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EXPLORING THE RELATIONSHIP BETWEEN PERCEIVED USEFULNESS, PERCEIVED EASE OF USE, PERCEIVED ENJOYMENT, ATTITUDE AND SUBSCRIBERS' INTENTION TOWARDS USING 3G MOBILE SERVICES

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ABSTRACT

This study aims to examine the relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3G mobile services. Cross sectional data were collected through a survey and analysed by means of factor analysis, correlation and regression analysis. Out of 150 questionnaires only 100 were usable. Findings show 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. Consideration of the factors identified should lead to more successful adoption of 3G.

Keywords: 3G mobile, service, adoption, usage, technology acceptance model (TAM), attitude

INTRODUCTION

Third Generation (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) [4, 16].

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 [14]. 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 [23]. Historically, Korea, Italy, Japan, Portugal and Hong Kong were the top five 3G mobile economies in terms of 3G mobile penetration rate [14]. According to the official International Telecommunication Union 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.

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 the relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3G mobile services 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

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. Pagani [21] conducted a study to identify the determinants of adoption of 3G mobile multimedia services and found that perceived usefulness, ease of use, price, and speed of use are the most important determinants of adoption of 3G multimedia mobile services. The importance of determinants differs by age groups or segments.

Performance Expectancy has positive influence towards Behavioral Intention" and "Use behavior". The practicability of system is still the major influential factor that influences the users to use technological service. "Facilitating Conditions" has positive influence towards "Behavioral Intention" and "Use behavior". "Social Influence" of 3G mobile tele-communication services, has positive influence towards "Behavioral Intention" and "Use behavior". "Behavioral Intention" of 3G mobile telecommunication services, has positive influence towards "Use behavior" [28].

Providing insight into those factors influencing acceptance of technology in the consumer context, the Technology Acceptance Model (TAM), shown in Figure 1, has been considered the most useful for predicting the usage of such technology. This model, proposed by Davis, Bagozzi, and Warshaw [8], is based on construct and relationships in the theory of reasoned action (TRA) [1, 9].

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 [11]. 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. [8] 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.

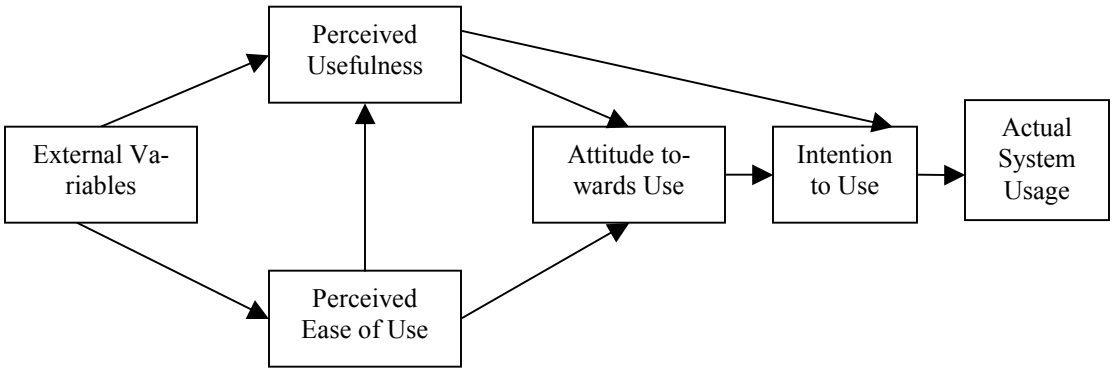

Figure 1: Technology Acceptance Model

Ortega, Martinez, and Hoyos [20] 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 [16]. Thus, the objective of this study is to provide a theoretically justified research model that extends TAM by proposing the addition of PE to the use of 3G services, and to empirically test factors influencing usage of 3G mobile services.

Perceived Usefulness (PU)

Davis et al. [8] defined PU as 'the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context'. Based on his definition, [1, 8] found PU a major determinant of usage behavior and intention. Subramanian [22] reaffirmed two belief measurements (PU and PEOU) using a new data set for two different technologies, and found PU, and not PEOU, had a direct effect on usage behavior employing structural equation modelling (SEM). In this study, we define PU 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)

Linkages between PEOU, PU and attitude in TAM theory have been empirically verified in the IT literature. Several studies have employed different usage measures and found them consistent with TAM results, that is its two beliefs have a close correlation to attitude [1, 3, 13]. Many studies have also tested the effects of external variable on PEOU [12, 13], and found such effect fully independent of PEOU [5, 24]. 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)

If the user can experience enjoyment through the adoption of new technology, attitude toward adoption will be positive. A person will be more motivated to do or repeat an enjoyable activity that is enjoyable more as compared to the same activity which is not enjoyable. A number of studies on PE [8, 13] have indicated that PE significantly affects intention to use computers. Prior studies of the WWW and mobile commerce have empirically added PE to the TAM to predict user acceptance and adoption of a specific source, and found this construct has a positive effect on attitude towards using a specified system [2, 6, 18]. 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 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 [15, 18, 19, 25]. 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 hypothesized 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 [8]. 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 [7, 17, 25]. To maintain instrument brevity, we adopt behavioral intention as an individual's intention to use 3G mobile services.

METHODOLOGY

Out of 150 questionnaires, only 100 were usable. The questionnaire consists of two main parts: demo-

graphic profile of respondents and perceptions and attitude towards using 3G mobile services. Measurement of items used was adapted from [8]. Cross sectional data were collected through a survey and analysed by means of correlation and regression analysis via Statistical Package for Social Sciences (SPSS) version 16 computer program. Correlation and 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

Profile of Respondents

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). The statistic provides an indication of the average correlation among all of the items that make up the scale. Values range from 0 to 1 with higher values indication greater reliability. Table 1 indicates the result of analysis of the Cronbach's alpha scale for Perceived Usefulness, Perceived Ease of Use, Behavior Intention, Perceived Enjoyment, and Attitude where its value is more than 0.7. This indicates that 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 [26]. As cited in [27] 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 [10], 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. 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: Multiple Regression Analysis

Multiple *R*	.668				
R^2	.447				
Adjusted R^2	.423				
Standard Error	.60734				
F	19.175				
Sig. *F*	0.000				
	VARIABLES IN THE EQUATION				
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

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 [7, 8] 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. [8].

Next, H3 exhibited a significant relationship between Perceived Enjoyment and Behavior Intention (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 [7, 14] 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).

CONCLUSION AND RECOMMENDATIONS

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.

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. 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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