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EXAMINING TECHNOLOGY PERCEPTION AND USER COMPETENCE ON TWO TYPES OF SMARTPHONE USAGES

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Abstract

This study intends to explain smartphone usage behaviours in the post-adoption stage of information systems (IS) based on the IS continuance model, the technology acceptance model (TAM), and the competence of the users. In this study, smartphone usage is divided into two types: usage of the smartphone's device functions and usage of applications. This is the first time this concept has been proposed and empirically tested. The results found strong predictors of user satisfaction (perceived usefulness and perceived ease of use) toward smartphone satisfaction and finally confirmed the influence of smartphone function use on smartphone app use. Finally, several important theoretical and practical implications and directions for future research based on limitations are suggested.

Keywords: Smartphone Usage Behaviour, Post-Adoption Stage of IS, TAM, User Competence.

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1 INTRODUCTION

In 2014 there were 2.7 billion smartphone users; in 2018 it is estimated that there will be 5.1 billion (Ericsson 2014). Nowadays, many people can't imagine a world without smartphones (Kakihara 2014). As a new phenomenon, smartphones are used for calls, messaging, Internet access, and application (app) services (Oulasvirta et al. 2011). Through these various functions, smartphone users can handle a variety of tasks, e.g. making phone calls, sending e-mails, searching the Internet, communication in social network services (SNS), and making payments (Koo et al. 2015). For these reasons, the number of smartphone users will continue to grow at an accelerated pace (Ericsson 2014).

As one of the newest developments in mobile computing, smartphones are composed of different technologies, e.g. digital cameras, music players, global positioning systems (GPS), and wireless fidelity (Wi-Fi) (Koo et al. 2015). Because smartphone users can customize the devices to fit their needs similar to a personal computer (PC), smartphones are not just mobile telephones but mobile computers (Verkasalo et al. 2010). Each user utilizes his or her smartphone in a different way, with many of those usage differences depending upon the user's competence (Koo et al. 2015). Clearly, smartphones, which are a kind of information system (IS), can be used in totally different ways because of their particular characteristics and the competence of individual users.

The smartphone market has reached the IS infusion stage, which is when "information technology (IT) applications become deeply embedded within normal life or organizations' work processes" (Ahuja & Thatcher 2005). How technology is used varies between the IS infusion stage and the early IT adaption stage (Cooper & Zmud 1990). Thus, contemporary smartphone users are expected to have distinct usage behaviours compared with users in the early IT adaption stage.

The purpose of this study is to investigate the smartphone usage behaviours from the perspective of IS user competence (Anderson 1980; Huff et al. 1992; Kraiger et al 1993; Marcolin et al. 2000; Munro et al. 1997) related to both functional device usage and app usage. Few studies have investigated how smartphone usage differs in the infusion stage from the adoption stage (Falaki et al. 2010; Koo et al. 2015). To achieve this goal, this study develops a research model combining several factors in the technology acceptance model (TAM) (e.g., perceived usefulness, perceived ease of use) and user competence 1) to evaluate the degree of usage capability of smartphone usage with user satisfaction, and 2) to examine the relationship between different types of smartphone usage (e.g., function use vs. app use). Unlike previous research, this study categorizes smartphone usage into two types: function use and app use. To our knowledge, this study is the first time smartphone usage has been categorized into these two types and empirically tested. From a practical perspective, this study can give an implication to smartphone and app developers as to which antecedents have importance for smartphone or app use. More importantly, this study can provide theoretical insights on how IT users in the infusion stage act differently from users in the adoption stage.

2 LITERATURE REVIEW

2. 1 Diffusion Stage of Smartphones

Statista (2013) forecasted that 83% of mobile users use a smartphone in 2018. This means that smartphone usage has already passed the early adoption stage in respect to the smartphone market. Cooper and Zmud (1990) found that individual users' behaviours were reasonably different in the post-adoption stage from their initial decision to accept or refuse IS. From that perspective, Saga and Zmud (1994) proposed that the IT diffusion process was divided into four stages: adaption, acceptance, routinization, and infusion. IT users experience new systems or technologies and get accustomed to utilizing them in the early stages of adaption and acceptance. Likewise, users in the latter stages, especially the infusion stage, are prone to creating innovative ways of using IT to match their current needs as well as to address new demands when they arise (Ahuja & Thatcher 2005). This is because

both the users and their peers have had extensive experience using the technology. (Koo et al. 2015). In other words, the usage behaviours of IT users are likely to change depending on the process of the diffusion stage. Hence, our study investigated smartphone usage in terms of the post-adoption stage of the IT diffusion process (i.e., IS continuance model) (Bhattacherjee 2001). Many studies have referred to the IS continuance model to explain the post-adoption stage of IT. Along this line, South Korea can be judged as being in the post-adoption stage of the IT diffusion process for smartphones, making the country a good place to investigate the usage behaviours of smartphone users in the infusion stage.

Initially, smartphones provided a totally new kind of mobile service based on their own operating systems and built-in functions (e.g. wireless internet) and this changed the users' mobile usage behaviours. On the other hand, in the infusion stage, smartphone users have access to mobile platform services making it possible to download a wide range of apps. This has led to smartphones becoming embedded in the everyday lives of their owners (Soikkeli et al. 2011). The multi-functionality of smartphones makes the usage of each one unique (Barkhuus and Polichar 2011). Accordingly, Falaki et al. (2010) found that smartphone users showed a huge diversity in their usage behaviours, such as the average number of interactions per day, the average amount of data received per day, and the average amount of battery consumption.

In recent years, smartphone usage has not been confined to the role of a simple mobile phone; rather, it has become a new business platform utilizing myriad different apps (Deloitte Newsletter 2014; Yoon et al. 2013). Morgan Stanley (2009) reported that while iPhone users made a similar number of telephone calls as normal mobile users, iPhone users showed a massive disparity in their amount of apps usage. On the one hand, some users only used the simple, mainly built-in functions on their smartphones. On the other hand, others fully utilized their devices by creating innovative ways to take advantage of the different apps available to them (Koo et al. 2015). This phenomenon has resulted in a separation between smartphone devices and smartphone apps, with each part generating different business models (Yoon et al. 2013). From this point, we separated smartphone usage into two variables categorized as function use and app use. To define these usage constructs operationally, the exploitative and explorative use concept was applied because those usage types have been developed and confirmed as IS usage in the infusion stage. Hence, function use and app use were judged to be appropriate for this study due to previous research in IS usage in the infusion stage. There is a definite difference between exploitation and exploration. Exploitative use focuses on efficiency, production, and execution to finish tasks. Explorative use involves search, discovery, and innovation to use features in a new way (Burton-Jones and Straub, 2006; March 1991). Do et al. (2011) found that smartphone usage was considerably different at the individual level based on the user's physical and social circumstances, regardless of the kind of smartphone services, basic function apps, or downloadable apps available. In other words, a specific user's usage behaviour can be dissimilar with his or her past usage habits depending on the situation. It can be assumed that function use and app use are relevant to both exploitative use and explorative use because of the great variety of smartphone usages (Do et al. 2011). From this assumption, this study defined function use as explorative and related to the built-in smartphone functions and the frequency that users try new features on their devices. App use is defined as exploitative and refers to the frequency users take advantage of downloadable applications.

2.2 Technology Perception in the Infusion Stage

Some previous studies have analysed IT usage in the post-adoption stages and found a few factors influencing usage behaviours (Bhattacherjee 2001; Hsieh and Wang 2007; Limayem et al. 2007; Saeed and Abdinnour 2013; Thatcher et al. 2011). Several similar factors were verified in these studies. Bhattacherjee (2001) examined the perceived usefulness and user satisfaction impact on users' continuance intention to use IS with a research model drawing from expectation-confirmation theory. A study by Hsieh and Wang (2007) focused on extended use of IS influenced by perceived usefulness, perceived ease of use, and user satisfaction based on the IS continuance model and TAM. They posited that the direct influence of user satisfaction was ineffective to extended use in the presence of

perceived usefulness and perceived ease of use. Limayem et al. (2007) developed IS continuance studies by applying habit construct; thus, they proved the moderating role of habit to continued IS usage and the significant influences of perceived usefulness, user satisfaction, and confirmation. A study by Saeed and Abdinnour (2013) expanded the post-adoption IT usage research in a self-service IS situation and proposed three stages in the post-adoption IS usage process, where each stage has distinct perceived usefulness, perceived ease of use, user satisfaction, and voluntariness of use. Thatcher et al. (2011) studied intention to explore the knowledge management systems (KMS), which was affected by perceived usefulness, perceived ease of use, trust in IT, and trust in IT support.

Research	Verified factors	Findings
Bhattacherjee (2001)	Perceived usefulness Confirmation User satisfaction	Based on expectation-confirmation theory, this research examined users' intention to continue using IS. This research proved that user satisfaction, determined by confirmation of expectation, and perceived usefulness influenced significantly to continuance intention.
Hsieh and Wang (2007)	Perceived usefulness Perceived ease of use Confirmation User satisfaction	Based on the IS continuance model and TAM, this research studied extended use of IS. This research indicated that user satisfaction, perceived usefulness, and perceived ease of use affected extended use, but the direct influence of user satisfaction was insignificant in the presence of perceived usefulness and perceived ease of use.
Limayem et al. (2007)	Perceived usefulness Confirmation User satisfaction Habit	Based on expectation-confirmation theory, this research explored continued IS usage with habit construct. This research demonstrated the influence of perceived usefulness, confirmation, and user satisfaction, and also verified the moderating effect of habit.
Saeed and Abdinnour (2013)	Perceived usefulness Perceived ease of use User satisfaction Voluntariness of use	With post-adoption IS usage studies, this research examined post adoption IS usage behaviours in self-service IS usage perspectives. This research found that there are three distinct stages in post-adoption level and the antecedents of IS usage behaviours have different significance level depending on the stages.
Thatcher et al. (2011)	Perceived usefulness Perceived ease of use Trust in IT Trust in IT support	This research explored trust in IT with the concept of post-adoption of knowledge management systems (KMS). This research suggested trust in IT and trust in IT support, mediated by perceived usefulness and perceived ease of use, influence intention to use KMS.

Table 1. Previous studies on post-adoption IT usage

Through similar verified factors in the above research, we decided to apply perceived usefulness, perceived ease of use, and user satisfaction variables, which are frequently used for post-adoption usage, for our study. Perceived usefulness and perceived ease of use are major factors influencing user attitude and intention to use in TAM (Davis 1989). Perceived usefulness is defined as the "degree to which a user believes that using a particular IS would enhance his or her job performance" (Davis 1989). Perceived ease of use, in contrast, is defined as the "degree to which a user believes that using a particular IS would be free of effort" (Davis 1989). Many studies have confirmed perceived usefulness and perceived ease of use as powerful antecedents of users' technology acceptance (Davis 1989; Taylor and Todd 1995; Venkatesh and Morris 2000) and post-adoption usage (Bhattacherjee 2001; Hsieh and Wang 2007; Limayem et al. 2007; Saeed and Abdinnour 2013; Thatcher et al. 2011). As for user satisfaction, some research has explored the relationship among perceived usefulness, perceived ease of use, and user satisfaction. Roca et al. (2008) argued that perceived usefulness and perceived ease of use affect positively the satisfaction of e-learning program users. Other IS studies stated that perceived usefulness and perceived ease of use are crucial determinants of user satisfaction, and user

satisfaction is also important in measuring ways of technology adoption and continuance (Davis 1989; Koo et al. 2015; Venkatesh and Davis 1996).

However, there is a great diversity of opinions about the role of user satisfaction among perceived usefulness, perceived ease of use, and IT usage behaviours. According to a study by Hsieh and Wang (2007), the direct influence of user satisfaction to extended usage was significant only in the absence of perceived usefulness and perceived ease of use. In contrast, Amoako-Gyampah and Salam (2004) verified the role of attitude towards IS and satisfaction with the IS with perceived usefulness of IS and behavioural intentions to use IS. In this regard, it can be meaningful to examine the role of user satisfaction among perceived usefulness, perceived ease of use, and IT usage in smartphone environments.

2.3 User Competence

Strictly, IS continuance is distinguished from IS infusion because users in the infusion stage are more active in exploring technologies in their own creative ways and, more importantly, likely to have higher user competence, which progresses with technology use (Koo et al. 2015). Hence, to study smartphone usage behaviours in the post-adoption stage, user competence needs to be studied. User competence is defined as a user's expertise or proficiency at using technology effectively (Kraiger et al 1993; Marcolin et al. 2000). Three different outcomes -- cognitive outcomes, skill-based outcomes and affective outcomes -- are identified for conceptualizing competence. Cognitive outcomes, referred to as declarative knowledge, mean understanding the concept of technology and method of use. Skill-based outcomes, referred as procedural knowledge, are the abilities to universalize technology procedures to new tasks and to increase the pace of performance. Finally, affective outcomes refer to attitude, motivation, and self-efficacy (Anderson 1980; Kraiger et al 1993). These three components have been studied widely in various contexts (Marcolin et al. 2000). In the case of competence in the IS field, cognitive outcomes are measured and referred to as user competence (Munro et al. 1997). Huff et al. (1992) defined user competence as being composed of three separate dimensions: breadth, depth, and finesse. Breadth means the degree of knowledge possessed by the user. Depth refers to how complete the user's knowledge is about technology. Lastly, finesse is defined as the capacity to apply technology innovatively (Munro et al. 1997). Competent IS users have a mastery of the simple functions, but moreover, they can generalize the IS performance to innovatively perform new tasks (Koo et al. 2015). Naturally, this allows those with a high level of user competence to master new, useful features and get more value from the technology (Basselieer et al. 2001).

In the case of breadth and depth, since both dimensions are associated with user knowledge, there is a concern that these two factors have not been clearly differentiated in the current literature, which is dominated by studies on user competence of smartphones at the infusion stage of the IT diffusion process. Thus, we referred to the questionnaire used by Koo et al. (2015) and decided to simplify the two dimensions as knowledge and capacity, which could almost be represented as user competence from the perspective of smartphone usage at the infusion stage of the IT diffusion process. Therefore, we adapted from Koo et al. (2015) and separated user competence into two dimensions (e.g., knowledge vs. finesse). This study confirmed the influences of those two factors on user competence in smartphone usage with the user satisfaction.

3 RESEARCH MODEL AND HYPOTHESES

This research applied TAM (Davis 1989; Taylor and Todd 1995; Venkatesh and Morris 2000), user competence theory (Huff et al. 1992; Kraiger et al 1993; Marcolin et al. 2000) and the IS continuance model to investigate smartphone usage behaviours in South Korea, which is at the IT infusion stage for smartphones. Since perceived usefulness, perceived ease of use, and user satisfaction (drawn from TAM) are the most frequently used and verified factors in previous research on post-adoption usage of IS, they were applied to this study (Bhattacherjee 2001; Hsieh and Wang 2007; Limayem et al. 2007; Saeed and Abdinnour 2013; Thatcher et al. 2011). Due to the difference between simple IS continued

usage and the IS infusion stage, two user competence factors, finesse and knowledge, were selected as antecedents. As for smartphone usage, this study separated two types, function use and app use. In addition, this study examined the role of user satisfaction among the influences of other factors.

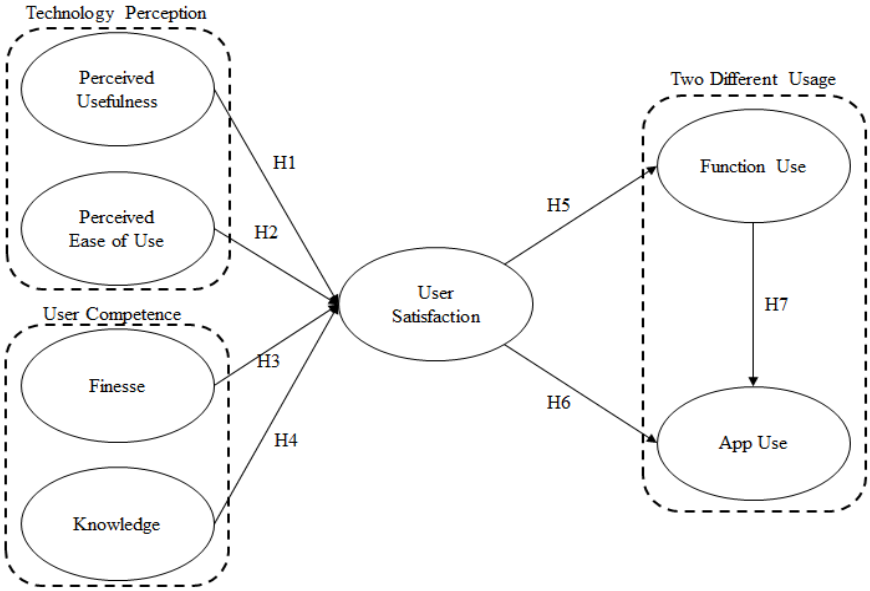

Figure 1. Research Model

In this research, perceived usefulness is adaptively defined as the level of which a smartphone user believes that using a particular smartphone would improve his/her usage effectiveness or efficiency. Perceived ease of use is adaptively defined as the level of which a smartphone user believes that using a particular smartphone would be free of effort (Davis 1989). In terms of IS usage, some studies have shown the positive influences of perceived usefulness and perceived ease of use on user satisfaction (Roca et al. 2008; Davis 1989; Koo et al. 2015; Venkatesh and Davis 1996). Thus, perceived usefulness and perceived ease of use would impact positively on user satisfaction in smartphone usage:

- H1. Perceived usefulness has a positive influence on user satisfaction in smartphone usage.
- H2. Perceived ease of use has a positive influence on user satisfaction in smartphone usage.

For this study, finesse is adaptively defined as a smartphone user's capacity to use a smartphone creatively. Knowledge is adaptively defined as a smartphone user's knowledge of how to use a smartphone for various purposes (Koo et al., 2015; Munro et al. 1997). A study by Basselieer et al. (2001) posited the user competence, representing the individuals' beliefs about their own abilities to use IT, can be an important indirect determinant of attitude and belief about particular technologies. The user competence stimulates the smartphone users to employ the different kinds of functions and information of the smart devices, resulting in arouse of high satisfaction (Koo et al., 2015). Thus, the higher the level of user competence, including finesse and knowledge, the more satisfied the user will be.

- H3. Finesse has a positive influence on user satisfaction in smartphone usage.
- H4. Knowledge has a positive influence on user satisfaction in smartphone usage.

User satisfaction is adaptively defined in this study as a smartphone user's psychological affect with or feelings about his or her smartphone usage experiences (Bhattacherjee 2001). Some studies based on TAM suggest that user satisfaction is a critical antecedent of technology use in both terms of adoption and continuance (Davis 1989; Koo et al. 2015; Venkatesh and Davis 1996).

- H5: User satisfaction has a positive influence on function use in smartphone usage.
- H6: User satisfaction has a positive influence on app use in smartphone usage.

In this study, finesse is adaptively defined as explorative use of in-built functions of smartphones, including, music players, cameras, and touch screens. App use is adaptively defined as exploitative use of downloaded apps. Between the two kinds of usage, explorative use and exploitative use, a positive relationship has been found by some researchers (Wang and Hsieh 2006). In this regard, this research assumes that function use and app use have a positive relationship and the simple use of in-built functions of devices should affect the creative use of downloaded apps.

- H7: Function use has a positive influence on app use in smartphone usage.

4 RESEARCH METHODOLOGY

To validate the research model empirically, data were collected by a questionnaire survey targeting smartphone users in South Korea, where smartphone usage accounted for over 60% of mobile users in 2012 (Martin 2012). In this regard, South Korea is an appropriate place to investigate smartphone usage behaviours in the post-adoption stage of the IT diffusion process.

4.1 Data Collection

The survey was performed with the support of a major online research company in South Korea.

Demographic variables		Frequency	%	Demographic variables		Frequency	%
Gender	Male	135	66.5	Occupation	Student	21	10.3
	Female	68	33.5		Office worker	96	47.3
Age	20s	44	21.7		Sales and service	7	3.4
	30s	51	25.1		Technician	16	7.9
	40s	38	18.7		Labourer	4	2.0
	50s	41	20.2		Professional	15	7.4
	Over 60	29	14.3		Self-employed	25	12.3
Marital status	Single	77	37.9		Civil servant	6	3.0
	Married	126	62.1		Homemaker	8	3.9
Education	High school	27	13.3		Other	5	2.5
	2-year college	30	14.8	Smartphone usage experience (years)	Under 3	84	41.4
	University	121	59.6		3-4	79	38.9
	Graduate school	25	12.3		4-5	26	12.8
Monthly personal income	Less than US$1,000	17	8.4		Over 5	14	6.9
	US$1,000-US$1,999	26	12.8	Smartphone type	Apple iPhone	29	14.3
	US$2,000-US$2,999	52	25.6		Samsung Galaxy	109	53.7
	US$3,000-US$3,999	42	20.7		LG Optimus	32	15.8
	US$4,000-US$4,999	26	12.8		Other	33	16.2
	More than US$5,000	40	19.7	Total		203	100

Table 2. Descriptive Statistics of Respondents.

The questionnaires were administered to current smartphone users in South Korea at random for five days from November 20 to November 25, 2013. To obtain usable data for our study, a screening question was used to select only smartphone users who had used their current smartphone for a minimum of two years. Through this selection, a total 203 usable surveys were collected.

In the case of gender, 66.5 percent of respondents were male and 33.5 percent were female. As for age, there was a comparatively even distribution with 21.7 percent of respondents in their twenties, 25.1 percent in their thirties, 18.7 percent in their forties, 20.2 percent in their fifties, and 14.3 percent aged 60 or over. A total of 37.9 percent of the sample was single, and 62.1 percent of sample was married. Most of the respondents had college degrees or university degrees (74.4 percent), and about half of the sample (46.3 percent) earned from $2,000 to $3,999 per month ($0.91 equalled about 1,000 Korean won in February 27, 2015). The largest portion of respondents were office workers (47.3 percent), and

41.4 percent of respondents had used their smartphone for less than three years. Finally, more than half of the sample (53.7 percent) used a Samsung Galaxy.

4.2 Instrument Development

The measurement items in this study were drawn from related previous studies. The items of perceived usefulness and perceived ease of use were adapted from the work of Gefen et al. (2003). To measure perceived usefulness and perceived ease of use which represent the effectiveness in business context, these items used the word "task", also used in business environments to evaluate the perceived usefulness, as usage performance associated with the use of smartphones following previous studies examining the usefulness of mobile internet services. The perceived usefulness and perceived ease of use sections each had three questions. This study had two dimensions to measure the user competence, which were finesse and knowledge. These separated dimensions have been verified by previous research in the context of IS post-adoption usage (Koo et al., 2015; Munro et al. 1997); thus, we adapted and elaborated on these dimensions according to our research perspectives. This study evaluated finesse with two questions and knowledge with three questions to measure user competence. As for user satisfaction, the measurement items were developed from related research (Bhattacherjee 2001). Four questions asked about general experience of smartphone usage based on psychological feelings, such as satisfaction, pleasure, contentment, and delight. Lastly, the measurements for function use and app use were adapted from previous research about two types of IS usage (Wang and Hsieh 2006) because the questions of function use inquired about the emergent use of smartphone device functions. In contrast, a question about app use asked about extended use of smartphone apps. There were three questions related to function use factors and only one question related to app use factors. All these questions used a seven-point Likert-type scale.

Construct	Wording
Perceived Usefulness (PU)	The smartphone makes it easier to do my tasks.
	The smartphone enhances my effectiveness in doing my tasks.
	The smartphone increases my productivity in doing my tasks.
Perceived Ease of Use (PEOU)	Learning to operate the smartphone is easy for me.
	I find it easy to get the smartphone to do what I want it to do.
	I find that the smartphone system is easy to use.
Finesse (FNS)	In general, I can say that I'm sufficiently creative in using my smartphone to deal with my tasks.
	In general, I can say that I'm an innovative user when it comes to using my smartphone to deal with my tasks.
Knowledge (KNL)	Indicate your current level of knowledge about smartphone elements (e.g., app store, functions, download the apps).
	Indicate your current level of knowledge about linking your smartphone with other devices (e.g. personal computer, Bluetooth, etc.).
	Indicate your current level of knowledge about connecting your smartphone to the Internet.
User Satisfaction (US)	How do you feel about your overall experience with smartphone use? Dissatisfaction-Satisfaction Displeased-Pleased Frustrated-Contented Terrible-Delighted
Function Use (FNU)	I explore new uses of the smartphone's functions to support my tasks.
	I often experiment with new ways of using the smartphone's functions to accomplish my tasks.
	I often find new uses of the smartphone's functions in performing my tasks.
App Use (APP)	I use all the available smartphone apps to help me with my tasks.

Table 3. Indicators for Constructs

5 DATA ANALYSIS AND RESULTS

The data analysis was conducted through partial least squares (PLS) analysis. PLS is a famous casual modelling technique that overcomes the disadvantages of linear structural relations (LISREL), another well-known casual modelling technique (Wold 1974; 1985). Hence, PLS is well suited to analyse small amounts of data and has fewer possibilities to generate abnormal or inappropriate solutions (Hulland 1999). In addition, PLS is considered to be a substantial structural equation model, so it is commonly applied in IS research (Chin et al. 2003). Smart PLS version 3.0 was used for this analysis.

5.1 Instrument Validation

The Harman's single-factor test was performed to check for bias that self-reported data can undergo, a common variance problem when data with more than two variables are collected from the same source (Podsakoff et al. 2003). The assumption of the test is that all the variables will be classified into one factor as a consequence of combining all of the variables together when the degree of common method variance is high (Wilson, 2010). Thus, this test indicates the presence or absence of common method bias in the data. An exploratory factor analysis was done using varimax rotation, resulting in seven factors with eigenvalues >1, as shown in Table 4.

Constructs	Items	Loadings						
Perceived Usefulness	PU1	0.930	0.624	0.531	0.442	0.583	0.556	0.596
	PU 2	0.935	0.571	0.527	0.450	0.645	0.575	0.586
	PU 3	0.907	0.514	0.524	0.380	0.581	0.515	0.498
Perceived Ease of Use	PEOU1	0.524	0.922	0.548	0.471	0.491	0.499	0.596
	PEOU2	0.635	0.942	0.584	0.499	0.560	0.525	0.608
	PEOU3	0.555	0.928	0.577	0.525	0.522	0.473	0.589
Finesse	FNS1	0.555	0.624	0.941	0.457	0.498	0.529	0.578
	FNS2	0.518	0.528	0.940	0.456	0.493	0.554	0.556
Knowledge	KNL1	0.452	0.494	0.457	0.919	0.406	0.413	0.532
	KNL2	0.401	0.473	0.421	0.926	0.374	0.408	0.488
	KNL3	0.404	0.498	0.449	0.895	0.415	0.434	0.526
User Satisfaction	US1	0.594	0.527	0.459	0.454	0.894	0.516	0.441
	US 2	0.610	0.505	0.498	0.346	0.925	0.518	0.483
	US 3	0.543	0.527	0.479	0.381	0.906	0.476	0.490
	US 4	0.628	0.496	0.480	0.409	0.911	0.543	0.504
Function Use	FNU1	0.541	0.494	0.521	0.412	0.543	0.946	0.576
	FNU2	0.512	0.501	0.551	0.410	0.506	0.933	0.557
	FNU3	0.591	0.488	0.520	0.448	0.512	0.885	0.541
App Use	APP1	0.607	0.642	0.603	0.565	0.528	0.606	1.000

Table 4. Exploratory Factor Analysis Results.

Subsequently, confirmatory factor analysis (CFA) was done to examine the item loadings, reliability, and discriminant validity. To verify the significance of item loadings, the value of each item should exceed 0.7 (Koo et al. 2015). Convergent validity is determined by three criteria: standardized path loadings, composite reliability (CR), and average variance extracted (AVE). According to previous research, the threshold of standardized path loadings should be over 0.70 (Gefen et al., 2000), CR as well as Cronbach's α should be over 0.7 (Nunally, 1967), and the AVE of each factor should be above 50 percent (Fornell and Karcker, 1981) to be statistically significant. In the case of item loadings for all of the factors in this research, they were above 0.70 (see Table 4).

As shown in Table 5, all the constructs were over 0.7 for CR and Cronbach's α, and all the AVE constructs were above 0.5. Thus, these results support the convergent validity of this research data (Gefen et al., 2000; Nunally, 1967; Fornell and Karcker, 1981). Discriminant validity is decided by comparing the constructs' loadings on their own and to those of other constructs. Statistically, the

discriminant validity is proved when the structures' square root of AVE is higher than all the correlation with other constructs (Bhattacherjee and Sanford, 2006). Table 5 shows that the square roots of all the AVE constructs exceed any correlation loadings with all the other constructs. Therefore, the discriminant validity was confirmed.

Construct	Cronbach's α	CR	AVE	APP	EOU	FNS	FNU	KNL	SAT	US
APP	NA	1.000	1.000	1.000						
PEOU	0.923	0.951	0.867	0.642	0.931					
FNS	0.870	0.939	0.885	0.603	0.613	0.941				
FNU	0.911	0.944	0.849	0.606	0.536	0.575	0.922			
KNL	0.901	0.938	0.835	0.565	0.535	0.485	0.459	0.914		
US	0.930	0.950	0.827	0.528	0.565	0.527	0.565	0.437	0.909	
PU	0.915	0.946	0.854	0.607	0.616	0.571	0.594	0.460	0.654	0.924
Notes: APP, App use; PEOU, perceived ease of use; FNS, finesse; FNU, function use; KNL, knowledge; US, user satisfaction; PU, perceived usefulness; shaded values show the square root of AVE of each construct										

Table 5. Correlations between Constructs.

5.2 Hypothesis Testing

The proposed research model was verified with the bootstrapping method. The size of the bootstrapping sample was 500. The results of hypotheses tests are shown in Figure 2.

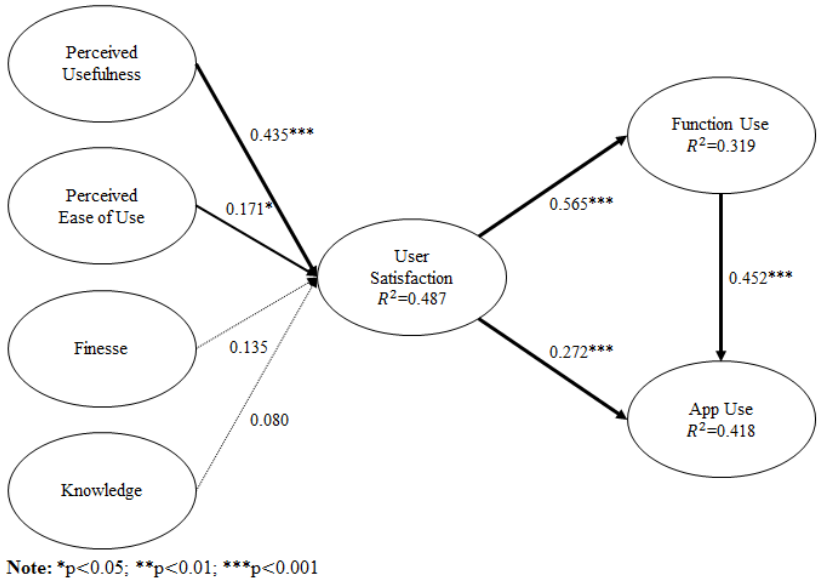

Figure 2. Results of Hypotheses Testing

To conclude, all the hypotheses were accepted except for H3 and H4. User satisfaction was significantly influenced by perceived usefulness (β=0.435, p<0.001) and perceived ease of use (β=0.171, p<0.05), and these two variables explained the user satisfaction at 48.7 percent. Thus, H1 and H2 were supported. However, the influences of finesse on user satisfaction and knowledge on user satisfaction were not significant in this research model. Therefore, H3 and H4 were rejected. Finesse was explained by user satisfaction at 31.9 percent and determined by user satisfaction (β=0.565, p<0.001). Likewise, app use was predicted by user satisfaction (β=0.272, p<0.001) and explained at 41.8 percent by finesse and user satisfaction. Therefore, H5 and H6 were supported. Finally, app use was influenced significantly by finesse (β=0.452, p<0.001), meaning H7 was supported.

Some results are accepted: hypotheses, H1, H2, H5, H6, and, H7, they were identical with previous research on related topics (Bhattacherjee 2001; Davis 1989; Hsieh and Wang 2007; Limayem et al.

2007; Saeed and Abdinnour 2013; Thatcher et al. 2011; Koo et al. 2015; Venkatesh and Davis 1996). However, the other results rising from H3 and H4 were dissimilar to related studies (Basselieer et al. 2001).

6 DISCUSSION AND CONCLUSION

6.1 Discussion

The aim of this study is to explain two kinds of smartphone usage behaviours, functional use and app use, in the IS infusion stage by the antecedents of perceived usefulness, perceived ease of use, finesse, and knowledge, which were drawn from TAM and user competence theory. In addition, we investigated the role of user satisfaction in the relationships among those factors.

After testing the hypotheses, we found some remarkable things. (1) The factors of TAM (perceived usefulness and perceived ease of use) were valid predictors of user satisfaction, but other factors of user competence (finesse and knowledge) were not predictors of user satisfaction. However, user satisfaction was a powerful predictor of the two types (functional use vs. app use) of smartphone usage. (2) Function use had an impact on app use effectively. Detailed explanations are as follows.

First, although all the independent factors from TAM were significant predictors of user satisfaction (perceived usefulness, β=0.435***; perceived ease of use, β=0.171*), and the antecedents from user competence were not effective predictors of user satisfaction (finesse, β=0.135; knowledge, β=0.080) in this study. In addition, user satisfaction was a strong predictor of both function use and app use (finesse, β=0.565***; app use, β=0.272***). The findings for TAM factors were identical to previous studies (Bhattacherjee 2001; Hsieh and Wang 2007; Limayem et al. 2007; Saeed and Abdinnour 2013; Thatcher et al. 2011). Also, the relationship between user satisfaction and smartphone usage was identical to previous research (Davis 1989; Koo et al. 2015; Venkatesh and Davis 1996). However, the results of factors related to user competence were inconsistent with previous research (Basselieer et al. 2001). We assume that the findings of user competence factors can be attributed to different contexts regarding smartphone usage in South Korea. Since South Korea is nearly at the post-adoption stage of IS usage, smartphone users in South Korea have already accustomed themselves to fully utilize the smart devices at a high level of user competence (Ahuja & Thatcher 2005; Saga and Zmud 1994). Thus, in such a unique environment, highly competent users are not always satisfied with their smartphone usage experiences because of their level of expertise. This finding proposes that for smartphone users who are highly aware of the usefulness and ease of use of the technology, behaviours are likely to be influenced by user satisfaction. However, if the users are not satisfied, they may not use the smartphone device functions as would be expected. On the other hand, competent smartphone users enjoy the benefits of their devices regardless of their satisfaction. To sum up, smartphone usage behaviours of general users are highly influenced by perceived usefulness and perceived ease of use, and this is prone to be triggered by user satisfaction. However, the usage pattern of competent users could not be based on satisfaction.

Second, we found that function use was a valid predictor of app use. In accordance with our research, the usage of smartphone devices can reinforce the usage of smartphone apps broadly and in depth. These findings are consistent with previous research in that one kind of IS usage influences other kinds of IS usage (Wang and Hsieh 2006). However, this study confirmed this relation from a different perspective, by examining smartphones both as devices with built-in functions and as platforms with downloadable apps (Wang and Hsieh 2006).

6.2 Conclusion

The major purpose of this study is to examine the smartphone usage behaviours in the IS infusion stage based on TAM and the concept of user competence. Through testing the research model, we verified that perceived usefulness and perceived ease of use are predictors of user satisfaction for

smartphones, that each antecedent differently impacts smartphone usage depending on user satisfaction, and that function use is a strong predictor of app use. Consequently, this study contributes to expanding the view of IS research related to smartphone usage. Also, the results provide practical insights to smartphone and app developers.

This study has several meaningful theoretical and practical implications related to smartphone usage in the IS infusion stage. In terms of theoretical implications, firstly, this study suggests a structural model of smartphone usage of device functions and of apps based on the IS infusion stage. Since it is one of the first empirical studies about IS usage in the post-adoption stage from the perspective of smartphones, it can contribute to related research. Moreover, it is possible to become usable basis theoretical backgrounds for future researches about IS usage in different stage. Second, this study developed the post-adoption IS usage concept by supplementing TAM and user competence theory. Although TAM has been applied frequently in IS usage studies (Bhattacherjee 2001; Davis 1989; Hsieh and Wang 2007; Limayem et al. 2007; Saeed and Abdinnour 2013; Thatcher et al. 2011; Koo et al. 2015; Venkatesh and Davis 1996), the studies examining the user competence concept are quite limited, therefore, this study can expand the view of smartphone usage research by adding the user competence concept with TAM theory. This could provide propositions, specifically for explaining the smartphone usage behaviour in more reasonable perspectives with various theories' grounds, and broadly for suggesting some hypothesis about the IS usage behaviours in more substantial perspectives. Third, this study proposed new kinds of smartphone usages, function use and app use, to investigate IS usage from a different perspective. It is quite deficient to explain the user behaviours with only a type of usage category. Regarding the different kinds of usage tendencies is needed to analyse the users' actions deeply, especially in IS or IT environments where the diversity of users has great importance theoretically and practically. To our knowledge, this is the first time smartphone usage has been separated into these two categories. Thus, the separation concept about smartphone usage has its meaning for contributing to related research field by confirming the specific concept of smartphone usages.

As for practical implications, this study can provide crucial information to both smartphone and app developers. The results of this research indicate that different factors impact the use of smartphone functions and apps. Therefore, through this research, developers would be more able to decide which attributes are more important to their users. For instance, smartphone or apps developers who target the amount of general users should try to satisfy their target because they would not use the smartphone's built-in functions or apps without contentment with those services, in contrast, the developers who target the competent users, usually the innovators or early adopters, do not need to invest their effort for satisfying their targets because they are expected to accept the smartphone functions or apps regardless of the satisfaction about those. These implications can contribute to allocate the limited resources of developers effectively and also to make more detailed strategies based on their target's characteristics. Moreover, these implications can be grounds of future strategies in other smartphone markets that have yet to reach the post-adoption stage of IS usage. Finally, according the current study, the app use of smartphone is positively influenced with the function use of smartphone, hence, the app developers or makers are recommended to connect their apps to the smartphone's built-in functions, because the more original smart device's functions used for the apps the more users are likely to touch the services.

Despite those noteworthy implications, this study has some limitations. First, the operational definition of two different usage type of smartphone with exploitative and explorative use concept can be an issue of arguments. Usually, smartphone built-in functions and downloaded apps are employed both exploitatively and exploratively. Hence, this issue should be more studied in future research. Second, because the research was done in South Korea, the data may be influenced by the local culture. Due to the high penetration of smartphones here, the results could be more universalized through studies in other countries.

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