

# Continued Usage with Attachment on Mobile Devices Influencing Perceived Value and Perceived Enjoyment\*

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## I. Introduction

The development of the Internet enables users to be connected wherever and whenever they want. This advancement creates a modern society that is dependent on their mobile devices. In this study, the term “mobile device” is not only referring to a cell phone but also a smart phone, a tablet PC and others which have become a necessity for modern society. This is especially the case for young people.

Young people identify themselves by their mobile devices, and gradually they become a part of what the device represents. It is being used as an expression of personality and self-expression (Li et al., 2005). So, a mobile handheld device becomes an extended self whereby the device is like an attachment to self. This is very important because the mobility of the device enables a person to always bring the device anywhere he or she goes. In the recent years, previous studies

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discussed that attachment can be formed towards a certain product or a brand as well as personal relationships. (Carroll & Ahuvia, 2006; Thomson et al., 2005; Park & Macinnis, 2006). Importantly, attachment is acquired through emotional factor which started from mindfulness of the experience (Siegel, 2007). As mentioned by McClland (1951) as users are more in control of the possession and more closely linked to oneself to the device, the degree of attachment also varies according to the product (Ball & Tasaki, 1992). Therefore, it is important to identify the fact that users always carry their mobile handheld devices which develop an attachment between users and their mobile handheld devices. This is an important concept necessary in this study.

The existing researches in Business Administration and Management Information System, however, studied acceptance of a new system through users' experience and their satisfactions which determine continuous usage of the new system which ultimately increases users' loyalty (Hassenzahl & Tractinsky, 2006; Bhattacharjee & Premkumar, 2004; Doll & Torkzadeh, 1988; McKinney et al., 2002). Ongoing studies focus on usage of Information Systems in accordance with usability and ease of use (Davis, 1989; Karahanna et al., 1999; Venkatesh et al., 2003). Typical user experience with Information Systems and evaluation is made based on appropriate information in the system even if they are

satisfied with it (Thomson et al., 2005; Wirtz & Lee, 2003). In other words, these studies examined users on their satisfaction and continuous usage (Chitturi, 2008). It introduces the concept of attachment between users and Information Systems. Firstly, new research is on user attachment with a cell phone, smart phone or Tablet PC. Secondly, extrinsic and intrinsic motivations are both important motivations that affect user attachment which was verified by a survey.

## II. Theoretical Background

The theoretical background of this study is divided into three. The first is extrinsic and intrinsic motivations, the second is experience in IS, and the last is theoretical background for the concept of attachment.

### 2.1 Extrinsic & Intrinsic Motivation

While the early stage of researches done on Information Systems (IS) and Information Technology (IT) use and acceptance mainly focused on extrinsic motivations, more researchers are turning their focus on intrinsic motivations. Based on earlier research, there are certain aspects of use or acceptance that cannot be explained by extrinsic motivation alone. This is especially true for hedonistic activities such as online computer games,

online shopping, social networking and even the usage of personal e-mails. Using and accepting utilitarian systems can also be affected by intrinsic motivation. As suggested by O'Brien (2010), both extrinsic and intrinsic motivations are necessary for functionality and pleasure to be a part of user's experience. This will further ensure that the users interaction with a particular system to incorporate emotion, cognition and physicality. This was already been suggested more than a decade ago by Davis et al. (1992) who insisted that the key drivers of behavioral intention to use are both the extrinsic and intrinsic motivation. Therefore, for this study, both the extrinsic and intrinsic motivations are considered as critical in users' continuous use of mobile handheld electronic devices. Extrinsic motivation is usually related to utilitarian systems as users are more concerned about the functionality of the system, especially the extend of which the system is useful for them to achieve their intended goals (Deci and Ryan, 1987). For example, the usage of systems such as an e-mail and Enterprise Resource Planning (ERP) have specific functionalities. Meanwhile intrinsic motivation is usually related to hedonistic systems. These systems are more concerned for the level of enjoyment and excitement that users achieve while using the systems.

## 2.2 Experience in IS

Mobile experience is defined in a broad sense (Nysveen and Pedersen, 2004). By using several mobile services and various value-added services offered on a broad range of mobile services including Short Messaging Services (SMS), mobile broadcastings, mobile games, mobile learning, and mobile shopping, users engage in broad and general mobile experience. Mobile experience is defined here as a general experience with mobile services and not as an experience with one particular mobile service.

One of the reasons for the failure of small business is the lack of IS knowledge (Thompson et al., 1994). Many companies, especially small ones, delay adopting innovation until they have enough IS expertise (DeLone, 1988; Gable, 1991). The pool of diverse expertise available in organizations is a key element in reducing knowledge barriers during IS implementation (Chau & Tam, 1997). Organizations with less IS experience or expertise, however, have less professional and skilled human resources, and low technical knowledge and technical potential.

Similarly, experience is assumed to increase user's confidence in their ability to master and use computers supporting their task performance. Agarwal et al. (1996), however, argued that the effect of experiences may not be universal. They found that a structured

learning experience was more beneficial than a self-training experience. Bruner and Kumar (2000) argued web sites that appear complicated to customers with low Internet experience are probably not as difficult to handle by customers with high internet experience. The results from prior studies indicate that a customer's experience is important in understanding a customer's perceptions, attitudes, and behavior in online environments (Nysveen and Pedersen, 2004; Tan and Teo, 2000).

### 2.3 Attachment

Originally the concept of attachment started from psychological research on caregivers' relationship with children (Bowlby, 1977), and it was developed to the attachment of children from their parents to friends and also to pets (Bowlby, 1980).

The existing studies mainly focused on interpersonal relationships from the perspective of the emotional bond that people feel about other people, and from the perspective of the relationship between people. As discussed by Bowlby (1979), emotional attachment is defined as the emotional bond between the specific objects. This emotional bond; or emotional attachment can be formed during childhood with parents but researches argue that it can also be formed with friends, pets and other objects. As the attachment theories

on interpersonal relationship are increasing, researchers on other domains are also gradually expanding the adoption of attachment theory in their domain (Carroll and Ahuvia, 2006; Thomson et al., 2005).

Ball and Tasaki (1992) proposed a formal definition of attachment as "the extent to which an object which is owned, expected to be owned, or previously owned by an individual, is used by that individual to maintain his or her self-concept." In their study, the role of attachment is in the relationship between people and possessions. Possessions that are clearly reflect users are more likely to develop high attachment. These possessions are socially visible, expensive, and reflective of the individual's roles, relationships, accomplishments, and experiences and usually personalized. During the life, there are a lot of things that people carry around but only a few will leave a strong attachment to the owner. This particular attachment could be caused by continuous interaction between the items with the owner. As the result of this lasting attachment, the owner will feel a great satisfaction. The attachment of an owner to an item therefore can predict the level of interaction and ultimately can explain users' use. A possession with a little low attachment will most probably have little emotional significant, whereas more emotional significant for possession with high attachment. This could also vary across the population with

respect to the kind of object. A study done by Lastovicka and Sirianni (2011) concluded that consumers do form relationships with their material possessions. These relationships also blur the distinction between human and object relationships in consumers' mind.

Rather than the target user's use, users may choose the alternative after experiencing it themselves. The field of interdependency theory can explain the interdependence of these assumptions (Kelley and Thibaut, 1978). This theory assumed that users' time and effort on specific targets contributed to maintaining an ongoing relationship between the user's satisfactions with the attractiveness of other alternatives. Even when users are satisfied with their current choice, when a better alternative is introduced, they therefore might decide to choose the better alternative. By referring to previous research related to attachment, however, when users are offered a better alternative, they are less willing to choose the better alternative since they are attached to their previous choice (Jones and Sasser, 1995). Those users who have a strong attachment usually have greater confidence, greater investment, and tend to make greater sacrifices (Bowlby, 1980; Hazen and Shaver, 1994). This may vary with the strength of attachment, rather than strong connection alone, affection, love and passion, strong feelings and connection (Bowlby, 1980, 1969) may lead to strong attachment which makes the user feel

the need to be closer. When users experience stress in the external environment, the physical or psychological attachment target seeks protection and affection from the target. For example, if they experience separation or isolation, it can be painful (Thomson, 2006). Attachment was described by Thomson et al (2005) as the following. Firstly, in order to form a personal attachment and affection, sufficient time for interaction is necessary. Secondly, a user and his or her attachment have a connection with his/her self-concept. Thirdly, when attachment has been formed, it is important to maintain proximity and being separated will lead to anxiety. There are some similarities when it comes to attachment as presented in existing studies which firstly, attachment is formed as the effect of self congruity or self-connections (Park and Macinnis, 2006; Fournier, 1998). Secondly, attachment is the effect of interaction (Thomson et al., 2005).

In recent years, numerous studies done on emotional attachment are not only applicable to interpersonal relationships, but as well as for a specific product or brand which lead to product or brand loyalty (Carroll and Ahuvia, 2006; Thomson et al., 2005). In this study, emotional attachment is shown on the perspective of the user experience of using a particular product. The emotional attachment is considered to be possible to improve the problem of focusing on user satisfaction with

the existing theoretical models. Therefore, even with a lot of research done on user satisfaction with existing information systems as well as marketing research studies on model of customer loyalty and involvement, those researches are still not sufficient to explain users behavior. Furthermore, the experience that was formed through long-term interaction between users with information systems (device) was not able to be reflected in those studies. In this study, the concept of attachment to mobile devices projects certain feeling when user uses these devices. This study introduces the notion of device attachment.

### III. Research Model

Traditionally, use intention has been considered as one of the most important theoretical foundations for traditional IT acceptance theories which were based on attitude-behavior theories such as the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), theory of planned behavior (TPB) (Ajzen, 1991), and technology acceptance model (TAM). According to these theories, IS uses or acceptances are determined by beliefs and expectations through rational decision making process, which, in turn, determine conscious intentions indirectly mediated by attitude or directly. Thus, most studies on the experience in IS use under the frameworks of

IS adoption focused on mainly the moderation effects on intention-usage, beliefs-intention or attitude-intention relations. Likewise, the effects of experience on antecedents of beliefs were also analyzed in IT adoption framework. For instance, Venkatesh (2000) showed the determinants of perceived ease of use for a new system can be classified into “anchoring” and “adjustment”: anchoring constructs are system independent beliefs independent of experience and adjustment constructs are beliefs on specific systems that are strengthen by experience. One of what the above studies have in common is that they were mostly based on the hypothesis that attitudes formed by direct experiences are stronger than those by indirect experiences (Fazio and Zanna, 1981). That is, the direct experienced users may have more clear and confident evaluation ability of, more attentive to incoming information about, and more readily accessible memory of using a particular IS than the indirect experienced users (Fazio and Zanna, 1981). These studies of users defined the information quality, system quality, service quality, perceived usefulness and perceived ease of use as the worthy factors to consider when describing continuous usage of information systems. In this study, the continuous usage of mobile handheld devices introduces the concept of device attachment as shown in Figure 1.

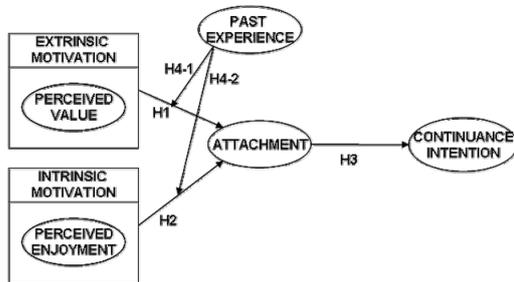


Figure 1 Research Model

According to the Bem's (1972) self-perception theory, user's attitude can be viewed by looking at user's behaviors. Based on this theory, users who have strong attachment consider their current device as a means of self-expression and try various ways to personalize their devices (Li et al., 2005, McVeigh, 2003). In addition, users who have strong attachment feel that they can emphasized on self-projection which leads to production of satisfaction (Belk, 1988). As a result, the current device that produces high perceived value will produce higher satisfaction and higher chances of continuous usage (Hong et al., 2006). Furthermore, the expectation theory that matches the users in performing a certain task, which expectation and termination of that task and the results obtained by comparing the value for the recognition of the value will be different. The expectation theory as based by Bhattacharjee (2001) who developed users' satisfaction model in information systems also discussed about providing a useful information system that will produce convenience and perceived

value for the users (Davis, 1989; Bhattacharjee, 2001; Bhattacharjee & Premkumar, 2004). Users view information systems' value based on its usefulness to decide on continuous usage which can be formed directly and indirectly. Thus, the perceived value in studying the continued use of information systems is important to study further. Below are a set of hypotheses with respect to perceived value:

H1: Perceived value will have a positive impact on an individual's attachment.

In using information system, in addition to intrinsic motivation such as fun and perceived enjoyment, there is also a need for continuous expansion. Based on this, a number of studies on technology acceptance factors and perceived intrinsic motivational factors were conducted (Chesney, 2006; Van der Heijden, 2004). According to Heijden (2004), perceived enjoyment can be defined as the extent to which fun can be derived from using the system. And most of the time, perceived enjoyment is more dominant in determining users' acceptance for hedonic systems. The study done by Heijden (2004) focused on the importance of intrinsic motivation in creating favorable user acceptance. Thus, people with positive perceived enjoyment are the most likely to develop positive attachment to devices and they are also the most likely to continue using the device that they are attached. Below are a set of hypotheses with respect to

perceived enjoyment:

H2: Perceived enjoyment will have a positive impact on an individual's attachment.

As attachment is formed with sufficient interaction time (Baldwin et al., 1996), it is just the matter of maintaining that relationship once it is formed (Johnson & Rusbult, 1989). People will continuously use a new information system such as Nintendo or a new cell phone that as the users get attached to the devices.

According to the attachment theory by Bowlby (1969), people who are experiencing attachment will have positive feelings (Baumeister & Leary, 1995). Also, those people with strong attachment feel really happy and much satisfied (Mcadams & Bryant, 1987) and the continued attachment invokes the need to express it (Reis & Patrick, 1996). Likewise, negative information may inhibit formation of attachment (Thomson et al., 2005), whereas positive information will produce overall positive assessment (Ahluwalia et al., 2001). This study is proposing this hypothesis with respect to attachment:

H3: Attachment on mobile devices will have a positive impact on continuous usage.

The attachment theory developed by Bowlby (1973) summarized three propositions. The third proposition suggested as follows: "It postulates that the varied expectations of the

accessibility and responsiveness of attachment figures that individuals develop during the years of immaturity are tolerably accurate reflections of the experiences those individuals have actually had." Feeney et.al (2008) in their study examined the attachment theory adoptions in understanding interactions with new peers in social situations. Based on the attachment theory, individual builds experience based representational or working models of the world and him/herself. These working models and forecasts derived from working models are based on actual experience with significant others. As individuals developed these working models, they are generalized to new social situations. Past experience is therefore expected to affect attachment of an individual to his/her possessions. Below are a set of hypotheses with respect to past experience:

H4-1: Past experience will have a moderating effect on perceived value to mobile handheld devices on attachment.

H4-2: Past experience will have a moderating effect on perceived enjoyment to mobile handheld devices on attachment.

## IV. Research Method

A survey was done to gather the necessary user's data. Prior to the survey, a pilot test was done to validate the instruments used for the

survey.

#### 4.1 Instruments

In this study, the extrinsic motivation construct, perceived value was adopted from instruments developed by Johnson et al. (2006). Meanwhile, the intrinsic motivation construct, perceived enjoyment was adopted from Lee et al. (2005) and Moon and Kim (2001). Instrument for attachment was adopted from Carroll and Ahuvia (2006); and Thomson et al. (2005). Continuous use construct was adopted from Bhattacharjee (2001). And lastly, the past experience construct was adopted from Smith et al. (2007). For all scales a seven-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (7) was used. In order to develop and validate the instrument, several steps were taken: 1) development of the measure from the literature; 2) pilot test of the measure.

#### 4.2 Survey Sample

A survey was conducted among university students in one of the university in Daegu, South Korea. A valid sample 240 responses managed to be collected. Table 1 shows the demographic characteristics of the sample. As our participants are university students, most of them are in between 18-26 years old and with more than half of them are male. Mobile

device usage experience is normally distributed with the highest concentration in the 7-9 years of experience. Meanwhile, the daily usage of mobile device is concentrated in the 4-6 hours per day.

Table 1 Demographic Characteristics of the Sample

Variables	Sample Composition	
Age Group	18-20 years old	57
	21-23 years old	67
	24-26 years old	95
	27-29 years old	21
Gender	Female	98
	Male	142
Mobile device usage experience	1-3 years	55
	4-6 years	42
	7-9 years	85
	More than 10 years	58
Mobile device usage experience	1-3 hours	69
	4-6 hours	98
	7-9 hours	45
	More than 10 hours	28

#### 4.3 Data Analysis and Results

We used partial least square (PLS) to accommodate the exploratory nature of the research model. The tool that was employed is SmartPLS 2.0. PLS was chosen as it accommodates the presence of a small to medium-sized sample, formative factors and better suited for the testing of moderating effects.

##### 4.3.1 Construct Validity

Peter and Churchill (1986) concluded that

one of the most critical aspects in researches is the non-empirical evidence when judging constructs validity. Nomological validity is the validation that clarifies whether measurement behaves as expected. This validation is done based on the explicit investigation of construct and measures. This is conducted based on the formal hypotheses that should be derived from theory. Therefore, both convergent validity and discriminant validity are essential in figuring out the nomological validity. Convergent validity is defined by Peter and Churchill (1986) pertains to the correlation between two different measures purporting to measure the same construct. It should reflect that a group

of measures from the same construct are reflecting to the same construct. As it provides additional evidence of systematic variance, it should be positively related to both discriminant and nomological validity. On the other hand, discriminant validity (Peter and Churchill, 1986) should reflect the extent to which the measure is unique and not simply a reflection of other variables. It is intended to show what a measure does not correlate with. It should reflect that measures from a construct are not similar to measures from different construct.

Based on Peter and Churchill (1986), they hypothesize seven relationships with regards to

Table2 Factor Loadings and Cross-Loadings

	PERCEIVED VALUE	PERCEIVED ENJOYMENT	ATTACHMENT	PAST EXPERIENCE	CONTINUOUS USE
PV1	<b>0.830</b>	0.279	0.407	0.366	0.394
PV2	<b>0.862</b>	0.367	0.496	0.387	0.430
PV3	<b>0.728</b>	0.199	0.287	0.250	0.324
PV4	<b>0.884</b>	0.459	0.614	0.452	0.517
PE1	0.427	<b>0.793</b>	0.630	0.560	0.459
PE2	0.332	<b>0.881</b>	0.434	0.336	0.221
PE3	0.349	<b>0.893</b>	0.487	0.304	0.224
PE4	0.307	<b>0.893</b>	0.482	0.398	0.289
ATTACH1	0.514	0.592	<b>0.848</b>	0.406	0.497
ATTACH2	0.303	0.383	<b>0.775</b>	0.199	0.372
ATTACH3	0.361	0.410	<b>0.826</b>	0.279	0.464
ATTACH4	0.635	0.554	<b>0.837</b>	0.381	0.527
EX1	0.376	0.451	0.380	<b>0.842</b>	0.465
EX2	0.349	0.280	0.364	<b>0.804</b>	0.422
EX3	0.294	0.308	0.187	<b>0.660</b>	0.330
EX4	0.382	0.443	0.251	<b>0.759</b>	0.357
CU1	0.433	0.355	0.572	0.548	<b>0.899</b>
CU2	0.430	0.282	0.389	0.320	<b>0.788</b>
CU3	0.284	0.072	0.201	0.142	<b>0.536</b>

construct validity. These seven relationships are: (1) measure development process, (2) measure characteristics, (3) sampling characteristics, (4) reliability, (5) convergent validity, (6) discriminant validity, and (7) nomological validity. In our study, the following relationships recommended by Peter and Churchill (1986) were applied to ensure the our nomological validity.

(1) Measure development process; this process is the procedures used to generate items and develop measures. This process was done by developing measures based on strong theoretical background and applying measurement scales that were developed and verified by previous researchers. The results as shown in Table 2 show that each measure produces lower correlations with other measures.

(2) Measure characteristics, which represent the nature of the measures investigated in validation research. These includes the number

of items, number of dimensions, difficulty of the items, type of scale, number of scale points and type of labels. As measure characteristics effects reliability, results shown in Table 3 show that each measures' composite reliabilities are larger than the suggested 0.70.

(3) Sampling characteristics represent the nature of the sample employed in measure validation research. The sample size for this study is 240 which are ample for this pilot test. Furthermore the tool used PLS is accommodating for exploratory study.

(4) Reliability, the degree to which measures are free from random error and thus reliability coefficients estimate the amount of systematic variance in a measure. In this study, reliability was assessed using internal consistency scores as shown in Table 3. As mentioned in relationship (3), all composite reliabilities are larger than the suggested 0.70.

(5) Convergent validity, as described above pertains to the correlation between two

Table 3 Composite Reliability, Averages Variance Extracted, and Correlation of Constructs

Construct	No. items	Mean <sup>a</sup>	SD	CR	AVE	Square Roots of AVEs and Correlations*				
						1	2	3	4	5
1. PV	4	4.802	1.412	0.897	0.686	<b>0.828<sup>b</sup></b>				
2. PE	4	4.819	1.302	0.923	0.750	0.418	<b>0.866<sup>b</sup></b>			
3. ATTA	4	5.214	1.361	0.893	0.676	0.455	0.604	<b>0.822<sup>b</sup></b>		
4. EX	4	5.446	1.397	0.852	0.592	0.574	0.480	0.399	<b>0.769<sup>b</sup></b>	
5. CU	3	5.301	1.533	0.765	0.540	0.517	0.362	0.574	0.518	<b>0.735<sup>b</sup></b>

CR: Composite Reliability AVE: Average Variance Extracted

<sup>a</sup>The mean is average of the item scores

<sup>b</sup> $p < 0.01$

\* The diagonal elements are the square roots of the variance shared between the constructs and their measurement (AVE). Off-diagonal elements are the correlations among constructs. Diagonal elements should be larger than off-diagonal elements in order to exhibit discriminant validity

different measures purporting to measure the same construct. As this validation is positively related to both discriminant and nomological validity, results in Table 2 shown that the square roots of all AVEs are much larger than all other cross correlations.

(6) Discriminant validity, the extend to which the measure is unique and not simply a reflection of other variables. Therefore results in Table 2 as mentioned in relationship (5) suggest that this study has adequate discriminant validity.

(7) Nomological validity, which addresses the issue of whether the measure behaves as expected. As the hypotheses of this study were derived from theoretical background, as well as the reliability and convergent validity results gathered are adequate to support the nomological validity of this study.

#### 4.3.2 Measurement Validation

The reliability, convergent and discriminant validity of the instrument were first examined. Table 2 shows that all but one loading are larger than the suggested threshold of 0.707 (Chin 1998). Table 3 shows that all composite reliabilities are larger than the suggested 0.70 and all AVE values are greater than the suggested 0.50 indicating a good convergent validity of the measurement model (Barclay et al. 1995; Fornell and Larcker 1981). Reliability was assessed using internal consistency scores, calculated by composite reliability scores.

Compeau et al. (1999) suggested that for sufficient discriminant validity to be present, items should load more strongly on their own constructs, and the average variance shared between each construct and its measures should be greater than the variance shared between the construct and other constructs. This can be seen in Table 2 that items load much highly on their own latent constructs than on any other latent constructs (cross-loadings). In addition, Table 3 shows that the square roots of all AVEs are much larger than all other cross correlations. Chin (1998) mentioned that discriminant validity is achieved when the square root of the AVE or a particular construct is larger than the correlations between it and the other constructs.

#### 4.3.3 Testing the Structural Model

The standardized PLS path coefficients are shown in Figure 2. All interaction variables were computed following the procedure of Chin et al. (2003) by cross multiplying the standardized items of each construct. The direct effect of Perceived Value with Attachment ( $b=0.378$ ,  $p<0.01$ ), Perceived Enjoyment with Attachment ( $b=0.441$ ,  $p<0.01$ ), and Attachment with Continuous Usage ( $b=0.454$ ,  $p<0.01$ ). A structural model with only direct effects of two independent variables on Attachment was first examined. Perceived Value and Perceived Enjoyment had significant impact on

Attachment, thus supporting H1 and H2.

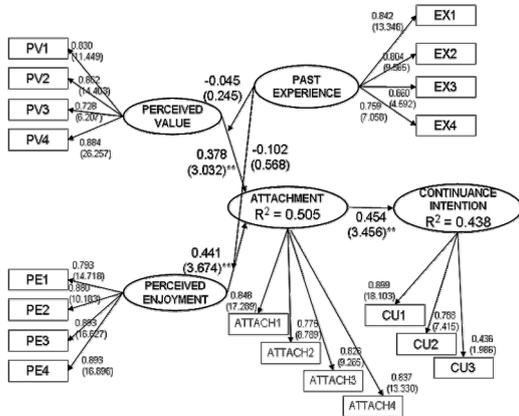


Figure 2 PLS Results of Research Model

As attachment had significant impact on Continuous Use, this is supporting H3.

Table 4 Past Experience Cohen's f Value between PV and Attachment

$R^2_1$	0.501
$R^2_2$	0.507
$k_1$	2
$k_2$	3
Sample size	240
$F = ((R^2_2 - R^2_1) / (k_2 - k_1)) / ((1 - R^2_2) / (N - k_2 - 1))$	2.872
Cohen's f	0.012

Bootstrapping analysis was performed to test the structural model. In order to test the moderating effects of Past Experience, this research employed the PLS-PS (product of sum) approach recommended by Goodhue et al. (2007).

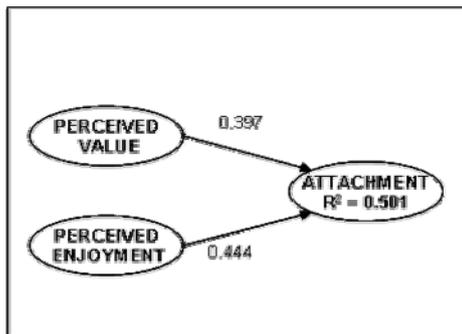


Figure 3.1 Direct Effect between PV, PE and Attachment

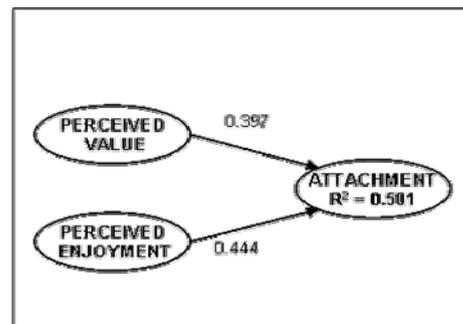


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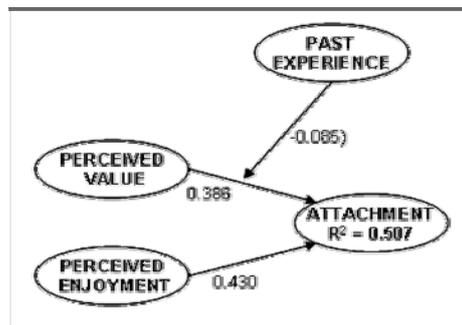


Figure 3.2 Moderating Effect on Past Experience between PV and Attachment

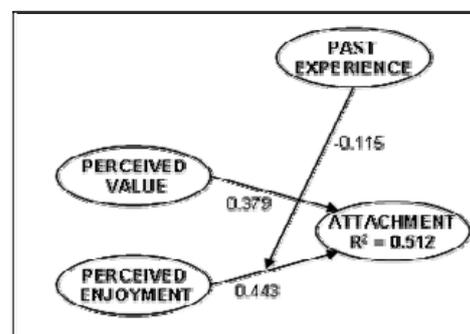


Figure 4.2 Moderating Effect on Past Experience between PE and Attachment

For this research, the sums of the moderating factor (Past Experience) and three variables (Perceived Value, Perceived Enjoyment and Attachment) were multiplied to generate the product of sums.

Table 5 Past Experience Cohen's f Value between PE and Attachment

$R^2_1$	0.501
$R^2_2$	0.512
$k_1$	2
$k_2$	3
Sample size	240
$F = ((R^2_2 - R^2_1) / (k_2 - k_1)) / ((1 - R^2_2) / (N - k_2 - 1))$	5.320
Cohen's f	0.022

Therefore, three single-indicator interaction terms representing the three moderating effects respectively were added to the model. Then, a model including both direct and moderating effects were examined. Past Experience did not have moderating effect on the relationship between Perceived Value and Attachment, therefore H4-1 was not supported. On the other hand, Past Experience negatively moderated the impact of Perceived Enjoyment and Attachment, supporting H4-2.

The tests for the moderated relationships were conducted by applying moderated multiple regressions (MMR). It is a statistical tool of choice for estimating interaction effects. The following formula by Aguinis and Gottfredson (2010) was used to compute the F-statistic and the effect size ( $f^2$ ) is calculated by the formula suggested by Mathieson et al.

(2001). Meanwhile, the effect size result was concluded based on the suggestion by Cohen (1988) that 0.02, 0.15 and 0.35 as operational definitions of small, medium and large effect sizes respectively. The steps taken to calculate the results are shown in Figure 3 and 4. The results of these two formulas were shown in Table 4 and 5. After validating the moderating effect of the proposed research model, the next step taken was to test the mediating effect of attachment on both perceived value and perceived enjoyment. The objective of this step is to determine whether attachment acted as a mediator as specified in the research model. The mediation analysis was conducted using structural equation modeling and regression.

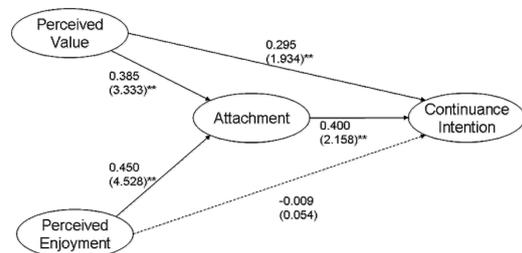


Figure 5 Result of mediating effect

In the case of perceived value, the direct path to continuance intention was found to be significant ( $b=0.295$ ,  $t=1.934$ ), suggesting partial mediation. However for perceived enjoyment, the direct path to continuance intention was found to be not significant, suggesting perfect mediation. In order to verify the mediating effect implied by the PLS

Table 6 Mediating effect analysis based on Baron and Kenny (1986) approach

Step	Coefficients	Comments	R <sup>2</sup>
Step 1. IV→Mediator (PV,PE→Attachment)	PV=0.397** (t=3.718) PE=0.444** (t=4.564)	The IVs must affect the mediator. This condition is satisfied for PV and PE.	0.501
Step 2. IV→DV (PV, PE→CU)	PV=0.442** (t=3.102) PE=0.182* (t=1.177)	The IVs must be shown to affect DV. This condition is satisfied for PV and PE.	0.295
Step 3. IV and mediator →CU	PV=0.295** (t=1.926) PE=0.009 (t=0.057) Attachment=0.391** (t=2.315)	If there were perfect mediation, expecting to see a significant relationship controlling for the mediator. Thus, PE is fully mediated by Attachment, while PV is partially mediated by Attachment.	0.375
Sobel test	Z=4.67** (PV→Attach→CU) Z=4.69** (PE→Attach→CU)	Since the Sobel test statistics are significant for both PV and PE, this indicates that these 2 factors have a significant indirect effect on CU that is mediated by Attachment.	

analysis, the second step was taken; which is the traditional regression analysis-based approach suggested by Baron and Kenny (1986). This approach consists of three-step process. As shown in Table 6, firstly the

mediator (attachment) was regressed on the independent variables (perceived value and perceived enjoyment). Secondly, the dependent variable (continuance intention) was regressed on the independent variables (perceived value

Table 7: Results of the Structural Models

	Directs Effects only	Direct Effects + Moderating Effects
<b>a. Dependent variable: Attachment; Independent variable: Perceived Value</b>		
R <sup>2</sup>	0.501	0.507
$\Delta R^2$		0.006 ( $f^2 = 0.012$ )
Perceived Value (PV)	0.397	0.386
Perceived Enjoyment (PE)	0.444	0.430
Past Experience (EX)		0.010 (n.s)
PV x EX		-0.085 (n.s)
<b>b. Dependent variable: Attachment; Independent variable: Perceived Enjoyment</b>		
R <sup>2</sup>	0.501	0.512
$\Delta R^2$		0.011( $f^2 = 0.022$ )
Perceived Value (PV)	0.397	0.379
Perceived Enjoyment (PE)	0.444	0.443
Past Experience (EX)		-0.003 (n.s)
PE x EX		-0.115

and perceived enjoyment). And lastly, the dependent variable (continuance intention) was regressed on the independent variables (perceived value and perceived enjoyment) and the mediator (attachment). On top of that as shown in Table 6, Sobel's test is also included. This test provides a means of testing whether the influence of the independent variable on the dependent variable that is expressed through the mediator is statistically significant. Meanwhile, the overall results of the structural model are presented in Table 7. Consequently, the results of hypothesis testing are summarized in Table 8.

## V. Discussion and Limitations

This paper has investigated a new model that emphasized on user attachment with mobile devices. It also intended to prove that both extrinsic and intrinsic motivations are important motivations that affect user attachment; and this is supported by the result that was validated by the study conducted among 240 participants. From the results collected, Perceived Value (extrinsic motivation) and Perceived Enjoyment (intrinsic motivation) have significant effects on users' attachment to their mobile devices. These mean that users consider both extrinsic and intrinsic motivations; end-rewards or end-goals and personal satisfaction in using mobile devices. Accordingly, mobile device developers should not only focus on the functionality and

sophistication of the device but also should consider in detail parts of their devices that can match their users' intrinsic motivation. It is critical to understand what else is important for users on top of the functionality and the sophistication of the device; this could be the design, colors, or add-on accessories or even personalized software. The results gathered showed that past experience has no moderating effect on extrinsic motivation. This means that whether they are users with more or less past experience will not have any effect on their perceived value of their mobile devices. This result is contradictory to the hypothesis of this study. This could be because regardless of the variety of mobile devices offered in the market nowadays, most of them are offering almost the same functionality and as the sample in this study consisted of university students, they are young and well-verse in using various technologies. It shows that the level of experience does not differentiate their perceived value because the group of samples is well-verse technology users. Instead, a sample that consists of real novice users might bring a different result.

Past experience, however, has negative moderating effects on relationship between intrinsic motivation and attachment, which means that past experience would weaken the relationship between intrinsic motivation and attachment. For novice users, they are excited and curious to explore a new devices which

Table 8: Summary of Hypotheses Testing

Hypotheses	Supported?
H1: Perceived value will have a positive impact on an individual's attachment.	Yes
H2: Perceived enjoyment will have a positive impact on an individual's attachment.	Yes
H3: Attachment on mobile devices will have a positive impact on continuous usage.	Yes
H4-1: Past experience has a moderating effect on perceived value to mobile handheld devices on attachment. H4-2: Past experience will have a moderating effect on perceived enjoyment to mobile handheld devices on attachment.	Partially, H4-1 is not supported as the effect size is not significant, while H4-2 and H4-3 are supported. Past experience negatively moderated the relationship between Perceived Enjoyment and Attachment. Past experience also negatively moderated relationship between Attachment and Continuous Usage.

they never experienced before. This creates good feelings and they become more attached to their device and even could lead to addiction. Also, as they gain more experience in using devices, they will start to get bored and less entertained with them. This will lead to lesser attachment to the device. This is supported by Venkatesh et al. (2012), who studied that suggested hedonic motivation is moderated by age and gender as well as experience. In their study, they concluded that intrinsic motivation plays lesser role in determining technology use with increasing experience. Their argument is that as users gain experience, they are no longer impressed with the novelty and innovativeness of the technology. This is important as the novelty and innovativeness of the technology is the key reason of the users' intrinsic motivation. It tells that as they gain more experience, their intrinsic motivation diminishes and they will

start using the technology only for its functionality and they might even start thinking of replacing their current devices with more novel devices which the most likely will once again increase their intrinsic motivation. This is supported by numerous studies that suggested that attachment is not stable over time and can be changed as time passes by (Fraleley et al., 2011; Sadikaj et al., 2011). The core assumptions of attachment theory assume that people's working models are relatively stable over time but this assumption has not been unchallenged. There are arguments that there is little reason to assume that working models should be stable over time and instead could be changed according to the people's personality or even their environment. Especially in the case of technology usage, hence, people's personality such as their personal innovativeness as well as peer pressure can play a big role in determining

their attachment towards their mobile devices. For example, a young person might feel that as they gain more experience, they are not longer challenging the innovativeness within themselves. They feel that continuing to use the same device is not improving their inner innovativeness and limiting their own skills' improvements. Additionally, someone who is very concerned about peer judgments might feel obligated to ditch their old devices and get new devices. This is critical especially for young people that see their mobile devices as an extension of themselves (Belk, 1988). This reasoning could also be related to users' social desirability (Crowne and Marlowe, 1964)]. People with high social desirability are more likely to present themselves in a socially acceptable manner. So, they could be presenting themselves as more or less connected to their mobile devices as they are trying to fit into their social group's expectations.

There are a few limitations in this study. As the participants are university students, factors such as limited resources including expenses could affect their decisions to continue using particular mobile devices rather than their personal preferences. On top of that, university students might use mobile devices differently than those in different situations. In the case of company workers, they might need mobile devices that can act as work stations in necessary situations but the same might not

apply to university students. The functionality and sophistication of a mobile device might be less important for students. It can be explained as company workers may be more concerned with their perceived value whereas university students may be more concerned with their perceived enjoyment. The empirical results presented in this study might produce a different conclusion given a different set of participants.

Secondly, the model proposed for this study lacks individual differences in attachment dynamics. Recent studies on attachment theory started to focus on more details on attachment representations (Sadikaj et al., 2011; Dewall et al., 2011; Eastwick and Finkel, 2008). Sadikaj et al. (2011) focused their study on attachment anxiety and attachment avoidance. Individuals with secure attachment orientations showed lower values in both the attachment anxiety dimension and the attachment avoidance dimension. A study on attachment avoidance was also done by Dewall et al (2011), which focused on levels of commitment in romantic relationships. Another study on attachment anxiety was done by Eastwick and Finkel concluded that attachment anxiety during the earliest stages of romantic relationships seems to be normative experience and may signal the activation of the attachment system.

Thirdly, only users' continuance intentions are investigated and users' actual usages were not investigated in this study. The omission of

actual usage reduces the ability of this study in predicting the long-term behavior after intention is formed. The main reason for this omission is because of the cross-sectional nature of this study. Since the cross-sectional research is designed to look at a variable at a particular point of the time, the inclusion of continuance usage will require this study to be redesigned into a longitudinal study.

## VI. Conclusion

This paper has highlighted the adoption of attachment theory in understanding users' continuous usage of their mobile devices. It is important to identify the fact that users always carry their mobile devices everywhere and anywhere they go and this lead to development of attachment between users and their mobile devices. The most interesting finding in this paper is the moderating effect of past experience only exists for intrinsic motivation but not for extrinsic motivation. This emphasized the importance of intrinsic motivation in continuous usage not only for hedonic applications but also for those utility applications.

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#### 권순재(Soon Jae Kwon)



현재 대구대학교 경영학과 교수로 재직 중이다. 성균관대학교 경영학부를 졸업하고 성균관대학교에서 경영정보시스템 전공으로 석사 및 박사를 취득하였다.

Journal of MIS, Decision Support Systems, Journal of Computer Information Systems, Behavior and Information Technology, Cyber Psychology and Behavior, Electronic Commerce and Research Application, Expert Systems with Applications 등에 논문을 게재하였으며, 국내에도 50여편의 연구가 있다. 주요 관심분야는 SNS에서 재미, 인터넷 및 모바일에서 소비자행동, 온라인 커뮤니티에서의 온톨로지연구 등이다.

<Abstract>

## **Continued Usage with Attachment on Mobile Devices Influencing Perceived Value and Perceived Enjoyment**

Soon Jae Kwon

The concept of attachment between users and Information Systems; specifically on mobile devices was examined in this study. Furthermore, the moderating effect of users' past experience also was investigated. The empirical study was done involving 240 university students; to investigate the participants' perceived value, perceived enjoyment, attachment and also continuous usage of mobile devices. Additionally, participants' past experience was also enquired to examine its moderating effects. The results show that attachment is mediating both perceived value and perceived enjoyment with continuous usage. Meanwhile, past experience negatively moderates perceived enjoyment with attachment and also negatively moderates attachment with continuous usage.

**Keywords:** mobile devices, device attachment, perceived value, perceived enjoyment, continuance model

<국문요약>

## 지각된 가치와 지각된 즐거움과 모바일 디바이스의 지속적인 사용

권 순 재

본 연구에서는 사용자와 정보시스템간(예: 모바일디바이스)의 애착동기(attachment)를 살펴보고자 하였는데, 특히 사용자경험(user's experience)의 조절효과(moderating effect)를 중심으로 분석을 실시하였다. 240명의 대학생을 대상으로 지각된가치(perceived value), 지각된즐거움(perceived enjoyment), 애착동기(attachment)의 요인들이 모바일디바이스의 지속적인 사용(continuous usage)과의 매개변수(mediating variable)의 관계를 분석하였다. 이와 경주하여, 사용자의 과거경험(user's past experience)이 모바일디바이스의 지속적인 사용과의 관계에서 조절효과(moderating effect)를 가지는지를 분석하였다. 그 결과 애착동기(attachment)는 지각된즐거움(perceived enjoyment)과 지각된가치(perceived value)에서 지속적인 사용(continuous usage)에 매개변수(mediating variable)로서의 위치를 검증하였다. 또한, 지각된즐거움(perceived enjoyment)과 지속적인 사용(continuous usage)에 조절효과를 가지는 것으로 분석되었지만, 지각된가치(perceived value)에서는 조절효과가 미비한 것으로 분석되었다.

**키워드:** 모바일디바이스, 애착동기, 지각된가치, 지각된즐거움, 지속적인사용 모델

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