Technology Complexity, Personal Innovativeness And Intention To Use Wireless Internet Using Mobile Devices In Malaysia

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Wireless Internet on mobile devices (WIMD) technology is rapidly growing in many countries including Malaysia. As WIMD is still in its growing stage, it is appropriate to conduct research on technology adoption of WIMD. This paper analyses the intention to use WIMD among Malaysians. The study adopted the Technology acceptance model (TAM) as it is considered to be one of the best models to study technology adoption. Questionnaires were distributed to 350 mobile phone and Internet users, from which 301 responded. The findings show Technology complexity and personal innovativeness have a positive impact on intention to use WIMD.

Field of Research**:** Mobile Internet, Mobile communications

1. Introduction

Wireless Internet on Mobile Devices (WIMD) refers to digital data services via wireless networks accessible through any type of mobile device. WIMD is leading the world into another spectrum of communications and means of conducting day-to-day business and life activities. Full bloom of wireless Internet services depends on user acceptance, as well as technology improvement (Lu, Yu, Liu, Yao, 2003). Malaysia, with its growing number of younger mobile subscribers, is an extremely suitable environment for mobile Internet. The wireless Internet will be a key target audience for developers and service providers to bring timely information to subscribers anytime, anywhere. The wireless market will see faster growth but the fastest growth will be viewed in packet-based technologies [1]and equipment. With immediate access to mobile Internet, business professionals will be able to improve their productivity while consumers will have more time for other tasks. Besides that, 'killer' applications for mobile Internet have to be able to provide timely information to users and allow them to send time-sensitive information (PricewaterhouseCoopers 2001).

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The penetration of wireless technology is increasing all over the world. By exploring the intention to use WIMD among Malaysians; it is hoped that the findings of the study will facilitate further development and growth of the wireless market in Malaysia. This study shows the willingness of Malaysians to use the wireless Internet on mobile devices. The study will help service providers in the development of marketing strategies for WIMD and improve their services in the near future. As WIMD is still in its early stage, it is appropriate to conduct the study on technology adoption of WIMD in Malaysia using the TAM model. Moreover the TAM model has been proven to be the appropriate model to study the early technology adoption. This study was conducted in the Klang valley using convenience sampling to represent urban Malaysian mobile phone and Internet users. The overall aim of the study is to identify the intention to use wireless Internet on mobile devices (WIMD) among Malaysian Internet and mobile phone users using the Technology acceptance model. The study will help to identify the factors that influence the adoption of WIMD, especially the relationship between ease of use and perceived usefulness and to identify how technology complexity and personal innovativeness affect ease of use and perceived usefulness.

2. Literature Review

2.1 Technology Acceptance Model

The technology acceptance model (TAM) is believed to be the most robust, parsimonious, and influential in explaining IT/IS adoption behaviour. Davis (1989) developed the technology acceptance model (TAM) in 1989 to explain the computer usage behaviour of 120 users at an IBM research facility. The study revealed that two powerful factors influence the adoption of technology – perceived usefulness (PU) and perceived ease of use (PEOU). These two determinants serve as the basis for attitudes toward using a particular system, which in turn determines the intention to use, and then generates the actual usage behaviour. For a long time TAM has helped to examine the mediating role of perceived usefulness and perceived ease of use and the relationships between systems characteristics (external variables) and the probability of system use (an indicator of system success).

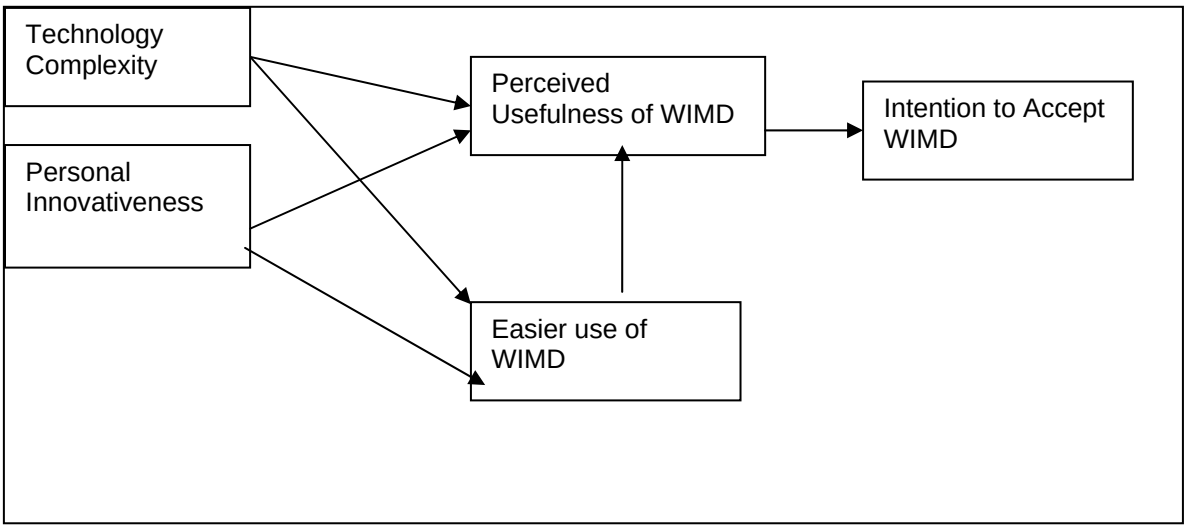
To study the impact of the wireless mobile technology on user intentions to accept WIMD, (Lu, Yu, Liu, Yao, 2003) proposed a conceptual construct, system complexity. The impact of system characteristics has been tested and supported across a number of studies (e.g. Davis, Bagozzi, and Warshaw, 1989; Davis, 1993; Hong et al., 2001). WIMD is a network of radio-connected devices that offer voice, information, and other Internet services (Beaulieu, 2002). WIMD has its own complexity, therefore to identify the influence of WIMD on user beliefs, its

unique features need to be specified. WIMD system complexity can be defined as the degree of integration between wireless Internet and mobile technologies supporting various communications and services. WIMD has some unique features that provide special Internet services of its own, in addition to supporting a variety of information services and business applications (Burnham, 2002; Coyle, 2001; Weisman, 2000). Mobile devices currently serve as entry points into the wireless web, carrying with them their own capabilities and limitations (Beaulieu, 2002; Bergeron, 2001; Raisinghani, 2001). The screen size of the mobile devices that are used for accessing wireless Internet is one of the problems, the smaller the screen size, the less information that can be displayed at one time. Each aspect serves as an indispensable part of the entire WIMD system complexity. These aspects may have an impact on the user's satisfaction, which in turn might result in the overall impression of using the WIMD. Operationally, the technology complexity could be examined in four facets: efficiency of data transfer; system functionality; interface design; and mobile device capacity. Effectiveness of WIMD largely depends on efficiency of data transfer on the system (Clarke, 2000; Macker, Park, and Corson, 2001; Varshney and Vetter, 2001). Therefore in order to find out the impact of technology complexity it is important to find out the relationship between both perceived usefulness and perceived ease of use with Technology complexity. Personal Innovativeness refers to "the willingness of an individual to try out any new information technologies" (Agarwal & Prasad, 1998). Personal innovativeness is another variable identified as influential on usefulness perception (Agarwal and Prasad, 1998). Individuals who are more innovative should be more positive in their beliefs about new technology like WIMD. WIMD by all means is an important IT innovation. Therefore it is appropriate to test personal innovation relationship with the perceived usefulness and ease of use.

3. Research Methodology

The literature review highlighted the TAM model and relationship between the variables that were found in previous studies. Rooted in the well known Technology Acceptance Model (TAM), TAM for WIMD was developed to guide exploration of important determinants for individual adoption of WIMD across five major cities in China (Lu, Yao, Yua, 2005). The TAM for WIMD model (Fig.1) is used in this study to determine the intention to use WIMD in the Malaysian context.

Figure 1: TAM for WIMD



Source: Lu, Yu, Liu, Yao, 2003

Prior research indicates that perceived usefulness is an important indicator for technology acceptance (e.g. Chau, 1996; Jiang, Hsu, Klein, Lin, 2000; Taylor and Todd, 1995). When a person feels using WIMD would enhance their job performance then they might intend to adopt WIMD, so it is appropriate to test perceived usefulness with intention to adopt WIMD.

H1: Perceived usefulness will have a direct positive impact on intention to adopt WIMD

Perceived ease of use is one of the major behavioural beliefs influencing user intention to technology acceptance. If WIMD is easy to use and the user feels comfortable then the job performance might be enhanced, so we test perceived ease of use with perceived usefulness of WIMD.

H2: Perceived ease of use will have a significant positive effect on perceived usefulness of WIMD

Technology complexity is an important factor when adopting any new technology, so we set up the hypothesis as:

H3a: Technology complexity will have a significant effect on perceived usefulness of WIMD
H3b. Technology complexity will have a significant effect on perceived ease of using WIMD

Personal innovativeness will influence the adoption of new technology to a great extent, so it is appropriate to test personal innovativeness with perceived usefulness and perceived ease of using WIMD.

H4a. Personal Innovativeness will have a significant effect on perceived usefulness of WIMD
H4b. Personal Innovativeness will have a significant effect on perceived ease of using WIMD

3.1 Research Instrument And Sampling Design

The survey instrument consisted of a three-page questionnaire which was designed and consisted of six sections. Section 1 comprises demographic data and mobile phone and Internet usage related information from the participating respondents. This section covered gender, age, marital status, monthly income, current location, Internet and mobile phone usage related questions. Section 2 consists of items of technology complexity taken from the study of (Lu & Yu 2006). The external factor technology complexity was chosen because people like to use new technology if it is user friendly and provides various forms of communication and services. Section 3 consists of items of personal innovativeness from (Lu, Yao, Yua, 2005). The variable personal innovativeness was chosen because the more innovative people are, the more likely to accept new technologies. Sections 4 and 5 consist of items of perceived usefulness and ease of using WIMD from (Lu & Yu 2006). Finally Section 6 consists of items of Intention to use WIMD from (Lu, Yao, Yua, 2005). The questionnaire items were measured on a five point Likert-type scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Respondents were required to indicate their level of agreement for each of the statements. As this research is exploratory in nature, convenience sampling was used for the study. This method was used, as it is convenient and economical. Respondents comprised of Internet and mobile phone users residing in the Klang Valley. Kuala Lumpur, the capital city of Malaysia, is located in the Klang Valley. The Klang valley was chosen because it has the highest Internet penetration and most people residing in Klang valley are aware and have some knowledge about 3G. As mentioned earlier, data was collected using a self-administered questionnaire survey. A total of 350 questionnaires were distributed to mobile phone and Internet users randomly. From 350 copies distributed, 301 valuable responses were received.

4. Findings

Of the 301 respondents, 54.2% are female and 45.8% male. Half of the respondents 52.2% are in the 21–30 age group, the second majority 33.9% are in the 31–40 age group, and 9.3% of the respondents are in the 41–50 age group. The majority of the respondents 69.1 % are in the income level RM1,000–5,000, 18.6% are >RM5,000 and 12.3% are <RM1,000. Nearly 80.7 % of respondents use the Internet, 92% use mobile phones and 32.6% use mobile

devices for surfing the Internet. The respondent's perceptions towards WIMD are illustrated using mean values. The table below shows the mean and standard deviation for each variable, the mean values are greater than standard deviation, which shows the variables are significant and also the variable intention to use WIMD (3.78) scored a higher mean value which shows that people are willing to use WIMD. The other factors such as technology complexity, ease of use are considered as important factors when adopting WIMD in the Malaysian context. (Table 1)

Table 1: Mean and Standard Deviation of Variables

Variables	Mean	Standard Deviation
Intention to use WIMD	3.78	0.745
Technology Complexity	3.45	0.590
Ease of Use	3.32	0.686
Perceived Usefulness	3.28	0.567
Personal Innovativeness	3.12	0.665

Internal consistency reliability coefficients for research constructs under study are well above the commonly acceptable level of 0.70 (Nunnally, 1978), which shows all the factors are reasonably acceptable in the Malaysian context. The Pearson correlation coefficient method is used to test the hypothesis and determine the significant relationship between the variables. The results are illustrated in Table 2

Table 2 Hypotheses Testing

Hypotheses	Pearson's Correlation	Sig.	Accept/Reject
H1**:** Perceived usefulness will have a direct positive impact on intention to adopt WIMD	0.329**	0.000	Accept
H2: Perceive ease of use will have significant positive effect on perceived usefulness of WIMD	0.561**	0.000	Accept
H3a: Technology complexity will have a significant positive effect on perceived usefulness of WIMD	0.420**	0.000	Accept
H3b: Technology complexity will have a significant positive effect on perceived ease of using WIMD.	0.439**	0.000	Accept
H4a: Personal Innovativeness will have a significant effect on perceived usefulness of WIMD	0.413**	0.000	Accept
H4b: Personal Innovativeness will have a significant effect on perceived ease of using WIMD.	0.445**	0.000	Accept

****. Correlation is significant at the 0.01 level**

The result shows that there is a medium correlation (0.329) between the variables, suggesting a moderate relationship between perceived usefulness and intention to adopt WIMD (H1). And there is a high correlation (0.561) between the two variables suggesting a strong relationship between perceived ease of use and perceived usefulness of WIMD (H2). There is a medium correlation suggesting a moderate relationship between technology complexity and perceived usefulness (0.420) (H3a) and perceived ease of use (0.439) (H3b). Personal innovativeness also showed a positive and moderate relationship with perceived usefulness (0.413) (H4a) and perceived ease of use (0.445) (H4b).

Despite cultural differences between Malaysia and other countries, the present study results were similar to previous studies conducted in various countries including Iran and China. The positive findings of Hypothesis 1, perceived usefulness will have a direct positive impact on the intention to adopt WIMD; this result is consistent with previous research (e.g. Davis, Bagozzi, and Warshaw, 1989; Davis, 1993; Taylor and Todd, 1995). This result is also consistent with the study conducted on the adoption of WIMD in China (Lu, Yao, Yua, 2005). In Malaysia, it is proven that people who believe that using a particular system will enhance their job performance, will have a positive intention to adopt WIMD. The positive findings of hypothesis 2, perceived ease of use will have a significant positive effect on perceived usefulness of WIMD, is consistent with some of the previous studies (Lu, Yao, Yua, 2005, Kleijnen, Wetzels, Ruyter, 2004). The positive findings of hypothesis 3a and 3b suggest that in the Malaysian context, technology complexity in terms of efficiency of data transfer, interface design, system functionality, and mobile device capacity has a positive effect on individual belief that using WIMD will enhance job performance and also the ease of using WIMD. The supportive findings of hypothesis 4a and 4b shows more innovative people are more positive towards the perceived usefulness and ease of using WIMD. Some previous research showed consistent results with the present study (Lu, Yao, Yua, 2005, Agarwal and Prasad , 1998).

5. Conclusion

The study was conducted among mobile phone and Internet users to find the intention to use WIMD in Malaysia using convenience sampling. The proposed conceptual model was supported by the empirical data. The results show strong support for all the hypotheses. The overall results of the study show that in order to study the intention towards WIMD in Malaysia, the Technology acceptance model is very appropriate with the significance value of 0.000 which is less than 0.01, so the model is significant at 99%. The results show that behavioural belief, perceived usefulness have a moderate positive impact on the intention to adopt WIMD and variables such as personal innovativeness and technology complexity have a positive impact on perceived usefulness and ease of using WIMD. The study also found that people in Malaysia are willing to use WIMD now as well as in the near future.

Firstly, the survey was confined to people residing in the vicinity of the Klang Valley area only, whereby people from other parts of the country were excluded from the research due to time and cost constraints. Consequently the study is subject to limitations concerning possible biases, which exist when only one geographic area is selected and that the sampling method may not be representative of the actual target market as a whole. Secondly, the convenience sampling employed in this study has shortcomings as the sampling method cannot be viewed to be an actual representation of the total WIMD market. Thirdly, the independent variables chosen for this study might be inadequate in identifying the user intention to adopt WIMD. There could be other variables that were excluded in the study, which may be important in the Malaysian context. Finally, the respondent's bias and errors could not be avoided in this study. Even though clear instructions and explanations were provided, there is no instrument available to ensure that all respondents truly understood the questions in the survey and that questions have been answered by the respondents according to their level of interpretation and understanding.

The study will help to enhance the Malaysian WIMD service providers understanding, with which they can come up with new strategies and plans to increase the usage of WIMD in Malaysia. From the analysis it shows that 80% of respondents use the Internet, 91% use mobile phones, but only 32.6% use mobile Internet. This provides a niche market for the service providers to address the consumer market. Some of the factors that need to be considered include screen resolution, image size and easy use of WIMD to encourage people to use WIMD. Since this study was only conducted in the Klang valley, it is strongly suggested that the study be extended to other parts of the country. Further studies can also include variables such as facilitating conditions, social influence and wireless trust to find out their influence towards the intention to adopt WIMD. Furthermore studies can also be conducted on the user satisfaction on WIMD services in Malaysia.

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