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What Affects Consumers' Attitude and Usage Intention of O2O Apps?: Integration of TAM, TPB, and Transaction Cost Theory

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A B S T R A C T

This study is about the attitudes and intentions of consumers considering the usage of O2O application (app) under the COVID-19 situation. By integrating TAM and TPB as a theoretical background, we selected VPC (various product choice) and PII (product information intensity) as new functional external variables that have a positive effect on new system called O2O commerce. We also applied the transaction cost theory to investigate the obstacle of O2O business. We conducted a survey of consumers in large cities in the Korean market. As a result of this study, it was found that the more O2O app users recognized the influence of SN (subject norms), the more useful O2O app was, the more it led to a change in attitude and usage intention was positively significant. In addition, as the O2O app was easy to use and useful, and the SN was recognized, the user's attitude was positive. On the other hand, it was also found that the transaction cost that consumers have to pay had a negative effect on usage intention. Additionally, VPC and PII have been shown to positively influence on usefulness of O2O apps.

Keywords: COVID-19, O2O Apps, TAM, TPB, Transaction Cost Theory, Usage Intention

Ⅰ. Introduction

The growth of the mobile system and the rise of smartphone users recently have increased the prevalence of online and offline (O2O) platform services. O2O services meet the needs of busy people who anticipate delivery in a short time when ordering products online through an app (Xu and Huang, 2019). In particular, food delivery services, one type of O2O services using mobile phone, provide real-time access so that busy consumers can receive products quickly and easily, while also providing online product ordering, take-out, and door-to-door delivery along with a wide variety of restaurant choices. Typically, consumers can search for, select, and have the desired product delivered to their desired

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location using their mobile phone (Suhartanto et al., 2019). Thus, O2O apps are an innovative method to buy products (Cho et al., 2019). Meanwhile, the COVID-19 from China in December 2019 has spread around the world (Zhao and Bacao, 2020). As a result, social distancing was enforced, and interest in commerce increased significantly without direct interaction between people, and O2O services began to receive great attention. O2O service is a business that searches for, selects, and orders product online and delivers it to the desired location without human interaction. Before the COVID-19, studies on O2O were conducted by some scholars (Pelsmaeker et al., 2017; Venkatesh et al., 2003; Wang and Somogyi, 2018) supported on the theoretical background such as TPB (planned action theory, Ajzen, 1991) and TAM (technology acceptance model, Davis, 1989). Several researchers have integrated these two models on online banking (Lee, 2009) and online purchase intention (He et al., 2019). In addition, consumers' O2O demand has greatly expanded due to social distancing because of COVID-19, and some researchers are focusing their attention on research on O2O business (Shah et al., 2021; Yang et al., 2021; Zanetta et al., 2021; Zvarikova et al., 2022).

The purpose of this study is to more elaborately understand the psychological and functional factors of regarding use of O2O apps. The former applied TPB and the latter applied TAM, and these two models were integrated. On the other hand, many existing studies have investigated using "usefulness and ease of use" as functional factors of O2O apps. Applying only these general factors, it can be difficult to pinpoint exactly consumers' usage intention in a specific situation called the COVID-19 pandemic. Therefore, in this study, we applied specific external factors such as product information intensity (Bang et al., 2005) and various product selections (Cho et al., 2019; Cho and Park, 2001) to more accurately determine the intentions of O2O app users. Therefore, we pose research questions:

- What are the psychological and functional factors for consumers' use of O2O apps?
- What are the functional external factors that promote consumers' use of O2O apps?

As such, our research assignment decided to investigate and understand the multifaceted consumer's usage of O2O apps. In other words, it is necessary to understand the psychological and functional factors of usage intention of O2O apps. In addition, product information intensity and various product choice are applied to the functional factors of consumers' usage of O2O apps, going one step further from previous studies. This is because the provision of detailed and accurate information and the selection of various products can be regarded as useful factors that save busy consumers' time and effort. Therefore, we applied and integrated two theories: TAM, a theory related to the motivation consumers adopt to use a new technology or system, and TPB, which addresses the psychological processes associated with consumers' use of a system. In addition, through the test of two external factors, they are regarded that consumers would perceive the use of O2O apps as useful and increase their usage intention. On the other hand, we consider that transaction costs could act as an obstacle to consumers' usage intention of O2O apps. Through the investigation of these various factors, it will be possible to broaden the horizon of understanding consumers' use of O2O apps, which is different from previous studies.

The rest of the study consists of following. In the theoretical background and hypotheses setting section, we propose a research model by setting explanations and hypotheses for each theoretical outline

and variable. In the research methodology section, we explain statistical research methods and the outcomes. In the conclusion section, we discuss the result of the study, theoretical and business managerial implications, and some limitations of this study and direction of subsequent study.

Ⅱ. Theoretical Background and Hypotheses Setting

2.1. O2O Application

O2O (online to offline applications) indicates a business that connects online and offline (Wu et al., 2015). A purchase decision is made through a search for a product or service in a mobile ordering app and payment is made online, and then the consumption of the order is an offline transaction type (Chen and Lee, 2008). O2O service refers to a commercial activity that induces users to purchase online products and services for later use or enjoyment in physical facilities. The most widely used apps in the Korean market are delivery apps that mostly order and receive food. In addition to major services such as food/food, mobility, and accommodation, real estate and interior services, as well as household and corporate human resource brokerage services such as housekeepers and IT personnel are also taking place. In the case of mobility abroad, Uber is a major operator of ride-sharing services worldwide. Global delivery O2O service, a major O2O service in the food sector, uses data to reduce delivery time and expand delivery items to food and beverage to secure competitiveness in the existing food delivery, while also expanding the platform into new food-related areas such as shared kitchens is expanding. The shared kitchen is a business that rents kitchen facilities by the hour, and Uber Eats, Door Dash, and Grubhub, which are American food delivery companies, and UK's Deliveroo, have advanced into shared kitchens. Other O2O services are spreading to various life fields in addition to existing major O2O services such as food delivery, mobility, and accommodation services like Airbnb. In particular, in China, O2O services include home services (auxiliary batteries, umbrellas, sharing services, laundry, interiors, etc.), lifestyle services (hair, beauty, exercise, pet, etc.), and information sharing O2O services (marriage, medical care, etc.). It is improving the convenience of life by combining online and offline through the platform.

According to Merrill Lynch global research of Lynch and Morgan (2017), the global O2O market based on the sharing economy estimated based on six sectors: ride-sharing, travel and leisure, food, retail, media streaming, and peer-to-peer finance will be expected to grow from about $250 billion in 2017 to 2025 about $335 billion annually. In addition, the size of the global O2O market based on the potential market is expected to be about $2 trillion, of which the US, Europe, and China are estimated to account for the majority of the total market with $758 billion, $645 billion, and $500 billion, respectively.

O2O transaction is different from e-commerce, where an order is placed online and the product is directly delivered through a logistics company, in which the user communicates with consumers in various ways online, and then the user participates in the product or service in a physical store. Many approaches are available to combine online functions with offline transaction. Some concentrate on enhancing the buying process (such as avoid waiting in lines), while others improve the brand experience through participating interactions. Starbucks, for example, has developed an application that is able to

make users to place an order on the mobile phone and then pick up the product at the nearest shop. In the case of Burger King, in Spain, consumers were encouraged to invent their own custom "Whopper" recipes via social media, which could then be picked up at its store (Trotter, 2021). Pokemon Go, a famous mobile augmented reality game, has in a popularly enabled offline stores to engage customers and in-store engagement while playing games, eventually generating more than $1 billion in revenue (Zugara.com, 2021).

The value of O2O business has its ability to increase consumers' loyalty. Although many studies are confident about the ultimate size of the O2O platform market, there are few studies dealing with various aspects of consumers' intention, i.e., positive and negative factors, and functional and psychological factors at the same time.

2.2. Technology Acceptance Model

TAM means that perceived usefulness (PU) and perceived ease of use (PEU) at the new technologies come into the significant effect in new system usage (Davis, 1989). PU here indicates the extent to which consumer trust that applying a specific system promotes job fulfillment (Davis, 1989). According to the previous researches, PU adopted Medical diagnosis technology (Zhang et al., 2017), self-service Kiosk (Kim and Qu, 2014), and mobile purchasing (Hung et al., 2012 have shown a positive impact on technology adoption. In adopting O2O, Yeo et al. (2017) showed that PU positively affected the users' intention (UI). And, Roh & Park (2019) verified PU as the factor with the largest impact on the users' intention of O2O apps. Hence, we suggest a hypothesis.

H1: Perceived usefulness has a positive relationship with usage intention of O2O apps.

In both TPB and TAM, attitude (ATT) toward a given behavior appropriately affects UI (Ajzen, 1991; Davis, 1989). ATT indicates the degree to which consumer has a well-disposed or ill-disposed valuation or valuation of the action in question (Ajzen, 1991). According to the study of Rezaei et al. (2016), attitudes can attract consumers more inclined to select certain behaviors. Hansen et al. (2004) verified a previous study indicating that users' attitudes were very important predictors of use intention in online food shopping (Thompson et al., 1994). Other researches that focused on purchasing food adopting apps also emphasized the important role of ATT in describing UI (Cho et al., 2019; Lee et al., 2017; Yeo et al., 2017). Hence, a hypothesis is suggested:

H2: Attitude has a positive relation to usage intention of O2O apps.

In addition, Davis (1989) verified two crucial cognitive responses relating attitude: PU and PEU. PEU indicates the extent to which people believe that it may not take effort to adopt a particular system (Davis, 1989). In O2O apps, PEU defines ease of selecting products and stores, ordering and monitoring orders (Ray et al., 2019), while PU represents users' usefulness and benefits of purchasing products in the app (Piroth et al., 2020). Some researchers focused on PEU and PU's positive impact on ATT for O2O app transactions (Alagoz and Hekimoglu, 2012; Cho et al., 2019). Hence, we suggest a hypothesis.

H3: Perceived usefulness has a positive relation to attitude towards O2O apps.

H4: Perceived ease of use has a positive relation to attitude towards O2O apps.

The higher the PEU, the higher the positive expectation of the outcome (i.e., usefulness) of using the target system. Furthermore, the less effort required to acquire and utilize new technologies, the more likely users are to perceive these systems as useful. Several previous researches have confirmed that ease of use has a positive effect on usefulness (Alalwan et al., 2017; Lee et al., 2017; Shareef et al., 2017; Shareef et al., 2018). Therefore, a hypothesis is suggested:

H5: Perceived ease of use has a positive relation to perceived usefulness of O2O apps.

TAM has been applied various external factors to indicate significant relations. Venkatesh and Davis (2000) applied to add external constructs at TAM. Davis et al. (1989) verified the important role in applying external constructs in Technology acceptance model by applying the agents behind emotional and cognitive responses to the new system.

This study proposes using a various product choice (VPC) as a new construct which will directly stimulate consumers' use of O2O as a functional factor (He et al., 2019). The more choices you have, the more useful your O2O app will be. Besides, the wide selection of products means that you have an edge over your competitors, and O2O apps can be useful to consumers. Thus, as suggested by previous studies (Cho et al., 2019; Cho and Park, 2001), when utilizing an O2O app, consumers can choose various types of goods, and they can also purchase from several vendors at various prices. VPC raises awareness of its value by enabling consumers to purchase products that best fit their needs. Hence, we suggest a hypothesis:

H6: Various product choice has a positive relation to perceived usefulness of O2O apps.

As Williamson (1975) points out as a condition of information influence, since sellers have an information advantage that they can use to promote opportunistic behavior, if the consumer does not have enough information to make a purchase decision, the consumer's transaction cost increases. Consumers can change the asymmetry of information by gaining more information. In this study, product information intensity (PII) is proposed as a new functional construct. As with VPC, consumers who are provided with various and elaborate information will find O2O apps more useful. Here, PII represents the amount of information a user should make a purchasing decision. (Palmer and Griffith, 1998; Sabherwal and Vijayasarathy, 1994). A study by Bang et al. (2013) has shown significant results in increasing volume in relation to the importance of time, including pricing information, product descriptions, delivery and return policies, and customer reviews. Hence, we suggest a hypothesis:

H7: Product information intensity has a positive relation to perceived usefulness of O2O.

2.3. Theory of Planned Behavior

TPB assumes that perceived behavioral control (PBC) and subjective norms (SN) have a significant relation to usage intention (Ajzen, 1991). Ajzen (2002) verified PBC indicates consumers' subjective control over the performance of behavior. Previous researches confirmed that PBC was a factor influencing UI of O2O apps. Hansen et al. (2004) confirmed that considering PBC significantly affected when analyzing UI for purchasing food online. Hence, we suggest a hypothesis:

H8. Perceived behavioral control has a positive relation

to usage intention of O2O apps.

SN refers to the perception of a user who is significant to him or her and who he or she thinks should do the act (Ajzen, 1991). Subjective norms are also relevant factors on usage of O2O app (Ray et al., 2019). Some studies verified that SN positively affected on UI in internet purchasing (Hansen et al., 2004; Piroth et al., 2020). Hence, a hypothesis is suggested:

H9: Subjective norms has a positive relation to usage intention of O2O apps.

Moreover, SN also significantly influences ATT in TPB. When consumers recognize that family, friends, and other stakeholders have a positive direction in using O2O apps, they may be more sympathetic to using O2O apps. Several studies have verified this significant relationship in using mobile food purchasing (Hansen et al., 2004; Piroth et al., 2020). Hence, we suggest a hypothesis:

H10: Subjective norms has a positive relation to attitude towards O2O apps.

According to Ajzen (2002), PBC is composed of two: controllability and self-efficacy. The former means the ability to control an agent's fulfillment quality, whereas the latter indicates easy or difficult to discover when a given user performs a specific action. For example, Teo and Van Schalk (2009) argued that PBC is diverged from the consumer's ability to handle related problems, as well as from other factors like looking for easily using technologies or getting support for their use(Teo and Van Schalk, 2009). According to Teo et al. (2016), PEU positively influenced PBC. Hence, we suggest a hypothesis:

H11: Perceived ease of use has a positive relation to perceived behavioral control.

2.4. Transaction Cost Theory

Transaction cost (TRC) indicates the cost often overlooked by user when purchasing product, and may represent time and cost for searching, monitoring, and adapting (Coase, 1937). This means that providers' roles minimize TRC that consumers have to bear. Moreover, these costs describe how consumers decide purchase decision based on various types of cost. Fundamentally, transaction cost indicates the market failure. According to transaction cost economics (TCE), market failures divide factors from human (e.g., restricted rationality, opportunism), and from environment (e.g., uncertainty, complexity, minority bargaining, information impact, and circumstance) (Williamson, 1975). Several studies introduced TRC to the conduct of some issues, such as e-business and mobile transactions, way of payments, joint marketing, and IS outsourcing (Aubert et al., 2004; Bucklin and Sengupta, 1993; Gao and Waechter, 2017; Grüschow et al., 2016; Kim and Li, 2009; Liang and Huang, 1998; Teo and Yu, 2005).

Over the past few decades, TCE has been developed in the topic of IT and has been a great help to clarify consumers' behavior. Several researches have been conducted as follows. A research verified that transaction cost determined consumers' acceptance of the online market (Liang and Huang, 1998). According to Teo et al. (2004), transaction costs negatively impacted online shopping intentions. Wu et al. (2014) confirmed that presenting sufficient clues reduced consumers' information retrieval cost indicates a key cause in forming online repurchase intentions. Che et al. (2015) investigate use intention to revisit online group purchases using transaction costs. They con-

firmed that the antecedent factors of transaction costs such as trust and unpredictability significantly affected on consumers' re-visit intention. As a result, we expect that transaction costs also affect the use of O2O apps. As mentioned earlier, we apply as the negative factors on the use of O2O apps. In addition, Consumers want to select a transaction mode to save on perceived transaction costs (Wigand, 1997). Hence, we suggest the hypotheses:

H12: Transaction cost negatively relate to usage intention of O2O apps.

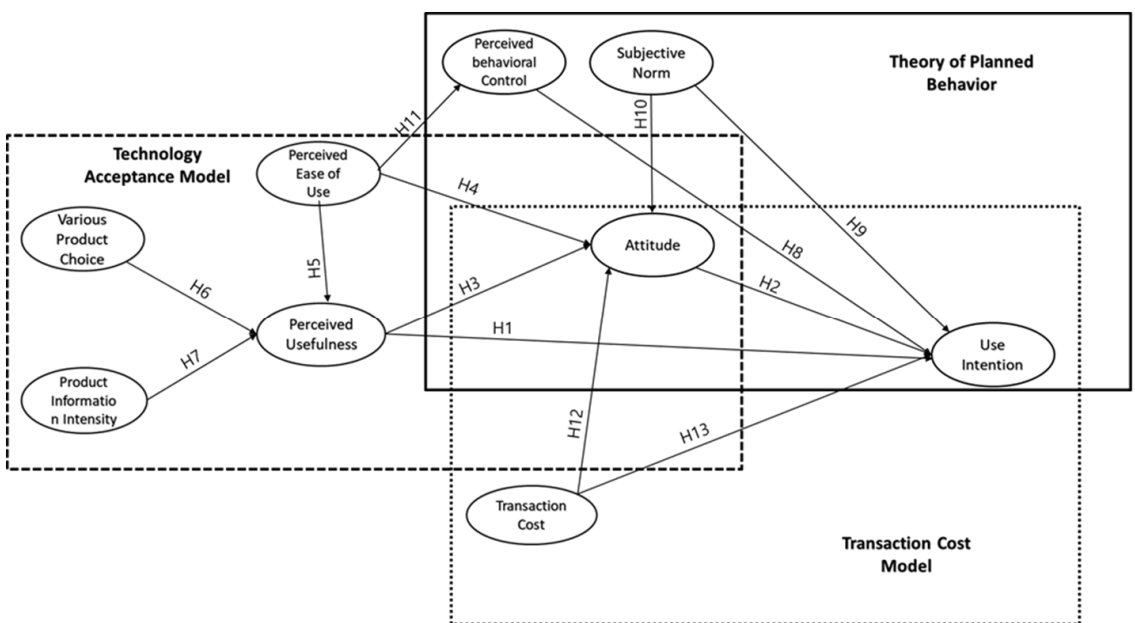
H13: Transaction cost negatively relates to the attitude towards O2O apps.

<Figure 1> indicates the study model based on the literature review and hypotheses described above.

Ⅲ. Methodology

3.1. Data Collection

A survey was conducted for smartphone users who adopted O2O apps in the Korean market under the COVID-19 pandemic. The target sample was consumers using mobile apps with smartphones living in the Metropolitan cities in South Korea. O2O transactions are considered typical mobile commerce that is likely to thrive in cost-effective and densely populated areas during the delivery of products or services (Ornstein and Dumas, 2015). We modified the questionnaire items according to the purpose of the research based on previous studies. The detailed items of the questionnaire are as follows; all constructs are 9, PU, PEU, ATT, PBC, SN, VPC, PII, TRC, and UI of O2O apps. These variables consisted of a total of 38 measurement items. <Appendix A>



<Figure 1> Study Model

indicates the contents of the measured constructs. All indicators regarding to composition of the measurement were tested through a 5-point Likert scale, ranging from strongly disagreeing to = "1" to strongly agreeing to = "5". Two preliminary tests of 35 mobile users investigated if the survey tool secured sufficient levels of logical consistency, readability, and contextual relevance. The survey data was collected through a Google online survey for 15 days from Jun 6, 2022 to Jun 20, 2022. In the Google questionnaire distributed through the mobile, 628 data were collected. We collected a total of 602 valid answers after scrutinizing the questionnaire and eliminating missing or double responses. Gender distribution of the sample consisted of females 310 (51.5%) and 292 males (48.5%). Ages were 30's, 20's, 40's, and 50's. As for the level of education, university graduates showed the highest distribution at 62.6%. The experience of using O2O apps was 36.9% for more than 5 years and 23.4% for less than .3 years. As shown in <Table 1>, the most frequently used O2O apps were delivery apps, taxi apps, and surrogate driving apps in that order under the COVID-19 in Korea.

3.2. Data analysis

A data analysis was conducted in two phases using SPSS 26 and AMOS 26 statistical packages. First, we tested reliability and validity of the study model. Second, the model fit and the research hypotheses were tested. We have only dealt with reliability and validity in this part.

First, we evaluated the reliability of the model through exploratory factor analysis (EFA) by SPSS, and the validity through confirmatory factor analysis (CFA) by AMOS. Form EFA, KMO (Kaiser-Meyer-Olkin) measure of suitability was 0.924, sphericity test of Bartlett, $\chi 2$ = 18332.638, d.f. (degree of freedom) = 703. In addition, we found the factor loadings of all items were higher than the acceptance criterion of 0.4. Moreover, the Cronbach α, a measure of reliability test applied in general social science research all indicated above 0.7, which is a general acceptance criterion. Therefore, we judged that the reliability of all variables was high (see <Appendix A>).

Next, we tested two validities, convergent and discriminant validity. To assess the former, we conducted CFA. Thus, we tested the model fit and internal consistency of the model. First, in order to test the model, CMIN / DF (normal chi square / degrees of freedom), GFI (goodness of fit index), AGFI

<Table 1> Demographic Characteristics of the Samples

Variable		Frequency	%
Gender	Male	292	48.5
	Female	310	51.5
Age	20～29 years old	158	26.2
	30～39 years old	186	30.9
	40～49 years old	134	22.3
	More than 50 years old	124	20.6
Education level	High school	100	16.6
	Associate degree	377	62.6
	Bachelor's degree	71	11.8
	Master & Ph.D. degree	48	8.0
	others	6	1.0
Experience using O2O apps	> 1year	54	9.0
	1～2.9years	141	23.4
	3～3.9years	108	17.9
	4～4.9years	77	12.8
	5 years ≤	222	36.9
Commonly used O2O apps	Delivery app	365	60.6
	Taxi app	89	14.8
	Chauffeur service app	45	7.5
	Restaurant Search app	37	6.1
	Accommodation search app	34	5.6
	others	32	5.3

(adjusted fit index), CFI (comparative fit index), NFI (standard fit index) and RMSEA (root mean square error) were tested (Byrne, 2013; Hair et al., 2017; Tabachnick et al., 2007). The test results of each indicator are as follows: CMIN/DF = 2.251 (criterion, $\leq$ 3.00), GFI = 0.91 ($\geq$ 0.90), AGFI = 0.88 ($\geq$ 0.80), CFI = 0.96 ($\geq$ 0.90), NFI = 0.94 ($\geq$ 0.90), RMR = 0.035 ($\leq$ 0.05), and RMSEA=0.046 ($\leq$ 0.05), we judged as appropriate. Secondly, a test on the internal consistency of the research model was conducted through the analysis of C.R. (construct reliability) and average variance extracted (AVE). They were not calculated through AMOS, so we applied the formula suggested by Fornell and Larcker (1981). As shown in <Appendix B>, the standardization coefficients of all factors reconstructed through EFA were 0.8 or higher, CR(t) values were also statistically significant, and C.R. and AVE were also higher than acceptable standard value, so we judged the convergent validity was secured.

Discriminant validity means as the degree to which an indicator does not reflect other constructs (Lee et al., 2007). Each of the item's AVE has to be larger than the squared value of the maximum shared correlation coefficient (Hair et al., 2017). The square roots of AVE were found to be greater than all correlations between two constructs, and the discriminant validity was established (see <Table 2>).

3.3. Hypothesis Test

Before tested hypotheses using structural equation model, we tested of model fit indices and verified that that was within the general accepted level: CMIN/DF = 2.251, GFI = 0.908, AGFI = 0.879, NFI = 0.936, CFI = 0.966, and RMSEA = 0.042 (Hair et al., 2019).

Secondly, we tested hypotheses. PU (ß = 0.27, p < 0.001), ATT (ß = 0.21, p < 0.001), PBC (ß = 0.30, p < 0.001), and SN (ß = 0.017, p = 0.004) positively significantly affected on users' intention of O2O apps. On the other hand, TRC (ß = -0.11, p = 0.003) negatively significantly influenced users' intention of O2O apps. Therefore, H1, H2, H8, H9, and H12 were upported.

In addition, PU (ß = 0.34, p < 0.001), PEU (ß = 0.29, p < 0.001), SN (ß = 0.11, p < 0.001) positively significantly affected ATT toward O2O apps. Therefore,

<Table 2> Correlation between Constructs of the Measurement Model

	1	2	3	4	5	6	7	8	9
VPC	**0.92**								
PII	0.69***	**0.84**							
PEU	0.52***	0.56***	**0.90**						
PU	0.48***	0.48***	0.65***	**0.87**					
PBC	0.65***	0.65***	0.65***	0.51***	**0.85**				
SN	0.32***	0.34***	0.36***	0.28***	0.47***	**0.93**			
ATT	0.50***	0.56***	0.51***	0.55***	0.53***	0.38***	**0.89**		
TRC	0.22***	0.17***	0.11***	0.004ns	0.11***	0.27***	0.13***	**0.79**	
UI	0.57***	0.55***	0.63***	0.61***	0.62***	0.43***	0.60***	0.20**	**0.80**
AVE	0.85	0.71	0.80	0.76	0.73	0.86	0.78	0.62	0.63

** p < 0.01, *** < 0.001, ns = not significant. The diagonal elements in bold are the square roots of AVE.

H3, H4, and H10, were supported. To the contrary, TRC (ß = 0.07, p = 0.15) did not affect ATT toward O2O apps. Therefore, H13 was not supported.

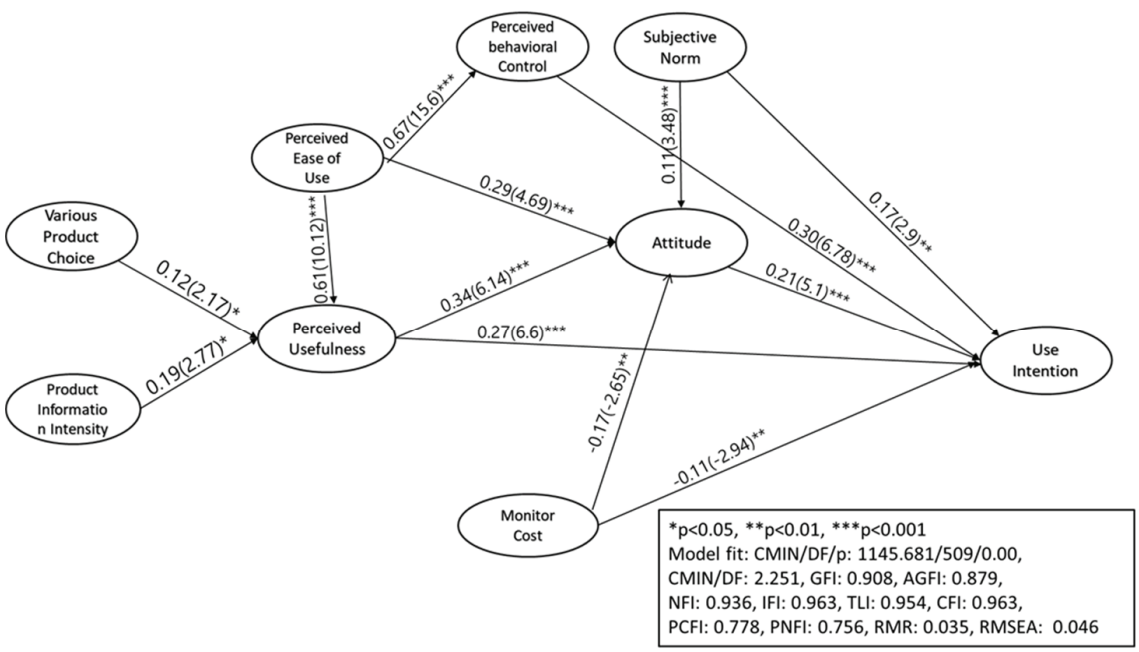
Furthermore, VPC (ß = 0.12, p < 0.03) and PII (ß = 0.19, p = 0.006) which we set as new external variables, and PEU (ß = 0.61, p < 0.001) positively significantly affected PU, so H5, H6 and H7 were supported. Also, PEU (ß = 0.67, p < 0.001) positively significantly affected PBC. Therefore, H11 was supported. <Figure 2> indicate these results.

Ⅳ. Conclusion

4.1. Discussion of Findings

This study attempted to investigate by considering both promotional and negative factors, functional and psychological factors as understanding consumers' adoption behavior O2O app under the COVID-19 situation. In order to achieve this research purpose, we integrated and applied TAM, TPB, and transaction cost theory as theoretical backgrounds. In addition, we introduced two external variables, VPC and PII as functional promoters. The results of this study emphasize the need to integrate three theories to develop an understanding of O2O adoption behavior and the main determinants of the relationship. In particular, we confirmed the strong relationship linking PEU and PBC that appeared as a result of the combination of these theories. Through this, previous studies (Teo et al., 2016; T. Teo and Van Schalk, 2009) on the need to combine other models associated with the theory of rational behavior such as TAM and TPB were confirmed.

This combined model has shown some interesting



* p < 0.05, ** p < 0.01, *** p < 0.001

<Figure 2> Result of Hypotheses Test

results that support previous work. First, the results of this study verified previous studies on the strong relationship between ATT and UI (Lee et al., 2017; Wang and Somogi, 2018; Yeo et al., 2017). Another association with the UI is SN and PBC. In particular, SN confirmed an existing study that the use of the O2O app was also related to the opinions of important surroundings related to individual attitudes (Aalwan, 2020; Roh and Park, 2019). This emphasized that consumers will not just buy products or services to use, but will adopt more O2O apps when they are with family or friends so that they can enjoy time together. Furthermore, we found that there is a significant relation between PBC and UI showed the same results as previous studies (Hansen et al., 2004; Silva et al., 2016). Given the relatively small significant results in the PU-UI relationship, the O2O app is still considered a new system, which can be estimated to affect consumers' ability to use these services more effectively (Aalwan, 2020). In this study, we proposed two new variables that positively influenced PU of O2O apps. First, the relevance of VPC emphasized that consumers perceived usefulness in opportunities to select various products, companies, and price ranges. That way, the decision-making process for using O2O apps becomes more advantageous and cost-effective. Secondly, we verified PII was relevant in that it was an important driver of the users' decision-making process, in which accuracy of product information has a positive influence on consumer usefulness by saving consumers' cost and time.

On the other hand, as an obstacle to ATT and UI of O2O apps, transaction costs defined as time and effort required to search, compare, monitor the properties and information of products or services that consumers want to purchase, and meet the terms of the contract. As a result, we confirmed that this cost negatively affected ATT and UI.

4.2. Implications

The theoretical implications of this study are summarized in two points. First, this study will be one of the few that explored the usage intention of O2O apps in various aspects. In particular, we applied TAM and TPB applied as functional and psychological factors as well as facilitating factors in consumer adoption of O2O apps. It can be said that this is the first study in the Korean market under the COVID-19. Second, we used new variables, VPC and PII, as functional stimuli to increase the usefulness of O2O apps, and we could more closely investigate the consumer's attitudes and intentions. VPC and PII were highlighted as playing a significant role in the usage of O2O app. This indicates that the usage of O2O app increases when consumers have a variety of choices of products or services with high information intensity.

The practical implications are summarized in four points: first, this study showed that both product diversity and product information intensity were related to determining the usefulness of O2O apps. People can save time and money when purchasing a product or service because of these factors, and they enjoy the ability to purchase a product or service anytime, anywhere. Therefore, marketing managers must provide accurate and detailed information about products to consumers, as well as modify and correct rapidly changing information in real time. In addition, it will be necessary to manage O2O apps so that consumers can use various products and services.

Second, the fact that SN has a significant influence on attitude and usage intention of O2O apps means that consumers consider the recommendations or influence of people around them when adopting O2O apps. O2O flatform needs to find ways to promote their markets under the COVID-19. Consumers tend to recommend others for usage certain O2O services

and take advice from family members and friends. Therefore, marketers have to provide additional monetary incentives (e.g., price discounts, quantity discounts, point accumulation, etc.) and loyalty programs to actual users. Consumers who are loyal to a particular O2O service play an important role in helping to recommend and attract new customers, so marketers should pay more attention to these customers.

Third, as with the results of a study by Humbani and Wiese (2019), which confirmed that transaction cost interferes with users' intention to make mobile payments, this study confirmed that transaction cost has a significant negative effect on usage of O2O apps. In fact, users bear a lot of tangible and intangible costs when performing offline transactions. Therefore, marketing managers must continuously manage and improve detailed factors such as access (app download), using method, and convenience of O2O apps so as to effectively reduce the effort and time required for a customer to finish the transaction process when using O2O apps. Finally, the factors used in this study may help marketers to successfully implement O2O app services and collect and analyze accurate data about consumers. In this way, they may enhance the system of O2O apps and achieve excellent performance, and consumers may have the chance to receive better information instantaneously and overcome the information asymmetry associated with a product or service.

4.3. Limitations and Suggestions for Future Study

We realize some limitations of this research and suggest for future study as follows: First, this study focused on O2O app users in Korea, and this result may not be generalizing to other cultures, regions, countries, and cultures. Therefore, studies should be conducted with consumers from different regions, cultures, or countries. Second, this study reflects the users' intention to use O2O apps during the extraordinary, but short-term, context of the COVID-19. Depending on the temporal and spatial contexts of individual behavior and intention, future research can be conducted longitudinally to recognize consumers in various contexts and to investigate and compare causal relationships over time. Finally, this study was conducted without discriminating between specific O2O brands. Moreover, we only focused this study on the consumer's viewpoint of O2O apps. Future study may be focused on some specific O2O apps or other mobile app, such as mobile shopping service providers.

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<Appendix A> The Measured Constructs of the Research Model

Constructs & Indicators	Factor Loading	Cronbach's α
Perceived Usefulness (PU; Liebana-Cabanillas et al., 2017)		
PU1. The O2O app is useful to me when ordering products.	0.78	
PU2. The O2O app gives me the opportunity to purchase a variety of products (services).	0.81	0.94
PU3. The O2O app makes ordering goods (services) quick and simple.	0.81	
PU4. The O2O app saves me time for ordering products.	0.76	
Perceived Ease of Use (PEU; Lee, 2009)		
PEU1. It's easy to use the O2O app.	0.76	
PEU2. The O2O app is easy to understand and clear.	0.80	0.92
PEU3. Using the O2O app requires minimal effort.	0.79	
PUE4. Learning how to use the O2O app is easy.	0.76	
Attitude (ATT; Cho et al., 2019)		
ATT1. I have a good feeling on the O2O app.	0.79	
ATT2. I think it's in my interest to use the O2O app.	0.82	0.91
ATT3. I think it's wise to use the O2O app.	0.76	
ATT4. I think using the O2O app is a good idea.	0.77	
Perceived Behavioral Control (PBC; Lee, 2009)		
PBC1. I think I use the O2O app to buy goods (services) well.	0.69	
PBC2. I think using the O2O app is wholly controlled by me.	0.73	0.90
PBC3. I think I have the resources, knowledge, and ability to use the O2O app.	0.67	
PBC4. I can use the O2O app skillfully.	0.77	
Subjective Norm (SN; Lee, 2009)		
SN1. People who are important to me think I should use the O2O app.	0.87	
SN2. People who influence me think I should use the O2O app.	0.89	0.90
SN3. People with opinions that are valuable to me will love that I use the O2O app.	0.83	
SN4. My important acquaintances think positively that I'm using the O2O app.	0.41	
Various Product Choice (VPC; Cho et al., 2019)		
VPC1. With the O2O app, there are many companies to choose from.	0.79	
VPC2. The O2O app allows me to choose from a variety of products.	0.80	0.91
VPC3. The O2O app allows me to order products at different price points.	0.82	
VPC4. The O2O app allows me to order products with various functions.	0.80	
Product Information Intensity (PII; Bang et al., 2013)		
PII1. I think information about product descriptions in O2O apps helps me use the app.	0.76	
PII2. I think the after-use written by other consumers for O2O apps helps us use the app.	0.68	0.86
PII3. I think the price and discount information of the O2O app helps you use the app.	0.76	
PII4. I think information about how long the O2O app is used, how to fulfill orders, and how to pay helps you use the app.	0.72	

<Appendix A> The Measured Constructs of the Research Model (Cont.)

Constructs & Indicators	Factor Loading	Cronbach's α
Transaction Cost (TRC; Teo & Yu, 2005)		0.90
TRC1. When using the O2O app, I spend a lot of time looking for information.	0.72	
TRC2. When using the O2O app, I am working hard to get information.	0.81	
TRC3. When using the O2O app, I spend a lot of time contacting the online store.	0.77	
TRC4. When using the O2O app, I try a lot to contact the online store.	0.83	
TRC5. When using the O2O app, I spend a lot of time responding to unexpected changes.	0.88	
TRC6. In the event of unforeseen circumstances in the use of O2O apps, I make a lot of effort to find alternatives.	0.85	
Use Intention (UI; Bhattacherjee, 2001)		0.88
UI1. I'm going to use the O2O app.	0.76	
UI2. My intention is to use the O2O app more than any other means.	0.70	
UI3. I think using the O2O app is worth it.	0.74	
UI4. In the future, I will use the O2O app as regularly as I do now.	0.70	

<Appendix B> Confirmatory Factor Analysis

Variable/item		Estimate	S.E.	CR(t)	SMC	C.R.	AVE
VPC	VPC1	1			0.84	0.94	0.85
	VPC2	0.93	0.03	30.13	0.73		
	VPC3	0.97	0.03	32.64	0.77		
	VPC4	0.97	0.03	33.98	0.79		
PII	PI1	1			0.51	0.84	0.64
	PI2	1.03	0.06	16.80	0.70		
	PI3	0.99	0.06	15.68	0.69		
	PI4	1.00	0.07	14.14	0.61		
PEU	PEU1	1			0.82	0.93	0.81
	PEU2	0.95	0.03	33.60	0.72		
	PEU3	0.94	0.04	23.16	0.69		
	PEU4	0.76	0.04	20.22	0.57		
PU	PU1	1			0.74	0.89	0.73
	PU2	0.91	0.04	23.87	0.64		
	PU3	0.80	0.04	22.47	0.60		
	PU4	0.92	0.03	27.56	0.77		
PBC	PBC1	1			0.58	0.89	0.73
	PBC2	1.10	0.05	21.86	0.72		
	PBC3	1.22	0.07	18.89	0.71		
	PBC4	1.18	0.06	21.17	0.70		
SN	SN1	1			0.85	0.95	0.86
	SN2	1.11	0.03	43.55	0.93		
	SN3	0.90	0.03	30.68	0.69		
ATT	ATT1	1			0.71	0.91	0.78
	ATT2	1.01	0.04	27.04	0.77		
	ATT3	0.83	0.04	22.81	0.62		
	ATT4	0.92	0.04	25.03	0.69		
TRC	TRC2	1			0.45	0.92	0.79
	TRC3	0.83	0.04	19.06	0.39		
	TRC4	1.50	0.15	10.30	0.78		
	TRC5	1.42	0.08	18.03	0.72		
	TRC6	1.34	0.08	16.51	0.62		
UI	UI1	1			0.55	0.91	0.78
	UI2	0.94	0.05	18.63	0.43		
	UI3	1.12	0.06	20.25	0.70		
	UI4	1.26	0.06	21.27	0.79		
					0.5 ↑	0.7 ↑	0.5 ↑

SMC: squared multiple correlations, C.R.: construct reliability, AVE: average variance extracted

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