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ADOPTION OF MOBILE WEB AMONG UNIVERSITY STUDENTS IN MALAYSIA: A REVIEW

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ABSTRACT

This paper reviews major issues of mobile technology and mobile web usage among university students, including characteristics, importance and problems faced by university students when accessing web sites through mobile devices. This article also reviews the technology adoption models/theories that will best explain the adoption of IT/IS. The author identified Technology Acceptance Model (TAM) as the best model in explaining adoption of mobile web because TAM is the most suitable in explaining behavioural intention in the context of mobile devices. Mobile Web is the World Wide Web which is accessed through a mobile device such as laptop computer, smart phone or tablet. It establishes the entirety of the Internet and is not limited to webpages which have been specifically designed to be viewed through mobile devices. Distinctive features of mobile technology especially mobile web technology and its progressive impacts on information transfer and learning process has created many educational opportunities for higher education institutions. Although mobile devices are highly flexible, accessible and convenient, students are still facing great problems when they use mobile web for educational purpose.

Keywords: *Mobile web, mobile technology, mobile devices*

INTRODUCTION

The use of World Wide Web (WWW) has seen a tremendous rise since its commercial application in 1994. The number of people and the amount of time spent on the Internet is keep increasing parallel with the development of information and communication technology (ICT). In a short period of time, Internet has provided substantial market potential to the

electronic market that allows people to get information and communicate in an easier and efficient way (Lin & Lu, 2000). Our lifestyle has changed and keeps changing with the emerging physical and non-physical technologies. In the same way, mobile devices are changing the way people access the websites. More users have changed from using desktop computers to mobile devices. Mobile device such as laptop computers, smart phones and tablets are widely used devices in accessing websites all over the world (Al-Khalifa, 2014; Johnson & Seeling, 2013).

The shift from using desktop computers to mobile devices to access websites has created new challenges for web developers and designers (Yu & Kong, 2015). This is because most of the web pages that are developed for bigger screen sizes especially desktop computers become unusable in most of the mobile devices (Fernandes, Rodrigues, Duarte, Hijiñ-Neira, & Carrico, 2014). They are required to be modified to fit all the mobile devices. However, it is not an easy task to develop webpages that is compatible with all the mobile devices (Fernandes et al., 2014). Those webpages must accommodate with the requirements and diversity of the devices.

WEBSITE IN HIGHER EDUCATION

Web pages play a crucial role in higher education sector. Universities are providing plenty of information and services to their visitors through their websites. They are offering information and services such as events, news, calendar, campus map and directions (Al-Khalifa, 2014). These websites are targeted to serve certain group of users including prospective students, current students, faculty researchers and alumni. Prospective students can enquire about course offered and fee structure, current students can seek information about their examination results or new course registration issues, university staff can get news updates while alumni can obtain information regarding job openings. Besides that, students and other faculty members can find plenty of information in the Internet regarding academic and research activities (Babu, Jeyshankar, & Rao, 2010).

MOBILE TECHNOLOGY AND DEVICES

Mobile technology has become part of the everyday lives of billions of people all around the world (Goggin, 2012). Initially, mobile devices were designed with an emphasis on communication support for voice calling and text messaging, where they have limited capacity for data processing and least capacity in handling video contents (Male & Pattinson, 2011). However, due to their unique characteristics and abilities, mobile devices are rapidly adopted for communication, thus made the developers and manufacturers of mobile devices to take the opportunity to innovate and expand their functional capabilities by incorporating other potential technologies such as audio, video and web browsing onto the mobile device platform without compromising the portability of these devices (Male & Pattinson, 2011).

Pollara (2011), defined mobile technology as “handheld information technology devices or artefacts that encompass hardware (devices), software (interface and applications), and communication (network services) while, the author defined mobile devices as “Any mobile technology with multiple functions and capabilities, especially the ability to access the Internet”. Ferdousi and Bari (2015) defined mobile technology as wide range of web-based tools and devices with Apps. According to them, mobility and reachability are the two

important features of this technology where they represent the freedom of time and location which is related to the concept of anytime and anywhere access. While, Heo, Ham, Park, Song, and Yoon, (2009) defined mobile device as a portable and self-contained information and communication technology where these devices are operated without any cables except temporarily (recharging, synchronizing with a desktop computer), must be easily used in the hands of its users and they support new applications or Internet connection (Weiss, 2002).

Characteristics of mobile devices

Mobile devices have a wide variety of functions and limitations that differ significantly from desktop computers (Alzaza, 2012). One of the most obvious differences between a desktop computer and a handheld device is the interface. Desktop computers use big monitors, mouse and have relatively large separate keyboards while mobile devices tend to have smaller screens and built in tracing pa and keyboard (Huff, 2015). In addition, mobile devices are very portable, while the desktop platform is stationery where they require a desk to operate them efficiently. Handheld mobile devices are not only smaller and lighter, they also offer portability and instant access to information from anywhere and at anytime (Weiss, 2002). Since developing and producing devices which are portable imposes constrains on the size of the features available in the device such as display area and the keyboard are, the designers of these mobile devices are required to create a balance between ergonomic of use and portability-driven size (Male & Pattinson, 2011).

Mobile devices can be characterized by three key features. Firstly, they are portable where we can bring these devices to different locations. Secondly, they have instant connectivity where these devices can be used to access plenty of information at anytime. Finally, a mobile device will have context sensitivity where they can be utilized to capture real and simulated data and information (Churchill, Fox, & King, 2012; Fernández-López, Rodríguez-Fórtiz, Rodríguez-Almendros, & Martínez-Segura, 2013). Mobile devices such as smart phones, laptop computers and tablets have offered its users the convenience and flexibility to gain knowledge, where mobile devices offer learning opportunities for the learner (Adegbija & Bola, 2015; Raman, 2015; Reyachav, Dunaway, & Kobayashi, 2015).

MOBILE WEB

Mobile Web is the World Wide Web which is accessed via a mobile device such as mobile phone or tablet (Kroski, 2008). It establishes the entirety of the Internet and is not limited to webpages which have been specifically designed to be viewed through mobile devices. We can access the Internet from anywhere they can get a cellular signal and at any time using Internet enabled handsets and mobile phones. Although mobile devices are highly flexible, accessible and convenient, users are still facing great problems in rendering and navigating web contents on mobile devices. Most of the present websites are developed for desktop users only and they are not mobile friendly (Martin, Pastore, & Snider, 2012; Roudaki, Kong, & Yu, 2015). They are poorly suited for mobile devices, making the web content look visually unpleasant and hard to navigate (Adipat, Zhang, & Zhou, 2011; Fernandes et al., 2014). Most of this problems are rooting from the physical constrains of these devices, especially the smaller size of the screen, limited memory and interaction mechanism (Ying Lu & Rastrick, 2014; Zhang & Lai, 2011).

Mobile web in higher education

As Internet and mobile technologies make significant paces in innovation and development, new openings for mobile technology supporting higher education sector emerges (Ferdousi & Bari, 2015), enhancing the role of mobile web technology as a medium of communication and information sharing. Mobile web with its ability to change the information acquisition and learning method is a new instrument for higher education (Razaque & Elleithy, 2012). Distinctive features of mobile technology especially mobile web technology and its progressive impacts on information transfer and learning process has created many educational opportunities for higher education institutions. As a result, more and more higher education institutions are giving importance to the effectiveness of their web when accessed through mobile devices.

Users are using their mobile devices to access several types of higher education websites and portals that offer wide range of services including official web pages and pages for each department, student and staff portals and learning management system portals. Official web page is the primary site where it offers information such as general information about the institution, information about academic colleges, departments, centres and other units, current news, publications and it also provide links to other departments. Web pages of each department will offer services and information about specific departments including the profile of the department, service offered by the department, news updates on the department, galleries, and directories. While, student and portals are pages that is specifically created for respective students and staffs where the respective students and staffs are required to login into the page to access the services provided in the page. Learning management system portal offers reporting and delivery of learning materials and other interactive features such as discussion forums and video conferencing.

INFORMATION TECHNOLOGY/INFORMATION SYSTEMS ACCEPTANCE RESEARCH BACKGROUND

Information technology acceptance can be defined as the demonstrable willingness to employ information technology for the tasks it is intended to support within a user group (Dillon & Morris, 1996). Acceptance of a technology is important because it is a vehicle that allow an individual to participate in a technology (Al-najjar, 2012). Previous research on IS has studied why and how new information technologies are adopted by individuals. There are numerous stream of research within this IS field. One of them concentrates on technology acceptance of individuals by using intention as the dependent variable (e.g., Hsieh, Hsieh, Chiu, & Yang, 2014; Park & Ohm, 2014; Tan et al., 2014). Other steams have concentrated on adoption and implementation of a specific technology at the organizational level (e.g., Wu, Cheng, Yen, & Huang, 2011). Each of the streams makes significant contributions to the body of knowledge on acceptance of information technology.

The aim of this selection is to understand actual usage, where the role of intention as a predictor of actual behaviour is significant and it is well established in IS discipline (Viswanath Venkatesh, Morris, Davis, & Davis, 2003). Scholars in IT/IS discipline have developed several theories and models focusing on the acceptance and diffusion of technology. They presented constructs (factors) that will predict the behavioural intention and

usage based on individual's beliefs. Some of the well-established models in IS discipline is listed below:

- Innovation Diffusion Theory (IDT) (Rogers, 1983)
- Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975)
- Theory of Planned Behaviour (TPB) (Ajzen, 1991)
- Technology Acceptance Model (TAM) (Davis, 1989)
- Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)
- TAM2 model (Venkatesh & Davis, 2000)
- TAM3 model (V Venkatesh & Bala, 2008)

Table 1 shows the determinants that have been used in technology acceptance theories. Information systems scholars have developed number of models based on social psychology theories as their theoretical base for research. The rationale behind this is grounded theories in information systems are insufficient to explain information system acceptance and adoption.

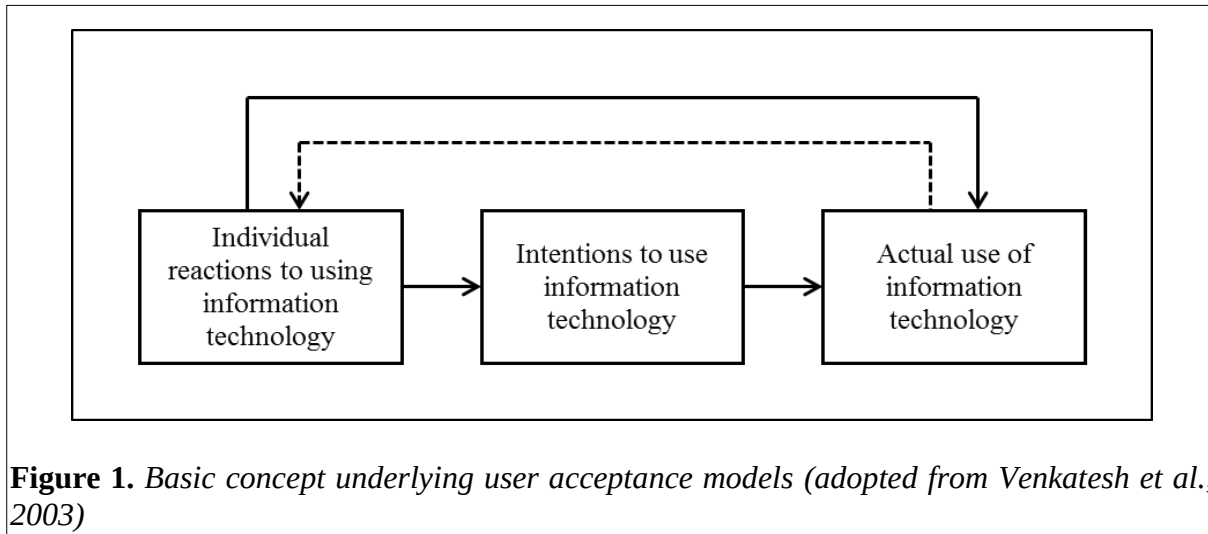
Table 1.

Factors in technology acceptance theories/models

Theory/Model	Determinants
Innovation Diffusion Theory (IDT)	Relative advantage, Compatibility, Complexity, Trialability, Observability.
Theory of Reasoned Action (TRA)	Behavioural Intention, Attitude, Subjective Norms.
Theory of Planned Behaviour (TPB)	Behavioural Intention, Attitude, Subjective Norms, Perceived Behavioural Control.
Technology Acceptance Model (TAM)	Behavioural Intention, Attitude, Perceived Usefulness, Perceived Ease of Use.
Unified Theory of Acceptance and Use of Technology (UTAUT)	Behavioural Intention, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions Moderators: Gender, Age, Experience, Voluntariness.
Technology Acceptance Model 2 (TAM2)	Behavioural Intention, Perceived usefulness, perceived ease-of use, Subjective Norms, Image, Job Relevance, Output Quality, Result Demonstrability Moderators: Experience and Voluntariness

Although theories and models used in past studies are able to predict technology acceptance behaviour of users, they are not able to address all constructs in a single comprehensive model that will have great explanatory power (Al-najjar, 2012). Besides that, each of these models has some constructs that have been totally ignored and some constructs are repeatedly used. For instance, attitude is a core variable that determines behavioural intention in TAM, TRA and TPB. In contrast, this variable is not included in TAM2, TAM3 and UTAUT. In the

similar manner, subjective norm is a core factor in TRA and TPB. However, subjective norm has been ignored in TAM. It can be concluded that each of these theories has its own advantages and disadvantages in explaining behavioural intention.



One of the well-known models that can predict and explain IT/IS acceptance behaviour is the TAM. Introduced by Davis (1989) this model is distinguished for its parsimony and explanatory power in information technology field. Davis proposed that individual's behavioural intention to use an information technology is determined by his/her perceived usefulness and perceived ease of use. TAM has been widely applied to new innovations and technologies where the user intended to adopt a particular technology to fulfil specific needs or to accomplish certain tasks. TAM is been developed based on the theoretical foundation of TRA, which is also a well-known psychological model. It is proven that causal linkages between belief-attitude-intention-behaviour can significantly predict users' acceptance of technology.

Overview of TAM

Originally, TAM and its extensions such as TAM2 were built to support managing Management Information Systems (MIS) activities in a workplace or other organizations by measuring the quality of delivered systems and addressing the central concern of IT adoption and use in the organization (Viswanath Venkatesh & Davis, 2000). Because of this, most of the studies related to TAM used organizations as samples to investigate IT and IS implementation. However, TAM has also been applied to study individual adoption especially when concerning individual differences and social influence (Viswanath Venkatesh & Morris, 2000). Studies that used individual consumer samples in non-work settings are less compared to the studies that are focusing on organizational settings where they are giving more importance on job relevance, mandatory or voluntary organizational settings, work experience and management influence. Thus, it is still worthy to examine this model to predict individual, non- work related adoption behaviour.

Wangpipatwong et al., (2008) stated that TAM is a most influential model because it proposes a small number of factors which are easy to understand, simple, specific, and they can be manipulated through system design and implementation. Moreover, many researchers has employed TAM in their studies and proved that the tools used with the model are statistically reliable (Moon & Kim, 2001). In general, TAM has been used to explain

individual's initial intention to adopt a technology, but Taylor and Todd, (1995b) explained that this model also employed for predicting behaviour of experienced users, with different emphasis on the determinants of intention.

CONCLUSION

Mobile web is a new instrument for higher education institutions with its ability to change the information acquisition and learning method. Distinctive features of mobile technology especially mobile web technology and its progressive impacts on information transfer and learning process has created many educational opportunities for higher education institutions. Although mobile devices are highly flexible, accessible and convenient, students are still facing great problems in rendering and navigating web contents on mobile devices. The author reviewed several technology adoption models and theories and suggested TAM to be used as a base model to explain the mobile web adoption. TAM is distinguished for its parsimony and explanatory power in information technology field where this model is widely used to explain individual's intention to adopt a technology.

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