Evaluation of Functionality and Added Value Factors to the Usage of Mobile Telecommunication Services*

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Abstract

Purpose - This study aims to provide a brief understanding of usability and its extended models with TAM as well as identifying additional determinants that had been suggested in previous studies on mobile services.

Research design, data, and methodology - Empirical data were collected by conducting a field survey of potential mobile application service users. The call for participation was also made in mobile related application issues, which were widely discussed.

Result - The ease of use and usefulness had a significantly positive influence on attitude and intention. It also was revealed that added value services can offer practical value to customers. Thus, positive attitudes toward the adoption of services by customers are present when they perceive higher usefulness and ease of use of mobile application services.

Conclusion - It was indicated that customers who are more inclined to try new products or who have a higher demand for new things tend to think about those functionalities and added value mobile application services from the perspective of usefulness and ease of use and operation.

Keywords: Mobile Service, Functionality, Added value services, Technology Acceptance Model.

JEL Classifications: C52, C83, M31.

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1. Introduction

Communications and services through mobile telecommunication networks that interface with mobile devices are becoming increasingly popular on a global scale. Mobile telecommunication and services are enabled by the convergence of two technologies the internet and wireless technology such as mobile phones and personal digital assistants(PDA). Abundant information has indicated that the diffusion of wireless Internet(3G/4G LTE) via mobile devices is also creating unparalleled opportunities for m-commerce to leverage the benefits of mobility.

Nowadays abundant mobile applications are being extensively used in various fields including mobile network games, m-commerce, social network service, m-marketing, m-finance and entertainment etc. Much of this is depending on the persistent and enormous growth of mobile devices like smart phones and table pads, etc. Furthermore, it is estimated that over 700,000 mobile applications are available in an assortment of google and apple's each store. Besides that, many new terms have been created within the domain area to which the mobile applications were applied. It has affected all of us, from using basic mobile services, such as voice call and messaging(SMS and SNS) to more advanced and sophisticated services, like mobile chat, mobile email, mobile web, and location based services. The rapid development of and growth in new mobile service innovation and evolution of mobile communications in Korea in recent years and its potential to attract new customers are seen as a significant source of revenue for mobile service providers, mobile network operators, and mobile content and application developers.

In most areas where mobile applications are used mobile services were identified as part of the new term's dimension. Services is competent in providing a form of data transactions and payment for their private and public commerce. The mobile services is defined as an application services accessible from mobile phones via wireless and mobile communication networks(Oh and Kim, 2013; Kim et al., 2014) The users are able to use the mobile services to finding for information, perform financial transaction, give opinions regarding certain matters, obtain advise, etc. After this, mobile services has been effectively

summarized as one of the beneficial technologies function and value added network services that is capable of adjusting to user specific circumstances(Oh, 2013).

And from the perspective of technologies function, in contrast to the high expectations, the acceptance, adoption and use of many of these new mobile services have not proliferated. First one, several of the mobile services have been elevated and successful in its development and implementation where the usage boots to increase to great potential. On the other hand, there are few mobile services which often fail to thrive in regards to its development and implementation due to a number of reasons such as the users'requirement are not met and taken for consideration.

Other Point of view, although, the value added network services are some highly successful services and applications, developing of mobile services often fail. There are many reasons behind this failure and dissatisfaction, these reasons could be for example, service and application program quality, deviate from the standards, lack of content quality, network safety, and requirements have not been taken into consideration, or highly overestimated during the development and launching of some of these mobile service. Mobile services can further be classified into five categories, communication services, entertainment services, information services, transactional services and Web2.0 services(Bouwman et al., 2012). There are many substantial factors that play important role in customers'perceptions while making decision to select for mobile network services(Nikou & Mezei, 2013; Jung et al., 2014). These factors can be classified such as payment mode, the way the usage are charged, functionality of the mobile service, and added value, whether the usage of such mobile services enhance end users'daily performances and provide added value and perception of quality, cost and performance, here in after referred.

However, in most of them, if not all, the behavior or buying intention(BI) was to identify the key success factors of the mobile service adoption either based on the user requirement or mobile service provider. And a study that takes an other perspective on service characteristics is necessary to identify the factors influencing the adoption or identifying which types of mobile service dimension are the most preferred by end users. A view point of other aspect that identifies the reasons why the acceptance or adoption of mobile services are a key factors for the success of different dimensions involved in the mobile telecommunication industry. And the prevalence of mobile services can be represented as not only being dependent on technology enhancement, but user adoption or user intention is also required(Oh, 2013). Therefore, the technology acceptance model and its extended models are much related with the user intention studies. So, this article purpose to provide a brief understanding of usability and its extended models with technology acceptance model as well as in determining additional determinants which had been suggested in previous works for mobile services.

2. Theoretical Background and research model

2.1. Framework of the adoption of mobile network service

Current research aim into technology related usability focuses mainly on computer functionality and value. Little has been written about the prevalence or cause of functionality and value specifically relating to customer mobile services, or which personal user experiences it most. The usability is well established, investigating mobile customer behaviour, interface design, utility(risk and benefit) and even users'emotional relationships like pleasure with the technology from Human Computer Interaction(Brereton, 2005; Oh & Choi, 2010; Oh and Lee, 2012). While many of the methods and findings from the HCI field are transferable to mobile service it is also important to acknowledge and consider the differences, such as motivation for using specific device and equipment like smart phone and tablet computer.

A study of use and usefulness of customer, business and entertainment technology indicated that older, more functionality people with less technology exposure did not use mobile service providing, but even younger people who have been exposed to technology throughout their life still experience functionality to some degree(Oh, 2013). If functionality is this prevalent more needs to be done to reduce negative usefulness surrounding the use of common products. Therefore, usability and functionality should be an important element in product and service design. So, finding ways to reduce stress is important to maximise usability and facilitate general acceptance of technology. It has been suggested that user adoption or user behavior intention can result from a lack of perceived ability.

Theory of Reasoned Action(TRA), Theory of Planned Behavior(TPB), Innovation Diffusion Theory(IDT) and Social Cognitive Theory(SCT) are among the theories used in the development of a model to access the user BI towards new technology. The comparison of the determinants for these models is shown in <Table 1>.
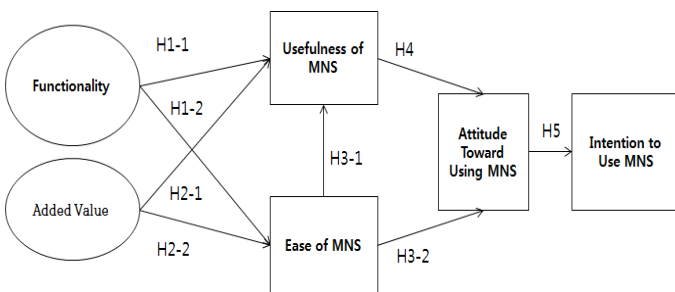
Definitions to those determinants can be found in the literatures(Davis, 1989: Carlsson et al., 2006; Wu et al., 2008; Chuttur, 2009; Venkatesh et al., 2003 ; Venkatesh et al., 2008; Holden and Karsh, 2010; Schierz et al., 2010). According to <Table 1>, the additional determinants for TAM extended models were that of which have been adopted, adapted or integrated with other theories aside from TRA. For example, CTAM-TPB model is the combination between TAM and TPB(Venkatesh et al., 2003). Therefore, the determinant of Perceived Behavioral Control(PBC) model was added to the original TAM. And then, TAM was adapted by few researchers that later proposed extended models of TAM like Technology Acceptance Model 2(Venkatesh et al., 2003), Unified Theory of Acceptance and Use Technology Model(Venkatesh et al., 2003), and Technology Acceptance Model 3(Venkatesh et al., 2008). The extended new models of TAM added several determinants mainly to provide a more comprehensive model struc-

ture(Venkatesh and Davis, 2000: Legris et al., 2003). The comparison of the determinants for these models is shown in <Table 1>.

<Table 1> The determinants of TAM and its extended models.

TAM	TAM2	UTAUT	TAM3	C-TAM-TPB
▪ actual system used ▪ attitude toward use ▪ perceive usefulness ▪ perceived ease of use	▪ actual used ▪ behavior intention ▪ perceive usefulness ▪ perceived ease of use ▪ subject norm ▪ image ▪ job relevance ▪ output quality ▪ results demonstrability	▪ actual used ▪ behavior intention ▪ performance expectancy ▪ social influence ▪ facilitating conditions ▪ gender ▪ age ▪ experience ▪ voluntariness	▪ use behavior ▪ behavior intention ▪ perceive usefulness ▪ perceived ease of use ▪ subject norm ▪ image ▪ job relevance ▪ output quality ▪ results demonstrability ▪ computer self efficacy ▪ perceptions of external control	▪ attitude toward behavior ▪ subject norm ▪ perceived behavioral control ▪ perceived usefulness

The theoretical background of this study is drawn from the technology acceptance model, which has been widely established as a powerful tool to explain the adoption of a variety of information technologies and mobile technologies including electronic payments, mobile commerce, and mobile telecommunication service. Therefore, the present paper contributes to the discussion in the mobile service adoption on how operators can counter the threat from overlooking customers' preferences when designing new mobile services. This study contributes to the technology acceptance model theory by making clear why users intend to adopt mobile services and creating insight for mobile service developers and providers to take crucial service related factors into consideration. <Figure 1> shows the research model and pathway analysis using by the structural equation model.

<Figure 1> Acceptance model for Mobile Network Service Usage

2.2. Hypothesis

2.2.1. Functionality

Especially in this paper, we set the external variables consist with functionality and added value. These factors are for mobile service adoption and have been selected based on an extensive review of literature. Functionality has been selected from Nielsen(1996) and Others(Dillon, 2001; Dahlberg et al., 2007; Johnson and Wiles, 2003; Pedersen, 2005). Other factors have been selected from Bouwman et al.(2012). These propositions was based on Gioug et al.(2006), Liang and Yeh(2011), Nikou and Mezei(2013), and Oh(2013).

The functionality in the mobile services is considered to be the interface between mobile technology and the user of the mobile services. User-Centred Design involving active and early input from potential users can provide insight into how people feel, allowing design adjustment to enhance the experience. By understanding what customers want and how they feel about technology designers can ensure the product offers not just function and form but positive feelings for the user as well. Moreover, Rogers(1995) based on Diffusion of Innovation theory argued that functionality of information systems innovations is an important factor for user to make adoption decisions. The followings are the decompositions items of service functionality(Nikou and Mezei, 2013).

Simplicity: the use of the mobile services should require only minimum knowledge of the technology. The mobile services must be very simple to learn how to use them and it should be intuitive.

Usability: a user can quickly understand how the mobile services work. With in the broader context of product development, usability is associated with the ease with which people can employ a tool or other human made object in order to achieve a particular goal(Nielsen, 1996).

Accessibility: mobile services should be accessible anytime/anywhere. Because, access occurs in different places, the mobile applications must adapt to the context according to the density of the request.

Flexibility: the capability of the mobile services to adapt to personal profiles or requests. The flexibility of the mobile applications relates to the adaptation of data capacity to answer to various data traffic volumes of the user according to the type of requests. However, reduction of speed and interruption of access caused by lack of data capacity will move away the user from the mobile applications.

As following upon review of the studies about functionality and added value, this research suggested hypothesized as follows.

<Hypothesis 1-1> The functionality is ability of the mobile services to allow a user to perform certain tasks. So will have significant effect on the usefulness to mobile application usage.

<Hypothesis 1-2> The functionality is ability of the mobile services to allow a user to perform certain tasks. So will have significant effect on the ease of use to mobile application usage.

2.2.2. Added value

The benefits of using the mobile services compared to other technologies, such as services based on desk top-computers. In so far as, the mobile service user must be convinced that using a particular mobile service/application would acquire a value that the other conventional models do not provide. It can be argued that this perception is the key factor for users to make adoption decision. However, if a mobile service is fit for use, or it conforms to users'requirements, then it can be considered as an application that is value adding. Carlsson et al. (2006) argued that a mobile service will be considered as an added value service, when it improves the productivity, efficiency and effectiveness of the users. They further suggested that mobile services must be sensitive to personalization and adaptive to localization.

Mobility is the capability of accessing the real-time information and communication, while the user is on the move. Mobility itself is a key. It provides access to services, and location independent when such services would be otherwise inaccessible.

Content quality: is the capability of offering recent, correct and timely contents. Mobile content-service providers will be able to attract more customers as well as to sustain their current customers by allocating their resources to improve the quality of services that affect customers'satisfaction. This can only be achieved if the mobile content-service providers and other parties involved know what exactly their customers'wants and needs. It is also important that they understand the customers'usage contexts.

Features of certain occasion: the occasion where use of a particular mobile service is the only available solution(such as, buying a mobile ticket, when one does not have cash).

Enjoyment/Entertainment: entertainment is considered as a capability of mobile services to fulfill entertainment needs and is considered to be an important construct that will affect customers'intention to use mobile services.

This research suggested hypothesized as follows.

<Hypothesis 2-1> The added value is the benefits of using the mobile services.
So it will have significant effect on the usefulness of mobile application usage.
<Hypothesis 2-2> The added value is the benefits of using the mobile services.
So it will have significant effect on the ease of mobile application usage.

2.2.3. Attitude and intention to use

The theoretical background of this study is drawn from the diffusion of innovations theory(Rogers, 1995), which has been widely established as a powerful tool to explain the adoption of a variety of information community technologies and mobile technologies including electronic commerce and application services. Especially the usefulness and ease of use have effect the most consistent explanation on the technology adoption decision upon research studies as shown [Table 1] and are therefore deemed as valid predictors for mobile service with applications adoption as well. To gain further insight on factors affecting customer intention of applications usages.

There are many studies confirmed the effect of ease of use on attitude toward to usage in information technology system and services(Moore and Benbasat, 1991; Venkatesh and Davis, 1996). For any emerging information technology and information system, ease of use is an important determinant of user intention of acceptance and behavior(Venkatesh, 2000). This research suggested hypothesized as follows.

<Hypothesis 3-1> Ease of use will have significant effect on the usefulness of mobile application usage.
<Hypothesis 3-2> Ease of use will have significant effect the attitude towards mobile application usage.

On the other hand, Perceived usefulness in the technology acceptance model, originally referred to job related productivity, performance, and effectiveness(Davis, 1989). This is an important belief identified as providing diagnostic insight into how user attitude toward using and intention to use are influenced usefulness has a direct effect on intentions to use over and above its influence via attitude(Davis et al., 1989; Davis, 1993; Taylor and Todd, 1995). This research suggested hypothesized as follows.

<Hypothesis 4> Usefulness will have significant effect on the attitude towards to mobile application usage.

Attitude has long been identified as a cause of intention. Psychologists have discussed the theoretical construct of attitude for decades. Attitude in Fishbein and Ajzen(1975) paradigm is classified into two constructs: attitude toward the object and attitude toward the behavior. The latter refers to a person's evaluation of a specified behavior. This evaluation of a specified behavior leads to

certain behavioral intention that further results in certain behavioral action. Adapting this general principle, attitude toward use in the TAM model is defined as the mediating affective response between usefulness and ease of use beliefs and intentions to use a mobile service system. In other words, a prospective user's overall attitude toward using a given system is an antecedent to intentions to adopt(Davis, 1989). This research suggested hypothesized as follows.

<Hypothesis 5> Attitude will have significant effect on intention to use mobile network service

3. Research Methodology

3.1. Data collection

Empirical data was collected by conducting an field survey of potential mobile application service users. In order to increase the response rate from mobile application service users, mobile application users are relatively young and generally well educated students. Therefore, the call for participation was also made in mobile-related application issues were widely discussed. The survey yielded 245 usable responses. Respondents ranged from 19 to 39 years of age (mean=26 years). Approximately, 59% of the respondents were male. Sixty-two percent had completed one college or university degree.

3.2. Measurement

The items on the questionnaire, developed from the literature, are listed by the [Table 1], with modifications to suit the mobile application service setting. Items selected for the constructs were primarily adapted from prior studies to ensure content validity. Functionality was measured by four-item measures adapted from Nikou and Mezei(2013). Also, added value was by four-item measures adapted from Carlsson et al.(2006). Other items for the usefulness, ease of use, attitude and intention behavior were adapted from Rogers(1981), Venkatesh and Davis(1996). Theses scales were slightly modified to suit the mobile application service context. The terms were measured by using a seven-point Likert scale, ranging from "disagree strongly"(1) to "agree strongly"(7). Before conducting the main survey, both a pre-test and a pilot test were administered to validate the instrument.

4. Results

4.1. Sample characteristics

Among the types of added value services(<Table 3>), nearly 60% of the subjects had adopted SNS applications(95%) MP3 download services(93%). The other commonly used value-added services were , mobile games(60%), Movie watching and download(51%), TV VOD services(40%) and Transportation Applications (38%).

<Table 3> Types of added-value services

Types	Frequency	Percent(%)(n=245)	Rank
SNS applications	232	95	1
MP3 download services	229	93	2
Mobile games	146	60	3
Movie watching and download	125	51	4
TV VOD services	98	40	5
Transportation Applications	93	38	6

4.2. Scale reliability

The reliability of all instruments was assessed by the Cronbach alpha reliability coefficient. The coefficient alpha for the functionality, added value, usefulness ease of use, attitude and intention to use were 0.86, 0.82, 0.85, 0.91, 0.82, and 0.85, respectively, which exhibited an acceptable level of reliability(alpha >0.70, see <Table 4>).

<Table 4> Cronbach alphas for each measure

Scale items	Item	Cronbach
Functionality	4	0.86
Added value	4	0.82
Usefulness	3	0.85
Ease of use	2	0.91
Attitude	3	0.82
Intention to use	3	0.85

4.3. Scale Validity

In addition to the model fit, the reliability, the convergent validity, and the discriminant validity of the scale were examined(see <Table 5>)

<Table 5> Standardized factor loadings, SMC and CR

Construct	Item	Factor loading (p < 0.01)	SMC	CR
Functionality	F1	0.847	0.734	
	F2	0.823	0.852	
	F3	0.785	0.601	0.890
	F4	0.865	0.746	
Added value	AV1	0.793	0.629	
	AV2	0.975	0.980	
	AV3	0.812	0.761	0.892
	AV4	0.839	0.861	
Usefulness	U1	0.817	0.668	
	U2	0.949	0.902	0.901
	U3	0.839	0.678	
Ease of use	EO U1	0.961	0.926	0.858
	EO U2	0.750	0.761	
Attitude	ATT 1	0.784	0.626	
	ATT 2	0.859	0.758	0.858
	ATT 3	0.779	0.621	
Intention to use	IU1	0.801	0.722	
	IU2	0.985	0.899	0.876
	IU3	0.825	0.626	

Convergent validity can also be evaluated by examining the factor loadings and squared multiple correlations from the confirmatory factor analysis. The criteria used to identify and interpret factors with each item should load 0.50 or greater on one factor(Hair et al., 1992). and the composite reliability $(CR = \frac{(\Sigma\lambda)^2}{[(\Sigma\lambda)^2 + (\Sigma(\theta))^2]}$; λ=factor loading; θ=measurement error of each measured variable) values of all the constructs were above the recommended level of 0.6, indicating that all measures had good reliability. Thus, all factors in the measurement model had adequate reliability and convergent validity. Moreover, the completely standardized factor loadings all reached the level of significance, all the constructs had a CR above 0.6.

And the average variance extracted($AVE = \frac{(\Sigma\lambda^2)}{[(\Sigma\lambda^2) + \Sigma(\theta)]}$; λ =factor loading; θ=measurement error of each measured variable) values for all constructs were higher than the suggested threshold value of 0.50, suggesting the convergent validity of the scale(Fornell & Larcker, 1981). Comparing the square root of the AVE with the correlations among the constructs indicates that each construct is more closely related to its own measures than to those of other constructs, and discriminant validity was therefore supported(see <Table 6>).

<Table 6> Inter-variable correlations

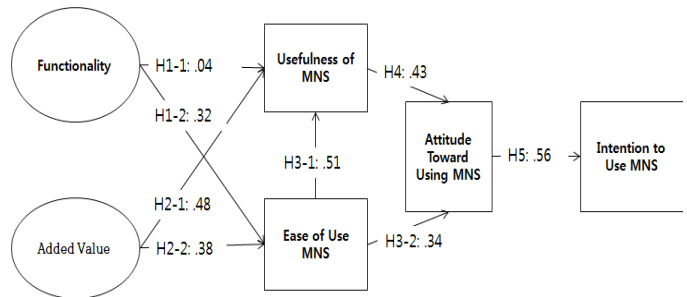| Factor	Functionality	Added value	Usefulness	Ease of use	Attitude
Functionality	0.73				
Added value	0.58	0.75			
Usefulness	0.12	0.30	0.72		
Ease of use	0.16	0.16	0.18	0.79	
Attitude	0.62	0.72	0.45	0.42	0.85
Intentiontouse	0.89	0.90	0.93	0.94	0.96

4.4. Structural model test

The research model and the proposed hypotheses were evaluated by the structural equation model(SEM). The analysis tool used in this study was AMOS(18) software. Parameter estimation was performed by maximum likelihood estimation. According to Table 5, all the model-fit indices exceed their respective common acceptance levels suggested in the prior literature(Hair, Anderson, Tatham, & Black, 1998). Therefore, it can be concluded that the measurement model has good fit with the data collected.

<Table 7> Fit indices for measurement and structural model

Fit indices	Recomm. ended value	Measurement model	Structural model
chi 2/d.f.	<3.00	2.408	2.320
GFI	>0.90	0.905	0.91
RMSEA	<0.08	0.076	0.075
RMR	<0.08	0.064	0.065
NFI	>0.9	0.930	0.95
NNFI	>0.9	0.952	0.93
CFI	>0.9	0.958	0.95

4.5. Structural model test and evaluating hypothesized

A similar set of fit indices was used to examine the structural model. Comparison of all fit indices, with their corresponding recommended values, provided evidence of a good model fit(chi square/d.f.=2.43, GFI=0.89, RMSEA=0.075), RMR=0.065, NFI=0.95, NNFI=0.93, CFI=0.95(see <Table 7>). Thus, we could proceed to examine the path coefficients of the structural model. Properties of the causal paths, including standardized path coefficients are shown in <Figure 2>).

<Figure 2> Results of the model

Most of the hypotheses were strongly supported, except for hypothesis H1-1(γ=0.04, t=0.609, P<0.001)). Properties of the causal paths, including standardized path coefficients are shown in <Figure 2>. As functionality had a positive and significant impact on ease of use(γ=0.32, P<0.001), and Added value, had a positive and significant impact on usefulness(γ=0.48, P<0.001) and ease of use(γ=0.38, P<0.001). Therefore, H1-2 and H2(1 and 2), were also supported. Ease of use, usefulness were found to be a highly significant factor in usefulness(γ=0.51, P<0.001) and attitude(γ=0.34, P<0.001), and also, usefulness had a significant impact on attitude(γ=0.43, P<0.001), both oof them supporting hypotheses H3 and H4. Finally, the effect of attitude on intention to use was a highly significant (β= 0.56, P< 0.001). Thus, H5 was supported. Finally, the direct effect, indirect effect, and total effect of each construct on behavioral intention to use applications service functionality and added value services were calculated. It could find, functionality, added value,

usefulness, and ease of use, were significant on intention to use indirect. These findings are consistent with those of technology acceptance model, technology attitude(or acceptance) was the most important factor influencing behavior intention for mobile services, followed by functionality, added value, usefulness and ease of use.

<Table 8> The direct, indirect, and total effect of each construct on BI

Name of Construct	Direct effect	Indirect effect	Total effect
Functionality	-	0.061	0.061
Added value	-	0.121	0.280
Usefulness	-	0.286	0.286
Ease of use	-	0.341	0.341
Attitude	0.561	-	0.561

5. Conclusions and suggestions

In this study, result is consistent with the finding of technology acceptance model. This study indicates that customers who are more inclined to try new products or who have a higher demand for new things think about that functionality and added value mobile application services are usefulness and easy to use, and operate in the process of using them. The functionality is shown a low significant effect value, but it could understand the functionality of mobile application programs does not useful even when customers are willing to try and use new things. There are so many kind of application programs, but because of that it cannot find and use a having good quality of contents in there.

The effect of perceived ease of use on perceived usefulness. This result is consistent with those of previous studies(Davis et al., 1989; Igbaria et al., 1997; Taylor & Todd, 1995; Oh, 2013). It also implies that mobile service providers need to consider the ease of use of services when identifying the application with added value services that can offer practical values to customers. The effect of usefulness and ease of use on attitude. Both of them had significantly positive influence on attitude. These results mirrored those of previous studies and theorem of technology acceptance (Davis et al., 1989; Taylor & Todd, 1995; Oh, 2013). Thus, customers adopt more positive attitudes toward adoption of services when they perceive higher usefulness and ease of use of mobile application added value services,

This study investigated customer behavioral intention to adopt mobile functionality and added value services. When the mobile application services have been available for any time and any where, although customers can easily adopt high-speed and LTE(long term evolution) data transmission through the mobile service system, movie and games entertainment and the con-

venience of retrieve life information, the usage rate of current added value services are already high speed. Hence, customers are still unwilling to spend much time and money on these added value services, and service flow cannot be augmented to create revenue. This conclusion provides as a supporting for mobile service vendors, who view the young and the most of all undergraduate students users as the target customers of added value services. And then, especially customers with higher personal applications with functionality and value added services, those who think about that those are easy to take and use can also a higher usefulness of the mobile services. Finally, to enhance customer behavioral intention to adopt and use for mobile applications services, attitude and acceptance should be the primary focus, followed by ease of use and usefulness. Most of the current mobole service providers in korea have focused on promoting high-speed transmission like LTE, and have not examine closely into customer's mobile services usages attitude and other related factors.

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