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Abstract: Despite the widespread adoption of smartphone applications, empirical research that examines the user acceptance on different application types is still scare. This paper empirically compares the effects of perceived enjoyment and perceived risk on hedonic and utilitarian smartphone applications. Our analyses show that perceived enjoyment is a stronger determinant of intention to use a hedonic smartphone application than a utilitarian application. Perceived risk has a significant negative influence on intention to use utilitarian smartphone applications, while it does not have a significant impact on intention to use hedonic applications. Surprisingly, perceived risk has an insignificant effect on perceived usefulness both in utilitarian and hedonic smartphone applications.

Keywords: Technology Acceptance Model, Hedonic Smartphone Application, Utilitarian Smartphone Application, Perceived Enjoyment, Perceived Risk

1. INTRODUCTION

With the rapid development of mobile computing, smartphones are on track to saturate markets around the world. According to International Data Corporation (IDC), total shipments of smartphone in 2012 were 712.6 million units up 44.1 percent from the 491.4 million units in 2011 [1]. Smartphone satisfied consumers' demand for advanced mobile devices boasting powerful processors and graphics processing units, abundant storage for applications and media files, high-resolution screens with multi-touch capability, and open operating systems. The advanced programming interfaces on smartphones for running third-party applications catalyzed the booming growth of mobile applications. For instance, over 50 billion mobile applications were downloaded from the Apple App Store since it opened in 2008. Mobile applications were originally intended for productivity: email, calendar, contact databases, corporate data, and banking, but public demand caused rapid expansion into pleasure areas, such as games and multimedia services. Generally, these applications could be classified into utilitarian (performance-oriented) and hedonic (pleasure-oriented) smartphone applications.

Despite the increasing importance of smartphone applications, we still have a much sparser understanding of the acceptance of it compared to traditional web services. The technology acceptance model (TAM) has been widely used to explore user intention toward an information system. Recently, TAM was applied to the mobile environment in order to examine the user acceptance of mobile services such as mobile banking and mobile game (e.g., [2, 3]). In the smartphone context, users realize that they have an extensive amount of private information on their phone including their identity and financial information, location, personal data and messages. The user's perception of risk becomes an important factor influencing the user's intention to use a smartphone application. In addition, smartphone users prefer to use applications for fun and pleasure anywhere and anytime. Therefore, perceived enjoyment should be considered to enhance the explanatory power related to

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user behavioral intention [4]. In this paper, we propose a research model that combines the perceived enjoyment and perceived risk factors with TAM to explore the difference of user acceptance of hedonic and utilitarian smartphone applications.

2. THEORY AND HYPOTHESIS DEVELOPMENT

2.1 Technology Acceptance Model

TAM proposed by Davis attempted to explain and predict user acceptance of information systems (IS) and posited that user acceptance can be determined by user behavioral intention [5]. The intention is determined by user attitude and the user's perceived usefulness regarding the IS. User attitude is determined by two acceptance-related beliefs, perceived usefulness, defined as the extent to which potential users expect using an IS to benefit their performance, and perceived ease of use, defined as the extent to which they expect IS acceptance to be relatively free of effort. Attitude towards using a technology was omitted by Davis, Bagozzi, and Warshaw in their final model because of partial mediation of the impact of beliefs on intention by attitude, a weak direct link between perceived usefulness and attitude, and a strong direct link between perceived usefulness and intention [6]. TAM is now widely used to predict the acceptance of new technology applications, such as new web applications and mobile services (e.g. [7, 8]). The purpose of this study is to compare the effects of perceived enjoyment and perceived risk on hedonic/utilitarian smartphone applications. Therefore, the positive associations between perceived usefulness, perceived ease of use, and behavioral intention are depicted in our research model. However, these associations are not stated as formal hypotheses since they are not new in IS acceptance research and are also ancillary to our research objective.

2.2 Perceived Enjoyment

Davis, Bagozzi, and Warshaw introduced the concept of perceived enjoyment to model the role of intrinsic motivation, and found that perceived enjoyment has a significant effect on intention to use a word processing program [9]. They defined perceived enjoyment as the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated. The effect of perceived enjoyment have been tested in many studies on IS such as internet [10], movie website [11], t-commerce [12], instant messaging [13], online auction [8], mobile game [2], and mobile services [14] etc. These studies showed that perceived enjoyment has a positive direct effect on behavioral usage intention, and it is influenced by the ease of use of the system. Hence, we hypothesize

H1. Perceived ease of use has a positive relationship with the perceived enjoyment of using smartphone applications.

H2. Perceived enjoyment has a positive relationship on the behavioral intention to use smartphone applications.

2.3 Perceived Risk

With the increasingly high penetration rate of smartphone applications, people are anxious about the risks presented when engaging in online activities or transactions. These risks include financial, product performance, social, psychological, physical, or time risks [15]. The distant and impersonal nature of the online environment and the implicit uncertainty of using a global open infrastructure for transactions can bring about two specific types of risk, namely, security/privacy risk and financial risk [16]. The perceived risk associated with online transactions may reduce perceptions of behavioral and environmental control, affecting transaction intentions negatively [17]. A high level of risk perception is also associated with behavioral and environmental uncertainty pertaining to potential threats and losses, which in turn affect the development of an individual's cognitive recognition about the usefulness of mobile services [3]. Hence, we propose

H3. Perceived risk has a negative relationship on the behavioral intention to smartphone applications.

H4. Perceived risk has a positive relationship with the perceived usefulness of using smartphone applications.

2.4 Hedonic and Utilitarian Information Systems

Based on motivational theory in which extrinsic and intrinsic rationale determine user behavior, TAM is the dominant paradigm for technology acceptance research [18]. Extrinsic beliefs such as perceived usefulness and perceived ease of use are mainly considered to evaluate IS because organizations are most concerned with performance outcomes in utilitarian contexts. The predictive ability of these two beliefs in utilitarian contexts has been empirically validated by substantial research (e.g., [19, 20, 21]).

Intrinsic beliefs such as perceived enjoyment were later proposed by Davis, Bagozzi, and Warshaw in 1992. The effect of perceived enjoyment was consistently weaker than the effects of the original two beliefs [9, 22]. However, a number of exceptions had been reported in the literature (e.g., [23, 24]). A review of these IS showed that they were mainly pleasure-oriented systems such as World Wide Web, games, and systems used in the home or leisure environment. It seems like that the user acceptance models in utilitarian and hedonic context are different. Van der Heijden classified IS into utilitarian and hedonic IS [11]. The objective of a utilitarian IS is to increase the user's task performance while encouraging efficiency. A hedonic IS aims to provide self-fulfilling rather than instrumental value to the user is strongly connected to home and leisure activities, focuses on the fun-aspect of using information systems, and encourages prolonged rather than productive use. Our study adopts the hedonic/utilitarian perspective that the smartphone applications can satisfy users with both hedonic and utilitarian purposes. Perceived enjoyment is expected to be a stronger predictor in hedonic smartphone applications while perceived risk is likely to be a stronger predictor in utilitarian smartphone applications. These expectations lead us to propose

H5. The relationship between perceived ease of use and perceived enjoyment is stronger in hedonic smartphone applications than in utilitarian applications.

H6. The relationship between perceived enjoyment and behavioral intention is stronger in hedonic smartphone applications than in utilitarian applications.

H7. The relationship between perceived risk and perceived usefulness is stronger in utilitarian smartphone applications than in hedonic applications.

H8. The relationship between perceived risk and behavioral intention is stronger in utilitarian smartphone applications than in hedonic applications.

3. RESEARCH METHOD

3.1 Measurement

The five constructs of interest to this study were perceived usefulness, perceived ease of use, behavioral intention, perceived enjoyment, and perceived risk. All constructs were measured using multiple-item perceptual scales, using pre-validated instruments from prior research, and reworded to relate specifically to the context of smartphone applications.

To measure user acceptance of smartphone applications, the measures for behavioral intention and perceived ease of use were adopted from TAM [6, 25]. Perceived usefulness for utilitarian smartphone applications was also measured using validated items from TAM, while perceived usefulness for hedonic smartphone applications was assessed using a modified version of Van der Heijden's scale [11]. Perceived enjoyment was measured using four semantic differential scales which were taken from related studies [9, 11]. Perceived risk was assessed using a modified version of past risk research [15, 26].

To avoid cross-cultural methodological issues, backwards translation was used to ensure translation equivalence [27]. All measures were translated into Korean by the authors, then back translated into English by a

professional translator, and verified by an independent native speaking professor.

3.2 Data Collection

To examine the effects of perceived enjoyment and perceived risk on hedonic/utilitarian smartphone applications, two types of questionnaires were developed. One was designed for smartphone multimedia service (hedonic model); the other was designed for smartphone banking service (utilitarian model). All items were measured on a seven-point Likert scale, with answer choices ranging from strongly disagree (1) to strongly agree (7).

Data collection for the two models was done through an online survey administered to students at an online university located in Korea. Students are mainly busy full-time employees, stay-at-home parents, soldiers, and those living abroad. Only students who used smartphone banking service or multimedia service at least once within the last 3 months were included. Eventually, 615 students completed the survey, of which 394 of the respondents were male and 221 were female. The respondents were mainly less than 30 years old (65%) and used smartphone applications anytime, anywhere (55%) with a usage frequency of more than once a week (57%).

4. DATA ANALYSIS AND RESULTS

Following procedures recommended by Anderson and Gerbing [28], data analysis was processed in two stages with AMOS 17.0. First, all measurement scales were tested for reliability and construct validity using confirmatory factor analysis (CFA). Next, the structural model was estimated using hypotheses testing to examine the significance of the path coefficients.

4.1 Scale Validation

All constructs in the model satisfied the requirements for reliability, convergent validity, and discriminant validity suggested by prior research [29, 30]: (1) all item factor loadings should be significant and exceed 0.70, (2) composite reliabilities for each construct should exceed 0.60, and (3) average variance extracted (AVE) for each construct should exceed 0.50 and the square root of AVE for each construct should exceed the correlations between that and all other constructs. The analysis results showed that the standardized factor loadings for all scale items were significant and greater than 0.70. As seen from Table 1, the composite reliabilities for each construct were 0.76 or greater, suggesting that the scales were reliable. The AVE was greater than 0.50 in all cases and greater than the square of the correlations, thus suggesting discriminant validity.

Table 1. Reliabilities and Discriminant Validity

		M	SD	CR	Correlation of constructs				
					PU	PEOU	PE	PR	BI
F	PU	5.45	1.15	0.81	0.76				
	PEOU	4.99	1.25	0.84	0.63	0.80			
	PE	4.37	1.40	0.93	0.49	0.54	0.87		
	PR	4.70	1.42	0.77	-0.01	-0.05	-0.06	0.73	
	BI	4.91	1.39	0.88	0.60	0.58	0.54	-0.20	0.84
H	PU	5.44	1.09	0.82	0.77				
	PEOU	5.04	1.23	0.87	0.74	0.83			
	PE	4.89	1.66	0.94	0.66	0.69	0.89		
	PR	4.76	1.36	0.80	0.03	-0.03	-0.05	0.76	
	BI	5.03	1.28	0.91	0.60	0.61	0.70	-0.04	0.87
U	PU	5.49	1.15	0.80	0.76				
	PEOU	4.97	1.23	0.82	0.52	0.78			
	PE	3.95	1.35	0.91	0.40	0.46	0.85		
	PR	4.66	1.45	0.76	-0.11	-0.13	-0.13	0.72	
	BI	4.83	1.43	0.86	0.58	0.54	0.43	-0.41	0.82

F, full model; H, hedonic model; U, utilitarian model; PU, perceived usefulness; PEOU, perceived ease of use; PE, perceived enjoyment; PR, perceived risk, BI, behavioral intention; M, mean value; SD, standard deviation; CR, composite reliability. Diagonal elements in the "correlation of constructs" matrix are the square root of average variance extracted (AVE).

4.2 Hypotheses Testing

The next step in our data analysis was to examine the significance and strength of each of our hypothesized effects. This analysis was done in two phases: (1) full model test and (2) model comparison test. The full model examined the main effects specified in hypotheses H1 through H4, while the comparison of hedonic model and utilitarian estimated the hypotheses H5 through H8. Results of the analysis for each phase, including standardized path coefficients, path significances, are presented in Table 2 and Table 3 respectively.

Table 2. Results of Hypothesis Testing

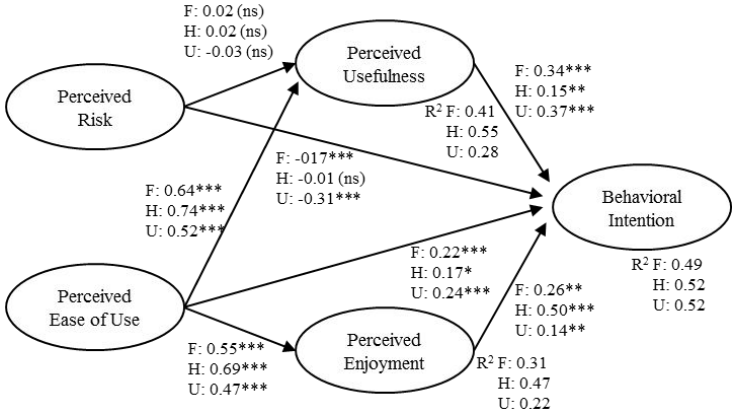
Hypotheses	Path	Coefficient	t-value	Supported
H1	PEOU → PE	0.55	14.33	Yes
H2	PE → BI	0.26	6.58	Yes
H3	PR → PU	0.02	0.52	No
H4	PR → BI	-0.17	-5.02	Yes

Table 3. Statistical Comparison of Paths Coefficient

Hypotheses	Path	Category	H	U	Supported
H5	PEOU→PE	Standard Coefficient	0.69	0.47	Yes
		S.E.	0.05	0.06	
		Sample Size	280	335	
		t-value	2.75		
H6	PE→BI	Standard Coefficient	0.50	0.14	Yes
		S.E.	0.07	0.05	
		Sample Size	280	335	
		t-value	4.28		
H7	PR→PU	Standard Coefficient	0.02	-0.03	No
		S.E.	0.03	0.04	
		Sample Size.	280	335	
		t-value	0.97		
H8	PR→BI	Standard Coefficient	-0.01	-0.31	Yes
		S.E.	0.04	0.05	
		Sample Size	280	335	
		t-value	4.57		

The full model examined the effect of perceived ease of use on perceived enjoyment (H1) and that of perceived enjoyment on behavioral intention (H2) and that of perceived risk on perceived usefulness (H3) and on behavioral intention (H4), as well as three associations between perceived usefulness, perceived ease of use, and behavioral intention suggested by TAM. The obtained path coefficients and their levels of significance indicated that H1, H2, and H4 were supported, but H3 (PR → PU) was rejected. Additionally, behavioral intention to use smartphone applications was influenced significantly by both perceived ease of use and perceived usefulness, as expected from TAM, and perceived ease of use had a significant effect on perceived usefulness (Figure 1).

To identify whether links with perceived enjoyment and perceived risk were different for hedonic smartphone application and utilitarian smartphone application, a multigroup structural equation modeling analysis was conducted. One group was a constrained model in which one path was constrained to be equal. The other was an unconstrained model in which this path was estimated freely. The difference in the chi-square statistic was significant (50.27/df=7, p=0.00), showing that causal links in the structural model differed significantly between hedonic smartphone application and utilitarian smartphone application. Then, t-statistics were calculated to compare the results across the hedonic group and utilitarian group more rigorously to evaluate the differences in path coefficients across models [31, 32]. The results (Table 3) indicated that the path coefficients between perceived ease of use (t=2.75, p<0.01), perceived enjoyment (t=4.28, p<0.01), and behavioral intention for hedonic model and utilitarian model were significantly different, as expected from H5 and H6. Perceived risk did not have a significant effect on perceived usefulness for hedonic model and utilitarian model. Thus, H7 was rejected. For utilitarian model, perceived risk had a significantly negative effect on behavioral intention, while it did not have significant effect on behavioral intention for hedonic model. The comparison results also showed that the path coefficient between perceived risk and behavioral intention for hedonic model and utilitarian model were significantly different, consistent with H8.



*** P<0.01, ** P<0.05, * P<0.1, ns insignificant at the 0.1 level.

Figure 1. Results of structural equation model

5. CONCLUSION

Virtually numerous studies had examined the intrinsic and extrinsic beliefs of hedonic or utilitarian information systems, and there was plenty of anecdotal evidence suggesting that these beliefs have significantly different influence on user acceptances. Surprisingly, however, there has been very little empirical research on comparison of the different effects of perceived beliefs on hedonic/utilitarian information systems. This paper attempted to fill this void in the literature by comparing the effects of perceived enjoyment and perceived risk on hedonic/utilitarian smartphone applications. Our analyses showed that perceived enjoyment was a stronger determinant of intention to use a hedonic smartphone application than a utilitarian smartphone application. It provides a practical implication for service providers that they should pay enough attention to hedonic-oriented values when designing hedonic applications. But this does not mean that utilitarian application service providers do not need to consider about hedonic-oriented values. More specifically, perceived risk has a significant negative influence on intention to use utilitarian smartphone applications, while it did not have significant impact on intention to use hedonic smartphone applications. We can cautiously conclude that perceived risk is a predictor and barrier to online transactions of utilitarian smartphone applications but hedonic smartphone applications. Furthermore, perceived risk has an insignificant effect on perceived usefulness both in utilitarian smartphone

applications and hedonic smartphone applications. It might imply that smartphone application users consider perceived risk and perceived usefulness independently. This phenomenon needs further exploration in future research.

This study has some limitations that provide some opportunities for future research. First, smartphone applications are not limited to these two types we chose for investigating. Further research needs to include more kinds of smartphone applications to reach a more general research conclusion. Second, only perceived enjoyment and perceived risk were compared in this study, more determinants of intention to use should be considered.

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