Inexperience and Experience with Mobile Data Services: Extended TAM

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Abstract

This study proposed an expanded technology acceptance model (TAM) incorporating perceived fee (PFE) and perceived enjoyment into the original TAM. We examined that the extended TAM provides supplementary information about behavior intentions (BI) toward mobile data services (MDS). This study also investigated some significant differences in the relative influence of the determinants of BI toward MDS depending on experience. The extended TAM was empirically evaluated by using survey data collected from 149 inexperienced users and 393 experienced users. The findings indicated that PFE is the strongest determinant of BI toward MDS, and the antecedents leading to users' BI vary over time. The results may provide further insights into MDS practitioners and marketing managers.

Keywords:

Mobile data services; Technology acceptance model; Technology acceptance; Technology continuance; User Experience

Introduction

Since the early 1970s, researches on information technology (IT) adoption and usage are a dominant issue in users' behavioral literatures. Among a variety of theoretical perspectives to explain the adoption and usage of IT, technology acceptance model (TAM) is popularly used to explain users' behavioral intention (BI) to adopt and use of IT [e.g., 5, 22]. While TAM is originally used to predict future users' adoption intention (AIN) of IT in pre-adoption situation, recent works have investigated that TAM also explains a reasonable portion of the variance in continued usage intention (CUI) of IT [e.g., 14, 26]. Some empirical studies on TAM suggested that depending on the specific technology context, additional explanatory variables may be needed. Van der Heijden [24] extended the original TAM to understand users' acceptance of hedonic information system. We extend the original TAM in the MDS context considered the key factors contributing to the acceptance and continued usage of MDS. Thus, the extensions to TAM will enhance our understanding of users' perceptions and beliefs influencing on BI toward MDS.

Some theoretical works have articulated the differences in users' perceptions and beliefs between at the initial adoption decision stage and at the continued usage decision stage. In the context of MDS, the determinants affecting adoption decision process may be not same as those of continued use decision process. Nevertheless, to best of our knowledge on MDS, there is no research that articulated the differences in users' perceptions and beliefs between for inexperienced users and for experienced users. Researchers have raised the question which antecedents are important for AIN and which for CUI [e.g., 12, 14]. Understanding the difference in the key drivers between inexperienced and experienced users helps managers more efficiently targeted investment and marketing at each group.

The theoretical contributions of this study are twofold. First, this study proposes an expanded TAM in the MDS context. The expanded TAM provides an advanced theoretical framework for understanding the factors affecting BI toward MDS. Two, this study empirically compares the antecedents of AIN with those of CUI, and provides further knowledge on the difference in the determinants between inexperienced and experienced users.

Theoretical Background

Effects of Indirect and Direct Experience

Researchers have been interested in the moderating effect of experience with a product or service. The cognitive dissonance theory [4, 9] investigated that the use of a service may change users' perceptions and beliefs with respect to the use of the service. As a result, the determinants of initial adoption are not the same as those of continued usage, and the relative importance of the determinants varies over time. Fazio and Zanna [8] examined that inexperienced users' beliefs are formed primarily based on indirect experience such as affective and cognitive information, while experienced users' beliefs are formed based on actual experience. They showed that beliefs formed by first-hand experience are more enduring and predict behavior better than beliefs formed by second-hand experience.

Several empirical researches on IT diffusion provide some evidence for differences in the determinants of BI between inexperienced and experienced users. Taylor and Todd [23] examined the important differences between two groups with regard to the relative influence of PUS, which was the strongest predictor of BI for the inexperienced group, while experienced users placed less weight on PUS. Karahanna et al. [17] suggested the theoretical framework as to how

users' pre-adoption beliefs change after they have already adopted and are using the IT. They found that the AIN of the IT is solely determined by subjective norm, whereas the CUI is solely determined by attitude. Yu et al. [26] compared the factors influencing T-commerce by inexperienced and experienced users, and showed the perceived enjoyment (PEN) is the most important factor affecting users' BI toward T-commerce.

Research Model and Hypotheses

The extended TAM in the MDS context is presented as Figure 1. The expanded TAM was developed by incorporating perceived fee (PFE) and PEN as additional users' beliefs into the original TAM. PFE would be a key determinant of BI to employ pay-per-use information system, especially for MDS. Moreover, MDS provides users both utilitarian services such as mobile banking and hedonic services such as online game, necessitating an additional intrinsic motivation construct (PEN).

Perceived Usefulness (PUS)
PUS is defined as the degree to which an innovative technology is perceived as providing benefits in performing certain activities [5]. The motivation-oriented perspective of TAM views PUS as a measure of extrinsic motivation [6]. Most studies on MDS have strongly supported that PUS is a crucial determinant of forming users' BI toward MDS at the stages of adoption and continued usage decision. Users would make a rational, calculated assessment of the extrinsic benefits of adoption and continued usage of MDS. Thus, we therefore hypothesize:
H1(a, b): PUS is positively related to BI for users (inexperienced users^a, experienced users^b).

Most empirical studies have found that the link between PUS and BI is stronger among experience users than inexperienced users. PUS formed by first-hand experience would be solider and predicts BI better than PUS formed by second-hand experience. Moreover, the efficacy and capabilities of MDS can be more easily and confidently assessed by experienced users through direct experience with MDS, resulting in a stronger relationship between PUS and BI. Thus, we therefore hypothesize:
H2: The relationship between PUS and BI is positively stronger for experienced users than for inexperienced users.

Perceived Enjoyment (PEN)
PEN defined as the extent to which the activity of an innovative technology is perceived to be personally enjoyable in its own right aside from the extrinsic benefit of the technology [6]. PEN thus represents an affective and intrinsic benefit, and several works in MDS have been found that PEN significantly influences BI toward MDS [e.g., 13, 19]. Since MDS is often used for personal purposes rather than for work purposes, the perception of enjoyment would be a key behavioral belief affecting BI regardless of prior experience with MDS. Thus, we

therefore hypothesize:
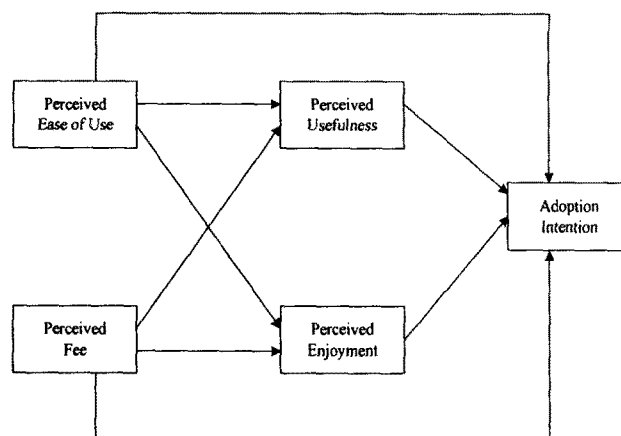
a) Inexperience Users
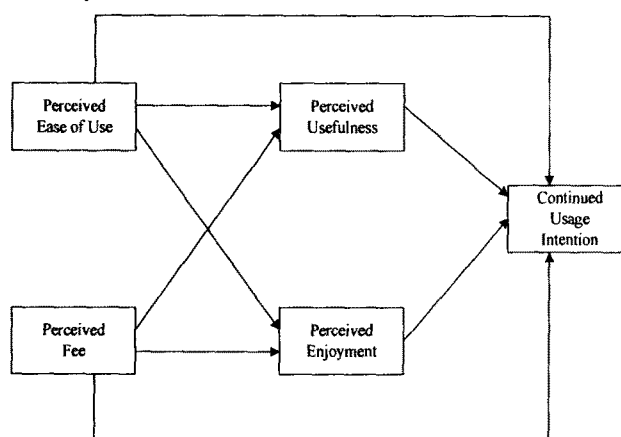
b) Experienced Users

Figure 1 Research Models

H3(a, b): PEN is positively related to BI for users (inexperienced users^a, experienced users^b).

Inexperienced users base the perception of their enjoyment on relatively superficial information, so are difficult to evaluate and identify PEN. After users gain pleasurable experience with MDS, they form more confidently held and more enduring PEN than inexperienced users. According to affective processing theory [3], pleasurable experiences leave strong affective traces in memory. When users evaluate the relative usage experience, the affective traces are readily retrieved. Thus, experienced users would more strongly form PEN than inexperienced users. Thus, we therefore hypothesize:
H4: The relationship between PEN and BI is positively stronger for experienced users than for inexperienced users.

Perceived Ease of Use (PEOU)
PEOU refers to the degree to which a user believes that using an innovative technology is perceived as being easy to understand and use [5]. An innovative technology that is perceived to be easier to use would facilitate the technology adoption and continued usage behaviors. Previous works on

MDS have showed that, as theorized in the original TAM, PEOU have both a direct effect and an indirect effect via PUS on BI [e.g., 13, 14]. Van der Heijden [24] examined that PEOU have an indirect impact on BI through PUS and PEN. In the MDS context, it is also expected that PEOU would affect BI both directly and indirectly via PUS and PEN. Thus, we therefore hypothesize:

H5(a, b): PEOU is positively related to BI for users (inexperienced users^a, experienced users^b).

H6(a, b): PEOU is positively related to PUS for users (inexperienced users^a, experienced users^b).

H7(a, b): PEOU is positively related to PEN for users (inexperienced users^a, experienced users^b).

Several empirical studies have found that PEOU is a more significant factor for inexperienced users than experienced users. Davis [5] examined that PEOU is a critical role of forming users' BI after one hour of use of an innovation technology product, it has no effect on BI after 14 weeks of usage. Thus, the strength of the relationship between PEOU and BI becomes weaker as users' understanding of how to use MDS is increased by virtue of their prior experiences with MDS.

H8: The relationship between PEOU and BI is positively stronger for inexperienced users than for experienced users.

Perceived Fee (PFE)

Perceived fee is assessed by a direct measure of the actual fee of a service [25]. For IT in organizational setting, the cost of adoption and usage of an innovative technology would not be a big issue to users since the cost is borne by the organization. However, since the cost of MDS is borne by the users, the monetary cost of MDS may be a key driver to generate AIN and CUI. According to KNIC and i-news 24 [20], both inexperienced and experienced users identify a high usage fee as a prominent critical barrier to prompt BI toward MDS. Kim et al. [19] empirically showed that PFE are negatively related to BI toward MDS. This study proposes that PFE would affect BI in two ways: (1) by indirectly influencing BI through PUS and PEN, and (2) by directly influencing BI. The direct effect suggests that PFE could be a potential barrier to decrease the likelihood of users' BI to adopt and continued use. The indirect effect is explained as stemming from a situation where, other things being equal, the cheaper an innovative technology is to use, the more useful and enjoyable it can be. Thus, we hypothesize the following:

H9(a, b): PFE is negatively related to BI for users ((inexperienced users^a, experienced users^b).

H10(a, b): PFE is negatively related to PUS for users (inexperienced users^a, experienced users^b).

H11(a, b): PFE is negatively related to PEN for users (inexperienced users^a, experienced users^b).

Inexperienced users may be difficult to judge the level of a service fee imposed, since a MDS fee will be charged according to the volume of data transmitted and the amount of contents used. Therefore, inexperienced users are encoding a MDS fee based on uncertain information. On

Table I Demographic Data

	Inexperienced Users		Experienced Users	
	Freq.	Percen.	Freq.	Percen.
Gender				
Male	89	59.7	208	52.9
Female	60	40.3	185	47.1
Age				
<20	33	22.2	201	51.1
20~30	75	50.3	146	37.2
>30	41	27.5	46	11.7
Service Providers				
SKT	63	42.3	211	53.7
KTF	58	38.9	135	34.3
LGT	28	18.8	47	12.0

the other hands, experienced users base their fee perception on the actual paid fee, so they have richer understanding and more concrete knowledge of the MDS fee structure. As experienced users accumulate the negatively valenced information of the MDS fee, they are more readily and accessible from memory than inexperienced users with imperfect information about the MDS fee [21]. Thus, experienced users would have a negatively stronger relationship between PFE and BI than inexperienced users.

H12: The relationship between PFE and BI is negatively stronger for experienced users than for inexperienced users.

Research Methodology

Instrument Development

The survey measurements for the constructs were mostly derived from prior studies to ensure their content validity. The question items were reworded to suit the MDS context of the current study. PUS and PEOU were measured by four-item measures adapted from Davis [5]. The three items for PEN were adapted from Davis et al [6]. PFE was measured by three items adapted from Voss et al. [25]. AIN and CUI were measured using the three-item scale developed by Davis [5] and Bhattacherjee [1], respectively. Two questionnaires were developed, one for inexperienced users and one for experienced users. The first question of our survey was designed to divide the respondents into inexperienced and experienced users. Inexperienced users were defined as people who had never used MDS, and experienced users were defined as people who had used MDS with the exception of experience with short message service (SMS). SMS has different characteristics from other MDS in that customer use SMS without accessing mobile Internet. Each question was measured on a 7-point, Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

Subjects

We distributed around 700 questionnaires, and finally obtained 569 responses. Among them, 27 responses were

discarded because they were only partially completed. The final sample for inexperienced users was 149 and for experienced users 393. Table 1 shows the demographic data about the respondents in the final sample.

Research Results

Measurement Model

A confirmatory factor analysis (CFA) using LISREL 8.5 [16] was conducted to test the measurement mode. In this study, model fit was assessed in terms of four different indices [15]: *root mean square error approximation* (RMSEA), comparative fit index (CFI), nonnormed fit index (NNFI), and standardized root mean square residual (SRMR). Most recommended fit indices were within the recommended level [11], representing good model fit [Inexperienced users RMSEA=0.11, CFI=0.92, NNFI=0.91, and SRMR=0.09; Experienced users RMSEA=0.07, CFI=0.97, NNFI=0.96, and SRMR=0.07].

To check the reliability, composite reliability (CR) and average variance extracted (AVE) were calculated [10]. The reliability is acceptable if CR is 0.70 or higher and AVE is 0.50 or higher. All factors meet both criteria for acceptable reliability. Second, convergent validity can be established if item loading are 0.60 or higher [2]. The lowest loading of this study was 0.61 for inexperienced users and 0.67 for experienced users, satisfying convergent validity. Third, to examine discrimanant validity, we compared the shared variances between factors with the AVE of the individual factors [2]. The diagonal of Table 2 contains the square root of the AVE. All AVEs are greater than the off-diagonal elements in the corresponding rows and columns, confirming discriminant validity.

Table 2 Correlation Matrix and Discriminant Assessment

a) Inexperienced Users

	AIN	PUS	PEN	PEOU	PFE
AIN	.92				
PUS	.41***	.77			
PEN	.28***	.14***	.87		
PEOU	-.23*	-.20*	-.02	.84	
PFE	-.42***	-.55	-.42*	.20*	.82

b) Experienced Users

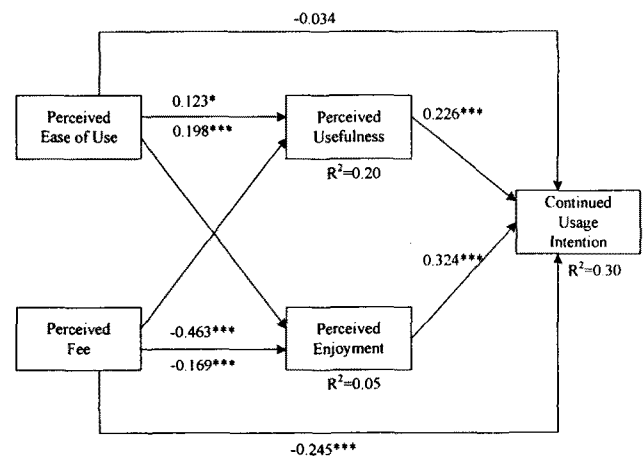|	CUI	PUS	PEN	PEOU	PFE
CUI	.78				
PUS	.49***	.80			
PEN	.44***	.53***	.89		
PEOU	-.03	.02	.16**	.86	
PFE	-.36***	-.42***	-.08	.22	.79

*: p<0.05; **: p<0.01; ***: p<0.001

Structural Model

The structural equation analysis to confirm the hypothesized relations among our study constructs was performed, and had a reasonable fit [Inexperienced users RMSEA=0.11, CFI=0.92, NNFI=0.90, and SRMR=0.11;
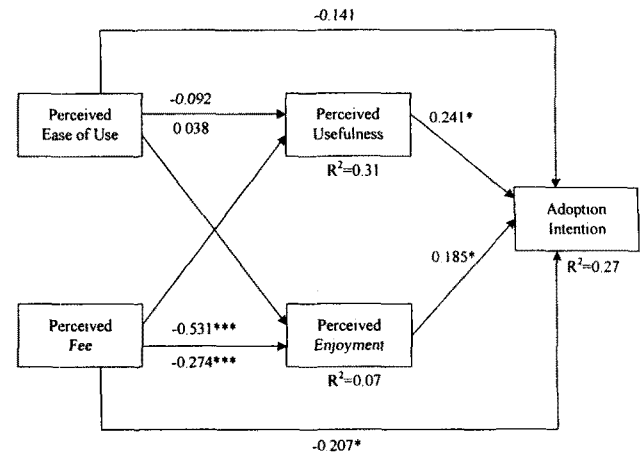
a) Inexperience Users

b) Experienced Users

Figure 2 Standardized LISREL Solutions

Experienced users RMSEA=0.08, CFI=0.95, NNFI=0.94, and SRMR=0.12]. The results of structural equation model for inexperienced and experienced users are presented in Figure 2.

PUS (β = 0.241, t= 2.415) and PEN (β =0.185, t = 2.299) positively affect AIN, and PFE (β = -0.207, t= -2.025) negatively affect AIN. Therefore, H1a, H3a, and H9a were supported. However, contrary to the original TAM, PEOU (β = -0.141, t= -1.809) was found to be an insignificant effect on AIN, resulting in rejecting H5a. The effects of PEOU on PUS (β = -0.092, t= -1.118) and on PEN (β = 0.038, t= 0.431) were also found to be insignificant, so H6a and H7a was rejected. PFE is negatively related with PUS (β = -0.531, t= -5.250), and PEN (β = -0.274, t= -2.904). Therefore, H10a and H11a were not rejected

For experienced users, PUS (β = 0.226, t= 3.722), PEN (β = 0.324, t= 6.010), and PFE (β = -0.245, t= -3.737) were found to be significant to CUI, so H1b, H3b, and H9b

were supported. PEOU (β= -0.034, t= -0.637) effect on CUI is not significant in the same manner as for inexperienced users, resulting in rejecting H5b. However, it has a significantly negative direct effect on PUS (β= 0.123, t= 2.320) and PEN (β = 0.198, t= 3.565), respectively. Thus, H6b and H7b were not rejected. PFE has negatively indirect effects on CUI via PUS (β = -0.463, t= -7.441) and PEN (β= -0.169, t= -2.908), so H10b and H11b were supported.

Hypothesis 2, 4, 8, and 12 were tested by statistically comparing the path coefficient from PUS, PEN, PEOU, and PFE to AIN with the corresponding path coefficients to CUI, respectively. These statistical comparisons were performed using a multi-group analysis suggested by Chin presented in the research work of Keil et al. [18]. Unexpectedly, the path from PUS to BI did not differ between inexperienced and experienced users (t= -1.631, p>0.05), resulting in rejecting H2. The path from PEOU to BI was not significant for either group, but the path of experienced users was stronger that of inexperienced users (t= -15.564, p<0.001). As expected, the path from PEN to CUI was positively stronger than the path from PEN to AIN (t= 20.730, p<0.001), and the path from PFE to CUI was negatively stronger than the path from PFE to AIN (t= -2.561, p<0.05). Therefore, H4 and H12 were supported.

Discussions and implications

Discussion of findings
In this study, the extended TAM in the MDS context has been formulated and empirically tested. The extended TAM provided an adequate model of MDS adoption and continued usage, accounting for a reasonable proportion of the variance in ANI and CUI.

More importantly, the results of this study suggested that there are some significant differences in the relative influence of the determinants of BI toward MDS depending on experience. Experienced users' CUI was better predicted by the antecedents than was the ADI of experienced users. This is in line with the notion that beliefs developed through direct experience are more confidently held, more enduring, and more resistant to attack than are those developed through indirect experience [8]. While the link between PUS and BI did not differ between inexperienced and experienced users, the link between PEN and BI was stronger for experienced users. According to Dhar and Wertenbroch [7], users view extrinsic aspects of consumption as a means of preserving or maintaining the status-quo in consumption experiences, while intrinsic aspects of consumption as a way to enhance the consumption experience. Improvement of the users' perception of enjoyment toward MDS helps their MDS usage increase at the post-adoption stage.

Theoretical Implications
This study presents important contributions and implications for research. The proposed extensions to TAM take into account the unique characteristics of MDS, representing important theoretical advances in acceptance and continued usage of MDS. Previous studied systems have generally been free for users, or for which they paid a one-time fee, with the daily use fee of charge, while MDS are charged by a pay-per-user scheme. The results of this study demonstrated that PFE is the most importance key barrier in forming users' BI toward MDS regardless of prior experience with MDS.

This study also examines that the antecedents leading to users' BI vary over time, and provides preliminary evidence suggesting that AIN and CUI are determined by different criteria. For inexperienced users, PUS has a more positive effect on AIN than PEN. As users have more information on MDS, the role of PEN becomes more prominent to generate users' BI. This means that extrinsic motivational factors have more powerful effect than intrinsic factors at the early stage, but the importance of the intrinsic motivational factors increase at the post-adoption stage.

Practical Implications
This study provided several important implications for the practitioners and marketing managers of MDS. Understanding what drives the adoption or continued usage of MDS is critical to foster MDS diffusion. The findings of this study help managers understand the formation process of BI toward MDS. The marketing managers can learn the difference in the key determinants between inexperienced and experienced users, and help MDS more efficiently targeted marketing at each group. By addressing the key drivers at each group, MDS providers ensure profitable both during the early years of business operations and in the long run.

Many previous practitioners have argued that the key barrier to users' BI is PEOU such as the lack of user friendliness of IT. The traditional approach toward increasing usability has been focused on PEOU. However, the findings of this study suggested that users are deterred more by PEN than by PEOU. In line with our findings, consumer survey examined that a high price keeps many users from trying MDS they are not sure about [20]. MDS practitioners need to understand that, although PUS, PEN, and PEOU are conceived as important issues in the traditional IT environments, the cost concept plays the most important role in fostering MDS diffusion. Therefore, MDS practitioners must pay close attention to improve in the users' perception of cost of MDS.

Limitations and Future Research Directions

This study is needed to consider two limitations. First, as a cross-sectional study of inexperienced and experienced users, this study may not fully capture the dynamics of their MDS adoption and continued usage decision processes. Further research needs to examine how the key factors affecting of the same users evolve temporally. Second, the sample in the study was geographically limited. The research needs to be replicated to examine the robustness of findings across cross-nation.

Conclusions

This study has proposed an expanded TAM incorporating PFE and PEN into the original TAM. The results of this study contribute to the development of a more comprehensive account of MDS adoption and continued usage. The findings of this study supported that IT researchers should give careful consideration to the unique characteristics of the innovative technology when investigating users' adoption and continued usage decision-marking processes. This study also demonstrated different decision criteria between at adoption decision stage and at continued usage decision stage. This study has taken the first effort in studying the dynamics of users' decision process over time in the extended TAM perspective. Understanding the different in users' decision processes enables manager to employ more targeted investment and marketing efforts at each group.

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