-related studies provide empirical evidence to support the effect of desire on BI. Chiu *et al.* [25] discovered that the desire to use online shopping services has a positive impact on BI. Huang *et al.* [26] concluded that desire is a crucial factor in the formation of BI.

Hypothesis 8 (H8). Desire significantly affects intentions to use.
Hypothesis 9 (H9). Desire significantly affects WOM intention.

2.2.7. The moderating function of perceived price unfairness of caddy fees

Perceived price unfairness has been extensively studied in the context of consumer behavior [27], and it refers to a consumer's evaluation of whether the difference between a particular seller's price and a reference price is unreasonable or unjustifiable [28]. The equity theory theoretically supports the moderating function of perceived price unfairness. The equity theory suggests that parties compare the ratio of inputs to outcomes with each other in social exchanges [29]. This means that consumers who are contemplating a purchase evaluation consider the amount they pay and receive as well as also the costs the firm incurs and the price that the product is sold at according to the equity theory [30]. Consumers more importantly perceive price unfairness for a particular product hinders their motivation to use the product, which leads an unfavorable attitude toward the product [31]. It can be inferred that if golfers think the current caddie fees are unfair, they will have a good image of RGC. Riquelme *et al.* [32] also found that consumers who perceive high levels of price unfairness have more negative emotions than customers who do not in the hotel-booking context. Opata *et al.* [33] suggested that when consumers perceive that the price of a product is not fair, their attitude toward the product is worse than the attitude of customers who perceive that the price of the product is fair.

Hypothesis 10a-d (H10a-d). Perceived price unfairness plays a moderating function in the relationship between MCI and image.

2.3. Measurement

First, the 12-item scales that were employed to measure MCI were borrowed from Hwang *et al.* [11] and Vandecasteele and Geuens [12]. Second, the three items for image were adapted from Ajzen [34] and Choe *et al.* [35]. Third, the three measurement items for desire, which were borrowed from Zhang *et al.* [19] and Perugini and Bagozzi [24], were also included. BI, which include intentions to use and WOM intention, were cited from Kim *et al.* [36], and they were measured using six items. Lastly, perceived price unfairness was measured using three items that were borrowed from Darke and Dahl [37] and Riquelme *et al.* [38].

2.4. Data collection

An online survey was used in order to distribute the questionnaires to the respondents in Korea. A video was shown in order to help respondents understand how RGC operates during a round. 393

respondents were used for further analyses. The results of the data analysis indicated that all constructs had Cronbach's alpha values greater than .70, which indicates high reliability [39].

3.   RESULTS AND DISCUSSION
This section presents the research findings, accompanied by a detailed discussion. The results are displayed in figures and tables.

3.1. Respondents' characteristics
Of the respondents, 56.7% ($n = 223$) were male. The largest number of respondents, which was 37.7%, were in their 20s ($n = 148$). Additionally, the largest category, which included 59.0% of the respondents, was bachelor's degree ($n = 232$) in regard to the education level. 29.8% of the respondents indicated that their monthly household income was under $1,000, and the majority of the respondents, which was 56.2%, indicated that they were single ($n = 221$).

3.2. Confirmatory factor analysis
The CFA results indicated that the model fit was acceptable. Moreover, all of factor loadings are greater than .784 with a significant at a level of .001. This means that all constructs have strong convergent validity. The AVE scores were greater than the .50 standard for all constructs, and all of the squared correlations (R^2) values were lower than the AVE for each construct, which supports the convergent and discriminant validity of the proposed concepts. Furthermore, the composite reliabilities were higher than .7, which indicates a high level of internal consistency.

3.3. Structural equation model
The proposed model indicates an acceptable fit to the data [40]. All of the nine proposed hypotheses were statistically supported at $p < .05$ except for the link between SMCI and image. Image was positively impacted by FMCI, HMCI, and CMCI. These results indicated that H1, H2, and H3 were partially accepted. Hypothesis 5, 6, and 7 were accepted, because image positively affects desire, intentions to use, and WOM. Lastly, the results showed that desire significantly affects intentions to use and WOM intention, which supports H8 and H9.

3.4. Moderating function of perceived price unfairness of caddy fee
The difference in the degrees of freedom was used to evaluate the differential effects of the moderator [40]. The original sample of the current study ($n = 393$) was divided into two sub-groups, which included a group with a low level of perceived price unfairness of caddy fees and a group with a high level of perceived price unfairness of caddy fees, by using a median split of the moderator score. The data analysis results indicated that perceived price unfairness of caddy fees plays an important moderating function in the relationships between FMCI and image ($\Delta\chi^2 = 4.219 > \chi^2 = .5(1) = 3.84$ and df = 1), which supports Hypothesis 10a. However, Hypotheses 10b, 10c, and 10d were not statistically supported.

3.5. Discussions and implications
3.5.1. Theoretical implications
First, the data analysis results indicated that FMCI plays a crucial role in regard to forming a favorable image of RGC. Lien and Cao [15] also found that functional motivation is a vital factor in regards to developing an image of new technology-based services. This study's significant theoretical implication is that the relationship between FMCI and image was firstly established in the context of RGC when it was compared with the previous studies.

Second, the results of the data analysis revealed that HMCI has a significant impact on image. Phang et al. [16] also suggested that when customers perceive high levels of functional motivation toward a new technology-based service, they would have a favorable image of the service. Phang et al. [16] in particular argued that HMCI has the most significant impact on the image compared to other MCIs. This study confirmed the existing theoretical background as well as expanded it in this regard by discovering the significant impact of HMCI on image in the context of RGC.

Third, the study's finding verified the significance of CMCI in the field of RGC, because RGC was discovered to have a significant impact on image. In addition, Vandecasteele and Geuens [12] revealed that CMCI is a critical antecedent of the outcome variables. For example, they proposed a theoretical research model that confirmed high levels of CMCI positively influence attitude in a new technology field. In this regard, this study contributes to literature in the field of technology-based services.

Fourth, the study showed that image has a positive impact on desire, which in turn positively affects intentions to use and WOM. There have been only a few studies in the history of technology research that emphasized the importance of image [18], which suggests that image plays an important role in the formation of the outcome variables, such as desire and BI. This study therefore was able to confirm and broaden the significant role of image by finding its impact on desire, intention to use, and WOM for the first time in the context of RGC.

Fifth, the results of the multiple-group analysis revealed that perceived price unfairness moderates the relationship between FMCI and image. The result of this study is similar to the result of the previous studies, which identified the moderating function of perceived price unfairness in other areas. For example, Riquelme *et al.* [32] suggested that customers who perceive a high degree of price unfairness have more negative emotions compared to consumers who perceive a low degree of price unfairness when booking a hotel using an online system. This study is distinguished from the previous research in this regard, because it is the first study that identifies the moderating function of perceived price unfairness in the field of RGC, which makes it a vital theoretical implication.

3.5.2. Managerial implications

First, one caddy is in fact in charge of four golfers in Korea. The game of golf is often delayed due to the caddy having to pick up the clubs from the golf cart. However, a golf game is played quickly in the case of using RGC, because it provides a personal service to the customers. Furthermore, the customers would recognize that RGC is very convenient during a round of golf, because it informs the golfers of the distance to the pin via a GPS that is installed in the RGC [10]. If these types of innovative functional aspects of the RGC are therefore emphasized to potential consumers, they would positively perceive the image of RGC.

Second, human golf caddies play the role of providing simple services as opposed to entertaining golfers in Korea. However, it is required above all for RGC to be exciting and stimulating for the potential consumers of it. For example, a service that is recommended is to install a camera on RGC in order to record a round of golf and provide images after a round of golf. This camera system is widely used in other fields currently, and its cost is also reasonable. In addition, the drone is employed in order to provide food ordering services during a round in Japan. If a food delivery service that uses a drone is provided, which is based on a real-time GPS tracker that is mounted on RGC, the golfers would recognize a high level of HMCI, and then it significantly affects the image of RGC.

Third, the golf course managers need to put in a considerable amount of effort in order to satisfy the cognitive needs of the consumers. For example, RGC includes various technology mechanisms, such as anti-deviation technology, automatic driving, and an eco-friendly battery, so if these technology mechanisms are highlighted to the consumers, it would stimulate the consumers' intellectual curiosity. Furthermore, it is recommended to emphasize the innovative aspect of RGC when advertising, so the consumers are then more likely to have a favorable image of RGC.

Fourth, it was previously explained that the caddy fees have risen in Korea since Covid-19 [3]. Also, the dissatisfaction among golfers has increased, because unqualified caddies are put into work [4]. The golfers may think that caddy fees are unfair in this situation compared to the services that they receive from a caddy. These types of golfers more importantly have a more favorable image of RGC than the golfers who do not. If it is therefore emphasized that the current caddy fees are unreasonable when promoting RGC, the customers are more likely to have a favorable image of RGC.

4.   CONCLUSION

The purpose of this study was to explore how an image is formed and its resulting variables in the context of RGC. For this, data were collected from 393 golfers in Korea. The results of data analysis revealed that FMCI, HMCI, and CMCI positively affect image. Moreover, this study confirmed the influence of image on desire, and then it positively affects intentions to use and WOM intention. Lastly, the moderating function of perceived price unfairness was identified in the relationship between functionally motivated consumer innovativeness and image.

There are some limitations that need to be acknowledged despite the crucial theoretical and practical implications of this research. First, the study was conducted solely in Korea, so it may be necessary for future research to gather data from other regions in order to validate the models that are presented in this study. Second, data were collected using an online survey, which may lead to selection biases according to Wright. It is therefore recommended for future studies to adopt alternative data collection methods in order to minimize the biases. Lastly, this study was conducted on RGC, so it might be limited to generalize the findings to other industries.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY

The authors do not have permission to share the data.

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