

*Full Length Research Paper*

# Third generation (3G) mobile service acceptance: Evidence from Malaysia

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**This paper aims to examine the factors affecting subscribers' intention towards using third generation (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 3G mobile service. Perceived usefulness was found as a key factor that 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 generalized 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. This paper enhances understanding of user acceptance of 3G mobile communication services.**

**Key words:** Third generation (3G), mobile phone, adoption, usage, technology acceptance, attitude.

## 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 and Schwartz, 2001; Lehr and 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% 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%, the number five country, Hong Kong, reached only about one third of Korea's rate (8.19%). 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.

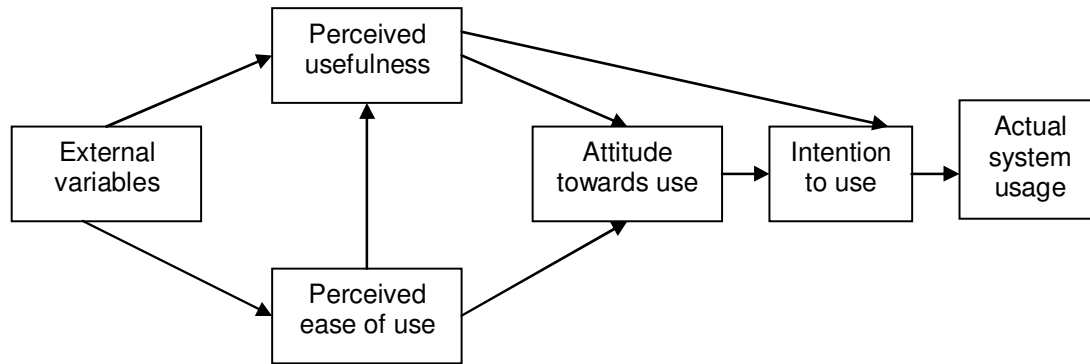


Figure 1. Technology acceptance model.

Research on 3G technology acceptance will therefore 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 (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; Dishaw and 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 and 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 et al. (1989) found the subjective norm did not significantly affect intentions over and above perceived usefulness and perceived ease of use and therefore omitted it from the original TAM.

Ortega et al. (2006) have empirically tested the basic constructs 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 and 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

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). 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 and Davis, 2000).

Perceived usefulness was found to have positively influenced the behavioural intention to use a computer system (Fagan et al., 2008; Guriting and Ndubisi, 2006; Ha and Stoel, 2009; Hsu et al., 2009; Huang, 2008; Norazah and Norbayah, 2009; Norazah et al., 2008; Ruiz-Mafe' et al., 2009; Sudha et al., 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 et

al., 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 posit that:

H<sub>1</sub>: Perceived usefulness will have an effect on behavior intention towards using 3G mobile services.

### **Perceived ease of use**

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). 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 and Ndubisi, 2006; Hsu et al., 2009; Huang, 2008; Norazah and Norbayah, 2009; Norazah et al., 2008; Ramayah et al., 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:

H<sub>2</sub>: Perceived ease of use will have an effect on behavior intention towards using 3G mobile services.

### **Perceived enjoyment**

Perceived enjoyment (PE) 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 et al., 1992).

Perceived enjoyment was found to be positively influenced by behavioural intention to use a computer system (Davis et al., 1992; Lee et al., 2007; Teo et al., 1999; Norazah and 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". 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 and Kim, as 2008; Venkatesh et al., 2002). In this study, we define PE

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:

H<sub>3</sub>: Perceived enjoyment will have an effect on behavior intention towards using 3G mobile services.

### **Attitude**

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 and Kim, 2001; Norazah and Norbayah, 2009; Norazah et al., 2008; O'Cass and 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:

H<sub>4</sub>: Attitude will have an effect on behavior intention towards using 3G mobile services.

### **Behavioral intention**

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 and Bagozzi, 2002; Lucas and Spittler, 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.

### **METHODOLOGY**

Out of 150 questionnaires, only 100 were usable. The questionnaire

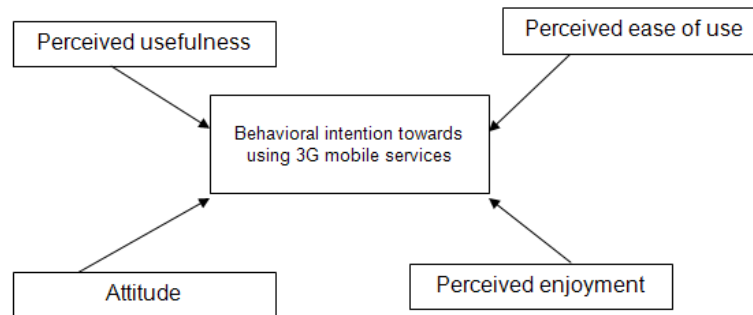


Figure 2. The research model.

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

consists of two main parts: demographic profile of respondents and perceptions and attitude towards using 3G mobile services. The measurement of items used, as presented in the Appendix, was adapted from Davis et al. (1992). Respondents were asked to read and indicate their agreement or disagreement with each of the statements supplied by using a 7-point scale. 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 regressions were used to looking for association between two metric variables and to test any cause and effect between two variables respectively. Multiple regression analysis assumes that for each fixed value of X, the distribution Y is normal and the means of all these normal distributions of Y, given X, lie on a straight line with slope b. It also assumes that the error terms are uncorrelated and are normally distributed with mean zero and a constant variance.

#### Data analysis

A statistical elaboration of the sample took place. The gender distribution of the survey respondents is 40% males and 60% females. The results also indicated that the samples have age predominantly between 25 and 35 years, which is 75 %. More than 90% of the respondents are working adults with monthly salary RM 2501 to 3000.

#### Reliability analysis

Internal consistency is measured using Cronbach's coefficient alpha ( $\alpha$ ), where values range from 0 to 1 with higher values indication greater reliability. Table 1 indicates all value is more than 0.7 (Hair et al., 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.

#### Correlation analysis of variables

Pearson correlations were calculated to identify the correlations among the variables. 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).

#### 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% level, 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 0.447. Thus, the four factors can significantly account for 44.7% in the subscriber's intention towards using 3G mobile services.

Results for  $H_1$  that perceived usefulness will have an effect on behavior intention towards using 3G mobile services revealed a significant result ( $\beta = 0.340$ ;  $t = 3.871$ ;  $p = 0.000$ ). Thus,  $H_1$  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 and Norbayah (2009) and Sudha et al. (2010), stating that perceived usefulness is a major determinant of usage behavior and intention. Findings in Table 3 also confirmed that perceived ease of use ( $\beta = 0.224$ ;  $t = 2.372$ ;  $p=0.020$ ) significantly related to behavior intention towards 3G mobile service. Hence,  $H_2$  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 and

**Table 2.** Correlation matrix and mean values.

Variable	PU	PEOU	BI	PE	ATT
Perceived usefulness (PU)	1				
Perceived ease of use PEOU)	0.488(**)	1			
Behavior intention (BI)	0.524(**)	0.508(**)	1		
Perceived enjoyment (PE)	-0.143	-0.347(**)	-0.238(*)	1	
Attitude (ATT)	-0.232(*)	-0.359(**)	-0.479(**)	0.312(**)	1
Mean	20.4460	20.3275	20.3333	10.6067	10.8625
Std. deviation	0.69506	0.80771	0.79983	0.16501	0.25469

\*\*Correlation is significant at the 0.01 level (2-tailed); \* Correlation is significant at the 0.05 level (2-tailed).

**Table 3.** Regression analysis.

Variable	<i>b</i>	SE <i>b</i>	Beta ( $\beta$ )	T	<i>p</i> value
Perceived usefulness	0.391	0.101	0.340	3.871	0.000
Perceived ease of use	0.222	0.094	0.224	2.372	0.020
Perceived enjoyment	-0.063	0.404	-0.013	-0.156	0.877
Attitude	-0.992	0.264	-0.316	-3.762	0.000
R <sup>2</sup>				0.447	
Adjusted R <sup>2</sup>				0.423	
Standard error				0.60734	
<i>F</i>				19.175	
Significant <i>F</i>				0.000	

Norbayah (2009) and Sudha et al. (2010). Next, H<sub>3</sub> exhibited insignificant relationship between perceived enjoyment and behavior intention towards using 3G mobile services ( $\beta = -0.013$ ;  $t = -0.156$ ) as its *p*-value is  $> 0.05$ . It is posited that H<sub>3</sub> 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 and Norbayah (2009) who have indicated that perceived enjoyment significantly affects intention to use computers.

The relationship expected between attitude and behavior intention towards using 3G mobile services, as proposed in H<sub>4</sub> is positive, however what was found was a negative relationship (regression coefficient for attitude =  $-0.316$ ;  $p = 0.000$ ). The results of regression analysis indicate that the coefficient of attitude is negative; that is, the increase or decrease in behavior intention towards using 3G mobile services will significantly affect the attitude of the users. 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. This result supports the findings of Norazah and Norbayah (2009), Norazah et al. (2008), O' Cass and Fenech (2003) and Vijayasathary (2004).

## Conclusion

This paper examined the relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3G mobile services. 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 2 Mbps in indoor communications and less than 1 Mbps 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.

This study was conducted only in Malaysia and does not cover other countries. The findings are only applicable in Malaysia and cannot be generalized 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 evaluate and analyses the 3G market, investigating the financial and industrial implications surrounding the 3G market.

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**APPENDIX****Measurement of items*****Perceived usefulness***

Efficient to use  
Convenient to use  
Relaxing  
Higher the quality of communicating  
Usefulness

***Perceived ease of use***

It is simple to use 3G services  
I learned to use 3G services quickly  
3G services are understandable and clear  
It is easy to use 3G services

***Behavioral intention***

Willing to use 3G services  
Willing to use 3G services in the future  
Recommend someone to use 3G services

***Perceived enjoyment***

Using the 3G services is interesting  
Using the 3G services is enjoyable  
Using the 3G services is delightful  
Using the 3G services is curious  
Using the 3G services guide me to explore novelty  
A great diversity of 3G services can excite me with more imaginative space

***Attitude***

Using the 3G services is beneficial  
Using the 3G services is worthy  
Using the 3G services is a good idea  
Using the 3G services is a positive attitude