Journal of Internet Banking and Commerce

An open access Internet journal (http://www.arraydev.com/commerce/jibc/)

Journal of Internet Banking and Commerce, April 2011, vol. 16, no.1
(http://www.arraydev.com/commerce/jibc/)

Factors Affecting Third Generation (3G) Mobile Service Acceptance: Evidence from Malaysia

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Abstract

This paper aims to examine factors affecting subscribers' intention towards using 3G mobile service. Cross sectional data were collected from 100 respondents through a survey. Data were then analyzed by means of multiple regression analysis. The findings verified the research hypotheses, and confirmed that Perceived Usefulness, Perceived Ease of Use and Attitude are jointly responsible in determining the subscribers' intention

to use of 3G mobile service. Perceived Usefulness was found as a key factor influences subscribers' intention to use 3G mobile services. This study was conducted only in Malaysia and does not cover other countries. The findings are only applicable in Malaysia and cannot be generalised for the other countries. Consideration of the factors identified should lead to more successful adoption of 3G. The study implies that the 3G mobile telecommunication companies need to lift consumers' intention to adopt 3G mobile services. Users' of 3G mobile services need to be provided with more diverse and entertaining ways of communicating, which are at the same time easily accessible and convenient to use. The paper enhance understanding of user acceptance of 3G mobile communication services.

Keywords: **3G; Adoption; Attitude; Mobile Phone; Technology Acceptance; Usage**

Introduction

The need for flexibility and responsiveness, has led to a growing demand for access to new third generation (3G) mobile services anytime, anywhere. 3G mobile network is the third generation of mobile networks that offer higher data rates than the previous generation networks (1G and 2G). It offers data rates of 144 Kbps for fast-moving mobile users in vehicles, 384 Kbps for slower moving pedestrian users, and 2 Mbps from fixed locations. While 1G as the first generation which emerged in the 1940s offers wide area low bandwidth, just less than 10 kbps. It used analog technology. 1G can only be used for voice service. 2G as the second generation, launched in the 1990s, offers data rates only between 10 and 20 kbps. It can be used for both voice communication and short message service (SMS) (Campbell & Schwartz, 2001; Lehr & McKnight, 2003).

There has been a steady growth in worldwide 3G mobile adoption. However, there also exists a wide range of 3G diffusion levels across countries. For example, the region of Asia trumped all others in 3G adoption with close to 52 percent of the world 3G market share as early as in 2006 (ITU, 2006). More recently, Asia-Pacific was home to an estimated 158 million 3G subscribers in 2008 and is expected to reach 564 million subscribers by 2013 (Suppiah, 2009). Historically, Korea, Italy, Japan, Portugal and Hong Kong were the top five 3G mobile economies in terms of 3G mobile penetration rate (ITU, 2006). According to the official ITU report, while the number one 3G nation, Korea, had a penetration rate as high as 25.95 percent, the number five country, Hong Kong, reached only about one third of Korea's rate (8.19 percent). It is evident that there are significant regional differences in the number of 3G subscribers. While close to half of the 3G subscribers are located in the region of Asia, less than thirteen percent of them are in Europe. The number of 3G subscribers increased significantly, thus it represents consumers' willingness to adopt advance wireless technology and engage in activities using systems where 3G can provide more comprehensive contents than other wireless services.

Research on 3G technology acceptance, therefore will be extremely worthy in providing useful information, especially at this early stage of 3G mobile Internet development and implementation. Hence, the purpose of this study is to examine factors affecting

subscribers' intention towards using 3G mobile service with the Technology Acceptance Model (TAM) as the guiding principle. This study will be primarily beneficial to the mobile services provider since they can understand the subscribers' perception of the services. Furthermore, the results of this study may allow them to better segment and target the market.

Literature Review

Conceptual Model and Hypotheses

The Technology Acceptance Model is a highly validated model and was tested by many researchers in their study (refer to Figure 1). This model, proposed by Davis (1989), is based on construct and relationships in the Theory of Reasoned Action (TRA) (Adams *et al.,* 1992; Chau, 1996; Dishaw & Strong, 1999).

The TAM was mainly derived from the TRA, which posited that an individual's willingness, rational decision-making, attitude and Subjective Norm will affect his/her Behavioral Intention. Subjective norm refers to an individual's belief that she/he should perform a certain behavior because this is expected of him/her by others important to the individual (Fishbein & Ajzen, 1975). According to TRA, Attitude and Subjective Norms independently affect intentions, whereas in the TAM, Perceived Usefulness and Perceived Ease of Use are believed to directly affect a person's attitude. Davis, Bagozzi, & Warshaw (1989) found the Subjective Norm did not significant affect intentions over and above Perceived Usefulness and Perceived Ease of Use and therefore omitted it from the original TAM.

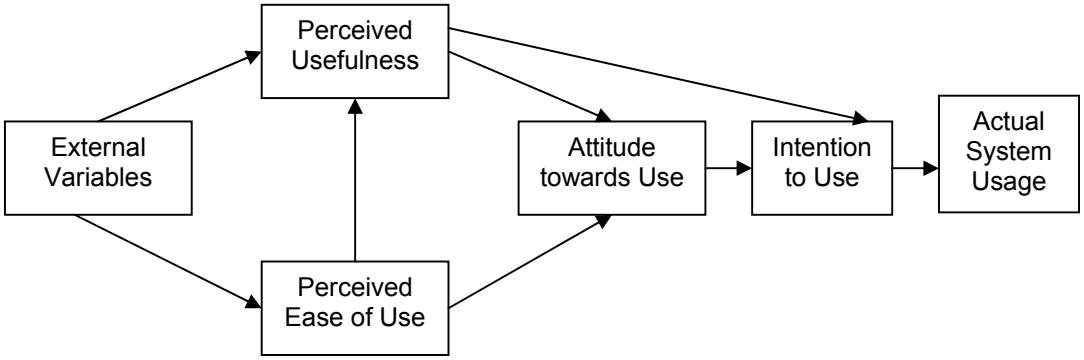

Figure 1: Technology Acceptance Model

Ortega, Martinez & Hoyos (2006) have empirically tested the basic constructs to of TAM without any external variables to apply on acceptance of online business management and industry effect. With the help of 3G wireless technology, operators can provide 3G services associated with a variety of entertaining and enjoyable services content (Lehr & McKnight, 2003). Thus, the objective of this study is to provide a theoretically justified research model that extends TAM by proposing the addition of perceived enjoyment to the use of 3G services, and to empirically test factors influencing usage of 3G mobile services.

Perceived Usefulness (PU)

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). Within the organisational context, a system that is high in perceived usefulness is one that the user believes will have a positive use-performance relationship. Previous researches have shown that perceived usefulness influences computer usage directly. In general, when the users found that the system is useful for them, then they will have the intention to use it and lead to the actual usage of the system. Based on previous research using the TAM model, it is found that perceived usefulness is the primary antecedent that determines the behavioural intention to use a computer system (Davis, 1989; Venkatesh & Davis, 2000).

Perceived usefulness was found to have positively influenced the behavioural intention to use a computer system (Fagan, Wooldridge, & Neill, 2008; Guriting & Ndubisi, 2006; Ha & Stoel, 2009; Hsu, Wang, & Chiu, 2009; Huang, 2008; Norazah & Norbayah, 2009; Norazah, Ramayah & Norbayah, 2008; Ruiz-Mafe´, Sanz-Blas, Aldas-Manzano, 2009; Seyal & Rahman, 2007; Sudha, Singh, Singh, & Singh, 2010; Tong, 2009). Pagani (2004) conducted a study to identify the determinants of adoption of 3G mobile multimedia services and found that perceived usefulness is one of the most important determinants of adoption of 3G multimedia mobile services. Instead, it is found that perceived usefulness does not directly influence the behavioural intention to use a computer system (Brown, Massey, Montoya-Weiss, & Burkman, 2002). In this study, we define usefulness as the degree to which an individual believes that use of 3G mobile services will improve his or her communicational performance. Therefore, we posited that:-
H1. PU will have a positive effect on BI towards using 3G mobile services.

Perceived Ease of Use (PEOU)

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989, p. 323). All else being equal, an application perceived to be easier to use is more likely to be accepted by the users (Davis, 1989). In majority of the research conducted using the TAM model, perceived ease of use was found to have positively influenced the behavioural intention to use a system (Fagan *et al.,* 2008; Guriting & Ndubisi, 2006; Hsu *et al.,* 2009; Huang, 2008; Norazah & Norbayah, 2009; Norazah *et al.,* 2008; Ramayah, Chin, Norazah, & Amlus, 2005, Sudha *et al.,* 2010). Perceived ease of use was found to influence the adoption of 3G multimedia mobile services (Pagani, 2004). However, it is also found in other research that perceived ease of use is found to have not directly influenced the behavioural intention to use a system (Ruiz-Mafe´ *et al.,* 2009). Generally, when a system is found to be easy to use, users will have the intention to use the system. Here, we define ease of use as the extent to which customer' use of 3G mobile services is perceived as easy or effortless. Accordingly, we hypothesize that:-
H2. PEOU will have a positive effect on BI towards using 3G mobile services.

Perceived Enjoyment (PE)

Perceived enjoyment is a type of intrinsic psychological motivation (Davis *et al.,* 1989). Perceived enjoyment is defined 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" (Davis, Bagozzi, & Warshaw, 1992, p. 1113). Perceived enjoyment was found to be positively influenced by behavioural intention to use a computer system (Davis *et al.,* 1992; Lee, Cheung & Chen, 2007; Teo, Lim & Lai, 1999; Norazah & Norbayah, 2009). According to Van der Heijden (2004) "for hedonic systems, perceived enjoyment (a dimension of perceived playfulness) is a stronger predictor of behavioural intention to use than is perceived usefulness" (Van der Heijden, 2004). However, there are other researches suggesting that perceived enjoyment does not positively influenced the behavioural intention to use a computer system (Fagan et al., 2008; Shin & Kim, 2008; Venkatesh, Speier & Morris, 2002). In this study, we define PE as the degree to which a person believes that use of 3G mobile services will be interesting and associates it with enjoyment. Therefore, we hypothesize that:-
H3. PE will be have a positive effect on BI towards using 3G mobile services.

Attitude (ATT)

Attitude has long been identified as a cause of intention. In terms of 3G mobile services, their features can be viewed as mere extension of GSM services with major differences in speed and bandwidth to access gain to the wireless network. Most customers today are likely to have been exposed to 3G mobile phones and to have formed an attitude towards using them, ranging from very favourable to very unfavourable. Prior empirical studies have shown the existence of such generalize attitude and its influences on the evaluation of new technology in similar situations (Moon & Kim, 2001; Norazah & Norbayah, 2009; Norazah *et al.,* 2008; O'Cass & Fenech, 2003; Vijayasarathy, 2004). In this research, attitude is hypothesized to the influences of the intention towards using 3G mobile services, and is defined as the degree to which an individual's attitude is favourably or unfavourably disposed towards using 3G mobile services. Accordingly, we hypothesize that:-
H4. Attitude will have a positive effect on BI towards using 3G mobile services.

Behavioral Intention (BI)

Behavioral Intention to use is a measure of the likelihood that a person will adopt the application, where as the TAM uses actual usage to represent a self-report measure of time or frequency of adopting the application (Davis *et al.,* 1989). However, it is not easy or practical to obtain an objective measurement of an individual's intention to engage in behavior. Several researches have shown that both theoretical and empirical support exists for the powerful correlation between intention to engage in a behavior and actual behavior (Dabholkar & Bagozzi, 2002; Lucas & Spitler, 1999; Vijayasarathy, 2004). Behavioral intention of 3G mobile telecommunication services has positive influence towards use behavior (Wu, 2008). To maintain instrument brevity, we adopt behavioral intention as an individual's intention to use 3G mobile services.

All things considered, Figure 2 illustrates the theoretical framework of the study.

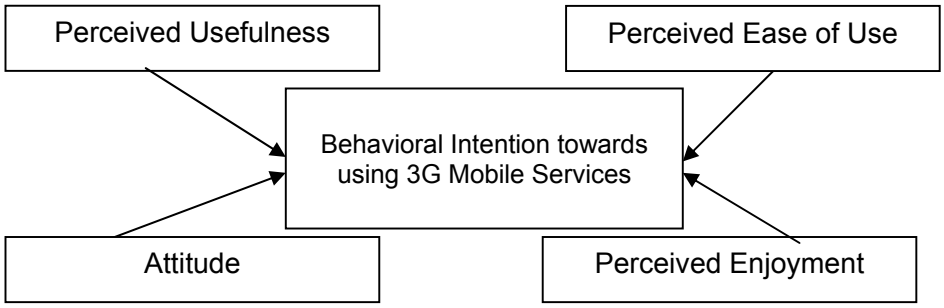

Figure 2: The research Model

Methodology

Out of 150 questionnaires, only 100 were usable. The questionnaire consists of two main parts: demographic profile of respondents and perceptions and attitude towards using 3G mobile services. Cross sectional data were collected through a survey and analysed by means of multiple regression analysis via Statistical Package for Social Sciences (SPSS) version 17 computer program. Multiple regression were used to looking for association between two metric variables and to test any cause and effect between two variables respectively.

Data Analysis and Findings

A statistical elaboration of the sample took place. The gender distribution of the survey respondents is 40 per cent males and 60 per cent females. The results also indicated that the samples have age predominantly between 25 and 35 years, which is 75 per cent. More than 90 per cent of the respondents are working adults with monthly salary RM2501-3000.

Reliability Analysis

The reliability of scale indicates that the study is free from random error. Internal consistency is measured in this research using Cronbach's coefficient alpha, (α). Values range from 0 to 1 with higher values indication greater reliability. Table 1 indicates all value is more than 0.7 (Hair, Black, Babin, Anderson, & Tatham, 2010). Hence, the survey instrument (questionnaire) can be a reliable tool to measure all constructs consistently. Moreover, all of the measures of constructs had been used in past studies, and have thus been validated.

Table 1: Reliability Analysis

Variable	Cronbach's Alpha
Perceived Usefulness	0.880
Perceived Ease of Use	0.850
Behavior Intention	0.780
Perceived Enjoyment	0.740
Attitude	0.790

Correlation Analysis of Variables

Pearson correlations were calculated to identify the correlations between the five variables: Perceived Usefulness, Perceived Ease of Use, Behavior Intention, Perceived Enjoyment, and Attitude. It is also used to describe the relationship of the dependent variable and the outcome. All the major variables were correlated together using the correlation test. The average score of the multi-items for a construct was computed since a single construct in the questionnaire was measured by multiple items, and the score was used in further analysis such as correlation analysis and regression analysis (Wang and Benbasat, 2007). As cited in Wong and Hiew (2005) the correlation coefficient value (*r*) range from 0.10 to 0.29 is considered weak, from 0.30 to 0.49 is considered medium and from 0.50 to 1.0 is considered strong. However, according to Field (2005), correlation coefficient should not go beyond 0.8 to avoid multicollinearity. Since the highest correlation coefficient is 0.524 which is less than 0.8, there is no multicollinearity problem in this research (Table 2).

Table 2: Correlation Matrix and Mean Values

	PU	PEOU	BI	PE	ATT
Perceived Usefulness (PU)	1				
Perceived Ease of Use PEOU)	.488(**)	1			
Behavior Intention (BI)	.524(**)	.508(**)	1		
Perceived Enjoyment (PE)	-.143	-.347(**)	-.238(*)	1	
Attitude (ATT)	-.232(*)	-.359(**)	-.479(**)	.312(**)	1
Mean	2.4460	2.3275	2.3333	1.6067	1.8625
Std. Deviation	.69506	.80771	.79983	.16501	.25469

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Multiple Regression Analysis

Multiple regression analysis was performed to test the hypothesis relationship between independent variables and dependent variable. Four hypotheses were proposed and results were enumerated in Table 3. The *F*-statistics produced (F = 19.175) was significant at 1 per cent level (Sig. F<0.01), thus confirming the fitness for the model. Therefore, there is a statistically significant relationship between the four factors (Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment, and Attitude) and Behavior Intention towards using 3G mobile services. The coefficient of determination R^2 was 44.7 per cent. Thus, the four factors can significantly account for 44.7 per cent in the subscriber's intention towards using 3G mobile services.

Table 3: Regression Analysis

Variables	***b***	**SE*b***	**Beta (β)**	**T**	***p* value**
Perceived Usefulness	.391	.101	.340	3.871	.000
Perceived Ease of Use	.222	.094	.224	2.372	.020
Perceived Enjoyment	-.063	.404	-.013	-.156	.877
Attitude	-.992	.264	-.316	-3.762	.000
R^2			.447		
Adjusted R^2			.423		
Standard Error			.60734		
F			19.175		
Sig. *F*			0.000		

H1 posited that Perceived Usefulness will have a positive effect on Behavior Intention towards using 3G mobile services. Results revealed significant result (β = 0.340; t = 3.871; p = 0.000). Thus, H1 is supported where subscribers' find that it is convenient to use 3G mobile services and also efficient to use it. This result is analogous to Adams *et al.* (1992), Davis *et al.* (1989), Norazah & Norbayah (2009), and Sudha *et al.* (2010) stating that Perceived Usefulness is a major determinant of usage behavior and intention.

Further investigation of study was performed on second proposed hypothesis on whether there is significant relationship between Perceived Usefulness and Behavior Intention towards 3G mobile service. Findings in Table 3 confirmed that Perceived Ease of Use (β = 0.224; t = 2.372; p = 0.020) is significantly related to Behavior Intention towards 3G mobile service. Hence, H2 is verified. The positive intention to use 3G mobile services is due to the reasons that subscriber's learned to use 3G services quickly and unearth that it is easy to use it. This corroborates the finding by Davis *et al.* (1989), Norazah & Norbayah (2009), and Sudha *et al.* (2010).

Next, H3 exhibited a significant relationship between Perceived Enjoyment and Behavior Intention towards using 3G mobile services (β = -0.013; t =-0.156). Its p-value is > 0.05, posited that H3 is not supported by the data. Great diversity of 3G services can excite subscribers' with more imagination space that lead them to experience enjoyable towards using 3G mobile services. However, results does not substantiate studies on Perceived Enjoyment by Davis *et al.* (1992), Igbaria *et al.* (1997), and Norazah & Norbayah (2009) who have indicated that Perceived Enjoyment significantly affects intention to use computers.

The final hypothesis, H4 proposed that Attitude will have a positive effect on Behavior Intention towards using 3G mobile services. Attitude exhibited a significant relationship with Behavior Intention towards using 3G mobile services (β = -0.316; t = -3.762). Its p-value is < 0.05, posited that H4 is strongly supported. Using the 3G services is good attitude and a good idea. Thus, the significant role of Attitudes in shaping Behavioral Intention has been visible when a relationship between the Attitude and Behavioral Intention has been studied. The assumption that Attitudes have a strong, positive direct influence on intention to use mobile devices/services is reinforced when the coefficients of the Attitude is examined (refer Table 3). This result in support to the findings of Norazah & Norbayah (2009), Norazah *et al.* (2008), O'Cass & Fenech, (2003), and

Vijayasarathy (2004).

Conclusion

This paper has examined relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3G mobile service. Results showed that subscribers' intention to use 3G mobile services is determined by their perception on its usefulness and how convenient it is to use and access 3G mobile services' functions. Further, the results highlighted the importance of Perceived Ease of Use towards 3G mobile services' in terms of how easy or effortless it is to communicate with each other. 3G offers a vertically integrated, top-down, services provider approach to delivering wireless Internet access. The 3G standard is able to support broadband services include: voice, audio, text, still image, dynamic video; interactive services such as conversations, messages, and restore and storage; distribution services such as point-to-multipoint broadcasts; location-based mobile information services; data services that are dependent on the radio connection; fixed wireless access for broadband connections; wireless packet service for Internet access; and wireless circuit service for voice and low-speed data connections since its data transmission rates are about 2Mbps in indoor communications and less than 1Mbps in outdoor communication.

In addition, results emerging from this paper offer some insights into mobile adoption that might prove useful to managers in the development of new 3G mobile services. Among the four factors, only Perceived Enjoyment was proven to be insignificantly influencing the Behavioral Intention towards using 3G mobile services. Perceived Enjoyment may be a necessary condition, but not the sufficient criterion to lift consumers' intention to adopt 3G mobile services. This is unusual exception to general technology acceptance situations and thus it is worthy of the consideration of the 3G mobile telecommunication companies. However, this study was conducted only in Malaysia and does not cover other countries. The findings are only applicable in Malaysia and cannot be generalised for the other countries. All things considered, the current findings significantly enhance understanding of user acceptance of mobile communication services. Consideration of the factors identified should lead to more successful adoption of 3G. Results suggest users' of 3G mobile services need to be provided with more diverse and entertaining ways of communicating, which are at the same time easily accessible and convenient to use. Future research can evaluates and analyses the 3G market, investigating the financial and industrial implications surrounding the 3G market.

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