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FITNESS APP USAGE INTENTION: INVESTIGATING CONSUMER INNOVATIVENESS AND THE TECHNOLOGY ACCEPTANCE MODEL

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Abstract

The purpose of this study is to investigate innovative fitness app usage intention by extending the explanatory power of Technology Acceptance Model (TAM) by adding a new variable, consumer innovativeness. This variable, which has been found to be a significant predictor of explaining adoption behavior in technology, was examined to further understand behavior intention in the fitness segment of the sport industry. Consumer innovativeness – along with the original TAM variables of perceived usefulness (PU) and perceived ease of use (PEU) – was examined to determine its influence on fitness app usage intention. The data collected from 356 survey respondents were used to test the proposed hypotheses. SPSS and AMOS were used to check measurement reliability, participants' demographic characteristics, model fit, and the path coefficient of the proposed model. The findings revealed that consumer innovativeness (and PU) affected innovative fitness app usage intention. PEU was found to have no such effect. The results contribute to TAM research by adding consumer innovativeness as a significant variable in examining fitness apps. Furthermore, the study provides practical contributions to the fitness technology area of the sport industry.

Keywords: Fitness app, technology acceptance model, consumer innovativeness

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Introduction

After the Covid-19 breakout, people's exercise methods have undergone tremendous changes. Regardless of what people may have thought about working out at home in the past, the at-home workout option has emerged as a popular exercise option for people while they maintain social distancing. Even with the reopening of gyms, many people continue to prefer the at-home workout option (King, 2020), and there is a perception that going to the gym will be a thing of the past (SWNS, 2020). The fitness application (apps) technology segment has worked to capitalize on this trend. Several leading sport businesses (e.g., Lululemon, Peloton) have been accelerating the development of the fitness market by collaborating with technology companies to provide customized training through apps to individuals, which gives consumers various options to accept new programs and exercise methods, rather than visiting the gym (McManus, 2022).
In addition to the increase in the download of paid apps related to fitness, the demand for online fitness programs has increased (Falardeau et al., 2021). Recently, many online fitness apps have emerged, and apps that provide personalized training plans and functions that incorporate technologies (e.g., FitCoach App, Yoga-Go) have gained popularity among the public. Fitness-related apps have been studied in various fields because such apps can apply various technologies and potentially influence people's well-being (Suh & Li, 2022). However, research on the intention to use fitness apps from the perspective of fitness consumers and the theoretical approach to fitness app usage intention remains in its early stages.

It has been posited that the behavior of downloading and using fitness apps can be treated as an acceptance intention for the app and content (Bae & Shin, 2020; Kwon et al., 2021). Fitness apps and technologies that can be applied to fitness apps are in rapid development, and the number of users has increased. Furthermore, fitness apps are relatively more structured and personalized than existing video platforms (e.g., YouTube). Fitness apps are likely to perform high because they often incorporate new technologies. However, technological advancements create barriers to adopting and using cutting-edge fitness apps (Roh & Kim, 2020). Therefore, in order to better understand the intention of fitness app users, the technology acceptance model (TAM) is used to investigate the behavioral intention of people in this study. TAM, which serves as the theoretical underpinning of this study, is a model that explains what triggers consumers' technology acceptance behavior (Davis, 1989). Specifically, one part of the theory involves

perceived usefulness (PU), which holds that behavioral intention would be affected if people perceived that particular technology would improve their productivity and efficiency. Another theory component is perceived ease of use (PEU), which holds that behavioral intention would be affected by the degree to which an individual perceives that using technology would be free of effort.

While TAM has been found to be a useful theory to explain consumers' technology adoption behavior (Ha & Stoel, 2009), adding another variable, such as consumer innovativeness, would complement the explanatory power of TAM (Im et al., 2003). As such, the purpose of the study is to examine the relative impact of perceived usefulness, perceived ease of use, consumer innovativeness on consumers' behavioral intention to use a fitness app. The findings are expected to make practical contributions to fitness app development and marketing strategies by identifying the factors that affect fitness app users' behavioral intention.

Theoretical Background

In order to explain and predict people's usage intention of fitness apps, perceived usefulness, perceived ease of use, and consumer innovativeness are utilized as prominent factors in this study. The theoretical foundation of the study involves three particular areas of focus: the technology acceptance model (TAM), consumer innovativeness, and fitness applications.

Technology Acceptance Model (TAM)

TAM is a theory proposed to investigate the behavior of accepting, adopting, and rejecting technology (Davis, 1989), and its explanatory power has been proven in various fields, including business (Ha & Stoel, 2009), information technology (Gefen & Straub, 1997), and education (Park, 2009). The TAM model includes external variables, perceived usefulness, perceived ease of use, and behavioral intention use (Venkatesh & Davis, 2000). Perceived usefulness is an evaluation that an individual using information technology will improve their work performance or quality of life by using a specific technology that has not existed before. Perceived usefulness can be viewed as the degree of mental and physical effort required to accept and use a product (Venkatesh, 2015). Perceived ease of use (e.g., perceptions by consumers regarding how much effort they need to put to use a particular technology) affects perceived usefulness, and these two variables affect behavior intention (e.g., usage intention).

Various theories (e.g., extended technology acceptance model, unified theory of acceptance and use of technology [UTAUT]) have been proposed to explain the intention to accept technology. For instance, UTAUT, which appeared to have better explanatory power than other previous models, has several limitations (Venkatesh et al., 2003). Bagozzi (2007) noted that newly addressed extended models had not been integrated as well as uncoordinated. Also, a review of the literature on UTAUT reveals that this model is not only in the middle of early stages, but also there are no clear areas which had developed this model deeply compared to its developing speed (Williams et al., 2014). TAM, the basic model which has been widely adopted for technology acceptance studies, still has room for future development. A simple and robust behavior model with high explanatory power has to be needed. Thus, adding a theoretically contextually relevant variable would enhance TAM's utility and predictive power. Therefore, the current study extends TAM by incorporating consumer innovativeness further understand individuals' technology acceptance behavior associated with a fitness app.

Consumer Innovativeness

Consumer innovativeness has been considered a predictor of new technology and product adoption (Im et al., 2003). Im and colleagues stated that consumer innovativeness is a trait that can be defined based on a person's predisposition and cognitive style. In the previous studies, researchers defined consumer innovativeness in terms of the new product adoption behavior, emphasizing the relatively earlier adoption of innovative people (Kim et al., 2021; Rogers & Shoemaker, 1971). Also, a discussion about why certain people adopt new services or products compared to other people was raised, and attempts have been made to understand their behavior based on consumer innovativeness (Lassar et al., 2005). Moreover, scholars have consistently found that incorporating consumer innovativeness into the TAM framework enhances the explanation of the adoption process more accurately (Lu et al., 2005). Despite the prevalent usage of this concept as a unique contributing factor in technology adoption behavior (Im et al., 2007), TAM has not been extensively examined in sport management. More research in this area is warranted because the sport industry is a field that is on the cutting edge of technology usage with myriad online and offline products (e.g., wearable devices, sport-related applications, sports game analysis). Previous studies about sport wearable technologies and sport team applications used an extended model of TAM to enhance the explanatory power of the model (e.g., Kim &

Chiu, 2019). There is a gap in the research as TAM and consumer innovativeness need to be considered together. Therefore, it is theoretically appropriate to add consumer innovativeness to TAM to understand fitness app usage intention.

Fitness Applications

The at-home workout is one of the exercise methods that has received increased attention based on consumers' personal preferences. Working out at home provides an alternative to busy modern people and is free from environmental constraints such as location where people live or even a pandemic (Lee & Chung, 2022; Lee & Park, 2022). From a consumer and business perspective, fitness applications for a home workout can be viewed as a blue ocean in the sport industry (Byun et al., 2018). These fitness apps are becoming more personalized when compared to existing video channels and they keep people engaged in at-home workouts (Molina & Myrick, 2021). Therefore, previous studies have been trying to determine peoples' fitness application usage or continuous usage behavior based on various behavior models (e.g., TAM, UTAUT, UTAUT2) (Damberg, 2022; Vinnikova et al., 2020). However, due to the novelty and increased popularity of fitness apps, there is a need to consider other salient variables, such as consumer innovativeness within the TAM framework to understand usage intention with this technological advancement in the sport industry.

Hypotheses Development

Newly introduced fitness apps that made people consider using them led to the necessity of appropriate theory for explaining their adopting behavior. It takes time and effort on the part of individuals to adopt newly suggested features in a fitness app. It would be important to explain peoples' adoption behavior by considering individuals' motivations for technology adoption. For instance, perceived usefulness is defined as a subjective assessment that an individual's quality of life and work performance will improve if they adopt a particular technology, and perceived ease of use is defined as the perception of the free of effort that is required to use a particular technology or system (Davis, 1989). So, if an individual's quality of life or work performance is not enhanced by adopting a particular technology, and if the effort required to use the technology outweighs the benefits of using it, then the individual is unlikely to engage in a particular behavior. Therefore, PU and PEU are the strong determinants for predicting people's technology adoption

since peoples' choice is based on these perceptions. Although using TAM for explaining fitness app adoption behavior has not been widely studied in the sport management context, empirical studies using TAM in a different context such as health care (e.g., Holden & Karsh, 2010), information systems (e.g., Davis, 1989) have consistently shown that PU and PEU predicted technology adoption behaviors. Cho et al. (2020) also noted that PU and PEU directly affect users' intention. Hence, the following two hypotheses are proposed for this study.

H1: Perceived usefulness will have a positive effect on fitness app usage intention.

H2: Perceived ease of use will have a positive effect on fitness app usage intention.

Including appropriate variables that can enhance the theory's explanatory power has widely appeared in various fields. Theoretical models like Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), and TAM were extended or analyzed with additional variables appropriate for each research context to get higher explanatory power, and their attempts were supported in previous studies (e.g., Davis et al., 1989, Venkatesh et al., 2003)). In sport management, researchers have included variables (e.g., perceived health benefits, social influence, trust, health valuation, technology readiness, etc.) to enhance the explanatory power (Beldad & Hegner, 2018; Chiu & Cho, 2021; Lunney et al., 2016). Furthermore, consumer innovativeness has been found to be a major predictor of innovative technology usage (Jeon et al., 2020). Agarwal and Prasad (1998) mentioned that innovativeness is important in understanding perception and usage intention formation. Following this line of research, Kim et al. (2017) applied consumer innovativeness to TAM to determine the usage of sport team apps. They found that consumer innovativeness has a direct influence on adopting team app intention. Based on the previous studies noted above, the following hypothesis is proposed to extend the work in this area:

H3: Consumer innovativeness will have a positive effect on fitness app usage intention.

Methods

A total of five fitness apps were selected from various fitness apps which are available on devices such as cell phones and iPads. Based on those fitness apps' features, the fitness apps with innovative features (e.g., on-camera option, live classes, workout challenges, following

friend's activities) were selected for this study. The features were briefly summarized to help participants understand them.

Participants and Procedures

The survey was constructed by using Qualtrics. An effort was made to collect data from the general population in the United States, so there were no specific requirements for participants to be engaged with this study. A total of 425 responses were recruited using Prolific, an online survey platform. Sixty-nine responses were excluded from the analysis because they were classified as low-effort responses, which included repeated answers for all questions, leaving 356 as usable data. Regarding the demographic characteristics of participants, 52.2% were male, 45.2% were female, 2% were non-binary/third gender, and 0.6% did not want to say their gender. In terms of ages, participants who are 18-29 made up 35.7% of the sample, followed by 30-39 (33.7%), 40-49 (17.4%), and 50 or older (13.2%). In terms of education, 29.2% had a high school degree, 41.6% had a bachelor's degree, 14.9% had an associate degree, and 14.3% had a master's degree or above. In terms of ethnicity, 73.6% were White/Caucasian, 7.3% were Black/African American, 8.1% were Asian/Pacific Islander, 6.2% were Hispanic, 3.7% were Multiracial, and 1.1% were involved in other ethnicities. In terms of income, 34% of the participants made less than $50,000, 40.7% of the participants had an income between $50,000 and $99,999, 15.2% were between $100,000 and $149,000, and 10.1% had an income of $150,000 or more. Lastly, 44.1% of the participants had experience using a fitness app for at-home workouts, and 55.9% of the participants had not experienced using a fitness app before (See Table 1).

Measures

Six items measuring PEU and PU, respectively, were adapted from previous research (Davis, 1989), and four items assessing behavioral intention were adapted from Hur et al. (2012). Consumer innovativeness was measured with four items that were adapted from Kim et al.'s (2017) scale. A 7-point Likert scale (1 = strongly disagree to 7 = strongly agree) was used to measure the focal constructs in the current study. A depiction of the innovative features of the fitness apps with images was suggested in the first part of the survey to help participants understand the innovative fitness apps for the survey. After collecting features from various fitness apps, these features were selected to be used in this study based on discussions with sport management experts. Examples of innovative fitness apps include "On-camera option allows a

trainer to give you personalized feedback, and the subscription also allows you to schedule one-on-one sessions with a fitness instructor, utilizing the display's high-quality camera and microphone," and "you can join workout challenges with other app users, share photos from your sweat sessions and even follow your friends' fitness activities." After reading the features of the fitness app with images, participants were requested to make answers to participate in the study.

Table 1 Demographic Characteristics

Variables	Categories	Percent (%)	Variables	Categories	Percent (%)
Gender	Male	52.2	Ethnicity	White/Caucasian	73.6
	Female	45.2		Black/African American	7.3
	Non-binary/third gender	2		Asian/Pacific Islander	8.1
	Prefer not to say	0.6		Hispanic	6.1
Age	18-29	35.7		Multiracial	3.7
	30-39	33.7		Other	1.1
	40-49	17.4	Marital status	Married	38.5
	50 or older	13.2		Divorced	5.9
Degree	High school degree	29.2		Separated	0.3
	Bachelor's degree	41.6		Never married	55.3
	Associate degree	14.9	Income	Less than $50,000	34
	Master's	14.3		$50,000 to	40.7

	degree or above		$99,999	
Fitness app experience	Yes	44.1	100,000 to $149,000	15.2
	No	55.9	$150,000 or more	10.1

Data Analysis

Structural equational modeling (SEM) was applied to test the model fit and path coefficients by using AMOS 21 program. After confirming the proposed model has a great fit, path analysis was performed to check the coefficient of each variable to behavior intention. Lastly, to present demographic statistic results, frequency analysis was performed by using SPSS 25.

Results

Measurement Model

First, to confirm the reliability of the scale that was used in this study, composite reliability values for PU (.93), PEU (.90), CI (.77), and BI (.90) were found to be higher than .70, indicating that a strong internal consistency among the items within the latent variables. All of the variables in this study were found to correlate with each other (Table 2). Also, all the average variance extracted (AVE) values except consumer innovativeness were above .5, indicating great convergent validity. In terms of the AVE value of consumer innovativeness, 0.45 also can be acceptable when the CR value is higher than 0.6 (Fornell & Larcker, 1981; Lam, 2012). Based on these results, the measurement utilized in this study were found to be valid and reliable.

Table 2 Descriptive Statistics and Correlation of Variances (N=356)

Construct	1	2	3	4
1. Perceived usefulness	1			
2. Perceived ease of use	.334**	1		
3. Consumer innovativeness	.362**	.307**	1	
4. Behavior intention	.630**	.252**	.585**	1
M	5.2	5.44	3.63	4.37
SD	.054	.048	.075	0.75

**$p<.01$

Structural Model

To test the model suggested in this study, SEM was performed. It was found that the model fit (x^2 = 537.415, *df* = 164, CFI = .940, TLI = .931, and RMSEA = .08) was good. Based on the result of the path analysis, the path from PU to behavior intention (b = .530, p <.001) was significant. Reliability and convergent validity appeared to have an appropriate value (Table 3). Therefore, Hypothesis 1 was supported. Also, the path from PEU to behavior intention (b = -.094, p >.05) was not found to be significant, so Hypothesis 2 was not supported. Lastly, the path from innovativeness to behavior intention (b = .620, p <.001) was significant, so Hypothesis 3 was supported.

Table 3 Reliability and Convergent Validity

Construct		Item	β	CR	AVE
Perceived Usefulness	PU1	Using this fitness app would enable me to accomplish my fitness goal more quickly.	.87	0.93	0.68
	PU2	Using this fitness app would improve my whole workout process.	.88		

	PU3	Using this fitness app when working out would increase my productivity.	.84		
	PU4	Using this fitness app would enhance my effectiveness.	.85		
	PU5	Using this fitness app would make it easier to accomplish my fitness goal.	.86		
	PU6	I would find this fitness app useful when working out.	.85		
Perceived Ease of Use	PEU1	Learning to operate this fitness app would be easy for me.	.80	0.90	0.59
	PEU2	I would find it easy to get this fitness app to do what I want to do.	.82		
	PEU3	My interaction with this fitness app would be clear and understandable.	.84		
	PEU4	I would find this fitness app to be flexible to interact with.	.58		
	PEU5	It would be easy for me to become skillful at using this fitness app.	.84		
	PEU6	I would find this fitness app easy to use.	.85		

Consumer Innovativeness	CI1	In general, I would be the first to use this new fitness app when it appears among my circle of friends.	.81	0.77	0.45
	CI2	If this new fitness app was available, I would use a lot of fitness apps compared to my friends.	.85		
	CI3	If this new fitness app was available, I would be the first to know about the latest fitness apps in my circle of friends.	.86		
	CI4	I like to use this new fitness apps before other people do.	.79		
Behavior Intention	BI1	I will use this fitness app on a regular basis in the future.	.93	0.90	0.70
	BI2	I will frequently use this fitness app in the future.	.94		
	BI3	Assuming I have access to this fitness app, I intend to use the app.	.90		
	BI4	Given that I have access to this fitness app, I predict that I would use the app.	.91		

β =Standardized factor loadings; CR =Composite reliability; AVE =Average variance extracted

Discussion

This study investigated how TAM – with the application of the consumer innovativeness variable – helps to explain people's innovative fitness app usage intention. TAM has been studied in various areas to understand and predict technology adoption behavior. However, there had been a gap in fitness app studies and using TAM theory with innovativeness to further understand the behavior in the sport management area. To fill the gap, the current study extended the TAM model by incorporating consumer innovativeness and tested the proposed model.

First, it was found that the TAM model with consumer innovativeness has a good model fit for explaining fitness app adoption behavior intention. The study conducted to find the direct effect of TAM and innovativeness also supported this result (Kim et al., 2017). Second, PU was found to have an impact on behavior intention. The study found that people perceive the usefulness of a fitness app with an innovative technological function, which was found to have a positive effect on behavior intention. People are likely to have an intention if they perceive the usefulness (e.g., enhance the quality of life or performance). PU was a strong predictor of explaining behavior intention in previous studies (Venkatesh & Davis, 2000), indicating that individuals' minds strongly influence perceived fitness apps' usefulness because they are likely to have an intention if their personal goal and productivity can be achieved by adopting the technology. In explaining sport brand apps, PU was found to have a strong predictor of behavior intention (Byun et al., 2018). Third, because path analysis of PEU and behavior intention was not significant, Hypothesis 3 was not supported. In this study, PEU was insignificant in explaining and predicting fitness app adoption behavior. Through this, innovative functions in fitness apps that can be unfamiliar to people may not significantly affect behavior intention. Similarly, the study regarding user acceptance of YouTube also found that PEU was not significant in the context of YouTube learning, indicating the weakness of PEU in some contexts should be clarified (Lee & Lehto, 2013). A specific level of effort is needed when people use certain types of technology. Therefore, PEU can be the core element that can decide people's behavior intention. In this study, perceiving innovative features of the fitness app as difficult can lead to the insignificance of the PEU. Interesting results also suggest that PU and PEU had a positive effect on sport-branded app usage intention, showing that the effect of PU and PEU is different on sport-related apps since each app (e.g., sport-branded app vs. fitness app) has different functions the consumers

perceive as pros (Won et al., 2022). There are also studies supporting PEU as a major predictor of behavior intention, so further studies needed to clarify the role of PEU in technology acceptance intention (Salloum et al., 2019). Lastly, consumer innovativeness played a major role in explaining the behavioral intention. It has the largest coefficient value of explaining the behavior intention in this study. As fitness apps have innovative functions like real-time feedback, working out together, and on-camera options, consumer innovativeness was a major variable explaining behavioral intention. Xu and Gupta (2009) found that innovativeness had a positive effect directly on the intention of experienced users and potential users, and the results that innovativeness had a direct and indirect effect on the intention to use fitness apps supported our finding of the study (Acikgoz et al., 2022).

Practical Implications

This study has several practical implications. First, if people perceive the usefulness of an innovative fitness app, they tend to use it to enhance their productivity, efficiency, etc. Given the importance of usefulness, the fitness app segment of the sport industry has to focus on the app's functionality which can help to achieve people's goals and enhance productivity. Also, the fitness app should be easy to use despite its various functions. If the app is hard to use (e.g., hard to find the button intuitively), people will not use it since it will take more effort than expected. Therefore, fitness apps should be developed by considering user experience and user interface. Lastly, there should be innovative features that can affect people's performance or goals effectively. Also, innovativeness can be collaborative with usefulness, so the fitness app industry should focus on investing innovative functionality of their apps.

While some innovative features in fitness apps might not be widely known among the general public, individuals are willing to adopt them if they prove valuable in helping them achieve their fitness goals. Consequently, fostering the expansion of the fitness app industry requires forging strong connections with sectors such as exercise assessment, education, data analysis, and technology. It is necessary to collect exercise data from fitness app users, introduce technology to identify users' exercise posture and collaborate with various industries for educational effects online. In addition, user data to be accumulated depending on the type of training can be used for movement and posture analysis, which will positively impact the fitness app industry and the entire sports training industry. Suppose the innovative function of the fitness

app solves the shortcomings and limitations of the app that the public thinks. In that case, the fitness app industry is expected to grow even in a rapidly changing society.

Limitations and Future Studies

This study has some limitations that should be acknowledged. First, participants answered the survey questionnaire after reading and watching a summary of innovative features and simple images of some fitness apps. While over 44% of the participants had used fitness apps, for the nearly 56% who had not used them before, their answers were based on their personal perceptions of fitness apps. Differential perceptions may have existed between those who experienced and who did not have experience using fitness apps. Thus, further investigation by segmenting consumers is needed based on their experience of using fitness apps. Second, in the demographic characteristics, participants above the age of 40 made up around 30% of all the individuals who participated in the survey. This is a relatively smaller portion compared to other age groups. As these kinds of apps have the potential to be very useful for the middle-aged and elderly population, consideration of including a wider range of population is needed to enhance external validity of the tested model. Third, in terms of the suggested model in this study, ongoing discussions exist regarding the higher explanatory power, external variables, and moderator and mediators to understand peoples' adoption behavior. Therefore, further studies with various model approaches are necessary for fitness apps to explain and better predict behavior intention.

Conclusion

The fitness app segment of the sport industry has witnessed significant growth since the arrival of Covid-19. Even with the "new normal" in society following this pandemic, the increase in at-home workouts has created a demand for fitness apps and advances in technology in this segment. In addition to basic features like using the app regardless of location and time, which can be dealt with as the traditional way of attracting people, fitness apps are developing by collaborating with various technologies and machines. The findings of this study reveal the impact of consumer innovativeness on user intention. Still, they also extend the explanatory power of TAM and its variables and extend the body of knowledge related to sport industry apps (e.g., innovative fitness apps).

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