A Review of Literature: The Role of External Variables in Learning Management System Utilization

Sousan Baleghi-Zadeh[a], Ahmad Fauzi Mohd Ayub[b], [a]Faculty of Educational Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, [b]Faculty of Educational Studies, Universiti Putra Malaysia, Serdang, Selangor Darul Ehsan, Malaysia, Email: [a]s_baleghi@yaho.com, [b]afmy@upm.edu.my

Today, the ratio of universities that have equipped themselves with Learning Management systems is increasing. However, the results of several studies have revealed that utilization of Learning Management System by students is limited. Technology Acceptance Model is one of the popular models which investigates factors affecting system utilization and includes external and internal variables. The purpose of the present paper is to investigate the external variables of the Technology Acceptance Model which affects Learning Management System utilization. The review of the related literature indicates that external variables are divided into four categories: individual differences, system characteristics, social influence and facilitating conditions. Therefore, to develop a comprehensive model, research should investigate all four categories.

Key words: *Learning management system, external variables, technology acceptance model.*

Introduction

Learning management system (LMS) is a popular information system (IS) that recently many universities around the world are becoming equipped with to enhance the quality of teaching and learning (Islam, 2013; Isiyaku, 2018). LMS supports students to manage their knowledge and communicate with their classmates in synchronous or asynchronous environments (Kear, 2011, Baleghi-Zadeh, S. et. al, 2014). Through LMS lecturers can deliver quizzes, materials and messages to students and save time. Consequently, they then have enough time to lead students toward deep understanding and higher order thinking (Piña, 2012). However, the results of several studies have revealed that LMS utilization by students is limited (Álvarez et

al., 2013; Stantchev, 2014; Baleghi-Zadeh, 2017). For example, Raman and Don (2013) in investigating LMS utilization among 188 higher education students found they were reluctant to use communication features. Similarly, while investigating the process of learning through LMS among 102 higher education students, Sulaiman (2013) found students had obstacles and deficiencies in using LMS in the program of problem-based learning.

One of the popular models investigating the factors that affect utilization of an information system is Technology Acceptance Model (TAM) (Venkatesh & Bala, 2008). TAM, which was introduced by Davis (1986), is regarded by many researchers as a powerful model in studying the utilization of an information system (Igbaria, Guimaraes, & Davis, 1995). TAM adopted its foundation from the Theory of Reasoned Action (TRA), which is one of the models of social psychology proposed by Fishbein and Ajzen (1975). However, unlike TRA, which is a general model for investigating human behaviour, it can only be used for investigating computer technology acceptance behaviour (Davis *et al*., 1989; Pituch & Lee, 2006). Factors which have key roles in TAM are perceived usefulness (PU) and perceived ease of use (PEU) (Davis, 1993). Perceived ease of use refers to the degree to which the prospective user expects the target system to be free of effort (Davis *et al*., 1989), whereas perceived usefulness refers to prospective user's subjective probability that using a specific application system will increase his or her performance within an organizational context (Davis *et al*., 1989). Behaviour intention to use is another variable of TAM which acts as a bridge between beliefs (PEU and PU) and system utilization.

In TAM perceived ease of use, perceived usefulness, and behaviour intention to use are regarded as internal variables that may affect system utilization (Davis *et al*. 1989). There are also several external variables in TAM that determine perceived ease of use and perceived usefulness (Davis et al. 1989). External variables have an important role in acceptance of an information system. Based on previous studies, there is a variety of external factors that may affect system use indirectly (Ngai *et al*., 2007; Sánchez & Hueros, 2010; Wang & Wang, 2009; Daneji *et. al*. 2019; Ismail, et. al., 2017). Finding external factors in TAM is crucial, because without external variables the model cannot explain human behaviour in a specific situation (Davis et al., 1989; Pituch & Lee, 2006). Indeed, if external factors are not determined, the model in examining the human behaviour will be general (Pituch & Lee, 2006). In the original TAM, the external variables were not specified but it was implied that this can encompass different intervention variables such as user characteristics, system design characteristics, organizational structure, and political influences (Davis *et al*, 1989). In the present study, by considering the related literature in the domain of LMS utilization, the most external variables which have influence on LMS use of students are investigated. Therefore, the main purpose of the study is to investigate external variables of TAM which affect LMS utilization among higher education students.

Literature Review

To observe information about external factors that may have influence on LMS use among higher education students, a comprehensive search was conducted. Therefore, the related literature included printed and online articles as well as conference papers. The key words used to search references were: Learning Management System utilization, web-based learning, online learning, online system, Technology Acceptance Model.

Technology acceptance model

Technology Acceptance Model (TAM) is regarded by many researchers as a powerful model in studying the utilization of an information system was introduced by Davis (1986). (Igbaria et al., 1995). This model adopted its foundation from the Theory of Reasoned Action (TRA), which is one of the models of social psychology proposed by Fishbein and Ajzen (1975). In this model, the actual behaviour is determined by the behavioural intention (BI) and the behavioural intention is determined by attitude toward behaviour and subjective norm (Fishbein & Ajzen 1975). Based on TRA, attitude toward behaviour is determined by beliefs and evaluation, and also subjective norm is determined by normative beliefs (Davis et al., 1989). In this model normative beliefs are considered as a person's beliefs about what salient others want them to do with regard to a specific behaviour (Bainbridge & Keeshan, 2013). Figure 1 below illustrates TRA model.

**Figure 1.** Theory of Reasoned Action (Fishbein & Ajzen 1975)
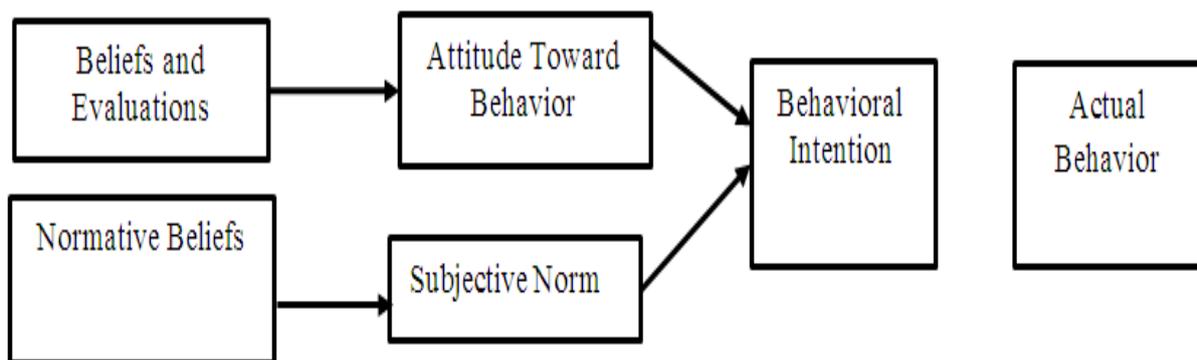
Technology Acceptance Model (TAM) is based on TRA, but unlike TRA which is a general model for investigating human behaviour, it can be only used for investigating computer technology acceptance behaviour (Pituch & Lee, 2006). In fact, the purpose of TAM is to find the factors which influence on the utilization of an information system (Venkatesh, 2000).

One of the differences between TRA and TAM is that TAM does not include subjective norm (SN). However, the factors which have key roles in TAM are perceived usefulness (PU) and perceived ease of use (PEU) (Wang & Wang, 2009). Perceived ease of use refers to the degree

to which the prospective user expects the target system to be free of effort, while perceived usefulness refers to prospective user subjective probability that using a specific application system will increase his or her performance within an organizational context (Davis et al., 1989). In the primary form of Technology Acceptance Model, behavioural intention to use and attitude were considered as determinants of system usage, but in the final model, attitude was removed (Venkatesh, 2000). Figure 2 below illustrates the primary form of technology acceptance model.

As figure 2 below shows, behaviour intention to use is a mediator between beliefs (PEU and PU) and Technology utilization (Davis et al., 1989). Based on previous studies, there is a variety of external factors that may influence system use indirectly (Ngai et al., 2007; Wang & Wang, 2009, Sánchez & Hueros, 2010; Mahat, 2013). Finding external factors in TAM is crucial, because without external variables the model cannot investigate human behaviour in a specific situation (Pituch & Lee, 2006). In other words, if external factors are not determined, the model in examining the human behaviour will be too general. In the original TAM, the external variables were not specified. However, Vankatesh & Bala (2008) divided external variables into four categories: individual differences, system characteristics, social influence, and facilitating conditions.

Figure 2. Technology Acceptance Model (Davis et al., 1989)
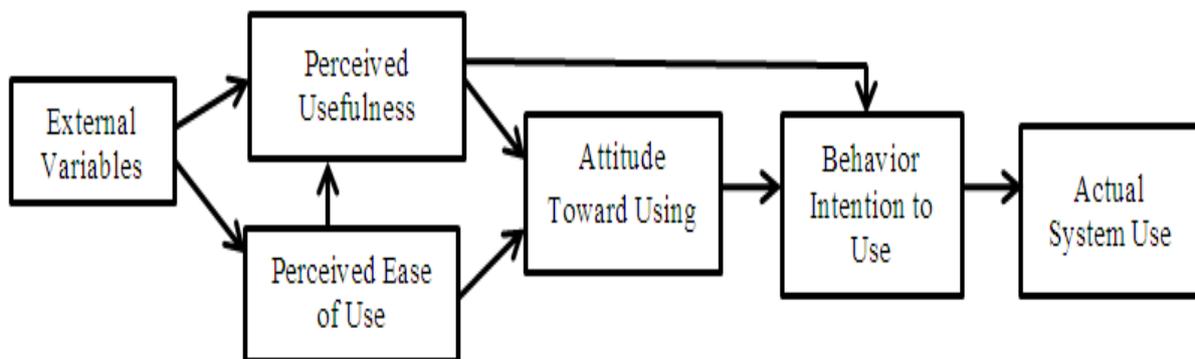
Venkatesh theoretical framework

As mentioned previously, Venkatesh and Bala (2008) by synthesizing previous studies in the domain of TAM found a theoretical framework including four categories of external variables: individual differences, system characteristics, social influence, and facilitating conditions as depicted in Figure 3 below.

Figure 3. Theoretical Framework (Venkatesh & Bala, 2008)
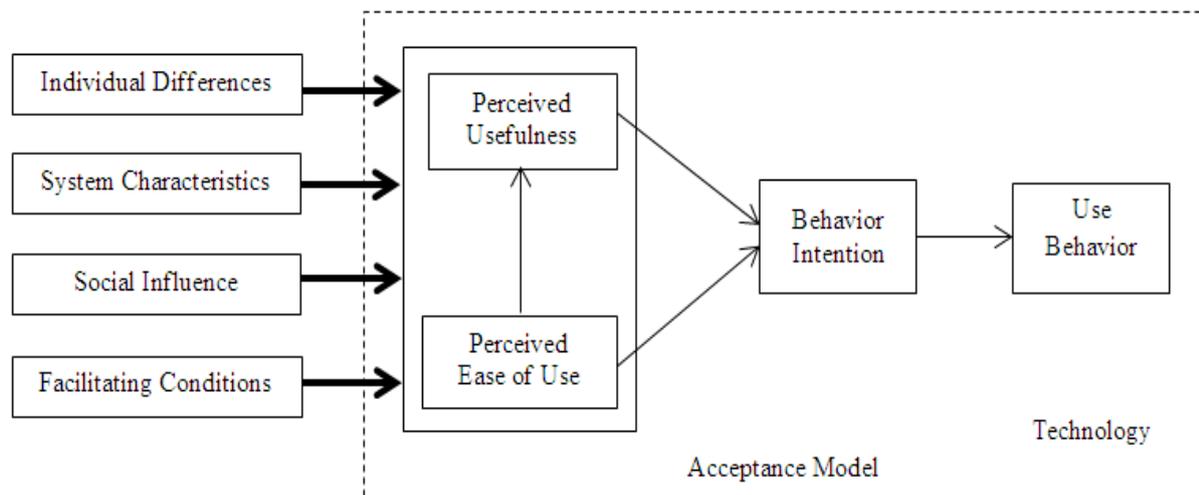
Individual differences

Individual differences may encompass user characteristics or demographic characteristics (e.g. gender, age) (Venkatesh & Bala, 2008; Pituch & Lee, 2006). In the domain of LMS utilization, previous studies regarded Internet experience (Pituch & Lee, 2006), self-efficacy (Wang & Wang, 2009; Motaghian et al., 2013); Personal Innovativeness in the domain of IT (Van Raaij & Schepers, 2008); Personal innovativeness toward IT (De Smet, Bourgonjon, Wever, Schellens, & Valcke, 2012) and computer self-efficacy (Ong et al., 2004) as individual characteristics. In the following section, two external variables in the domain of individual difference are briefly discussed.

Internet experience

Internet experience is one of the aspects of individual characteristics (Pituch & Lee, 2006). Schumacher and Morahan-Martin (2001) regarded in the context of internet experience, as the amount of experience in various internet applications. Tan and Teo (2000) also regarded Internet experience as using the various applications of the Internet and the respective frequency of use. According to Igbaria et al. (1995), experience has a key role in the acceptance of technology (Igbaria et al., 1995). Kerka (1996) argues that in distance learning, experience has an important role in student achievement. Therefore, this construct can be considered as an external variable that may indirectly impact LMS utilization.

Personal innovativeness toward IT

Van Raaij and Schepers (2008) regarded innovativeness as a sort of openness to change. De Smet et al., (2012) described personal innovativeness toward IT as the preference of an

individual to examine any new information technology. Innovative people are interested to discover and explore new technologies and consequently, they are more familiar with new systems. According to De Smet et al. (2012) individuals with high levels of innovativeness feel that the LMS is more user-friendly. In other words, the innovative person operates the system better than individuals with low innovativeness (Van Raaij & Schepers, 2008). Additionally, innovativeness toward IT encourages users to feel that the LMS is more productive for learning (De Smet et al. 2012). Since innovativeness influence beliefs, it can be considered as an external variable (De Smet et al., 2012; Janjua, Muhammad & Usman 2018).

Self-efficacy

Self-efficacy refers to the level of ability one thinks he or she may have in performing a task (Bandura, 1980). However, the growth of technology has made a number of terms emerge from the concept of self-efficacy such as Internet self-efficacy, mobile self-efficacy, and computer self-efficacy. There are several studies that have investigated the influence of self-efficacy and their components on technology use. The results of previous studies in investigating the influence of self-efficacy on LMS perceived ease of use are not consistent. For example, Park et al. (2014) investigated the influence of self-efficacy on perceived ease of use among 155 users and found a positive relationship between teleconferencing perceived ease of use and self-efficacy. However, Pituch and Lee (2007) in investigating the influence of self-efficacy on perceived ease of use found that there was no relationship between perceived ease of use and self-efficacy. These results suggest that future studies incorporate self-efficacy as an external variable on Technology Acceptance Model and investigate its influence on LMS use.

System characteristics

Davis et al. (1989) suggested system characteristics as an external variable which may affect perceived usefulness and perceived ease of use. Venkatesh and Bala (2008) regarded system characteristics as strong determinants of perceived ease of use and perceived usefulness. There are several studies which confirmed the role of system characteristics as an external variable which predict system utilization (Pituch & Lee, 2006; Igberia, 1995; Ke, 2012). System characteristic includes a variety of variables such as computer playfulness, interface style, interactivity (Ke, 2012), system quality (Igberia, 1995; Wang & Wang, 2009), system functionality, system interactivity and system response (Pituch & Lee, 2006). In the following section, system interactivity and system functionality are briefly explained.

System functionality

System functionality assesses the flexibility and quality of LMS features from the user point of view (Pituch & Lee, 2006), for example, whether LMS is equipped with features through

which students can send their assignments, download the contents of syllabus, take quizzes, use a variety of media such as text and video and so on (Pituch & Lee, 2006; Selim, 2003). System functionality provides facilities for students to communicate with each other and access course materials at anytime and anywhere (Selim 2003; Pitich & Lee, 2006). Therefore, it has an important role in LMS usage among students.

System interactivity

System interactivity refers to interaction among instructors and students in the process of learning and teaching (Pituch & Lee, 2006). The LMS should be equipped with features such as forum, email and chat-room through which students and teachers interact with each other (Folden, 2012; Kekwaletswe, 2012). This factor assesses the interaction between lecturers and students (Pituch & Lee, 2006). System interactivity has a crucial role in process of learning among students and may influence on perceived ease of use and perceived usefulness (Pituch & Lee, 2006).

System quality

Information quality refers to the quality of LMS in conducting teaching and learning activities (Delone & McLean, 2003). In fact, quality of system will increase the performance of teaching and is related to perceived usefulness. Thomas and Stratton (2006) argued that if the quality of information system provided with LMS increases, perceived usefulness of the instructor will also increase. There are several studies that show there is a positive relationship in this regard (Condie & Livingston, 2007; Zhao, 2007).

Educational system quality

Educational system quality is one of the components of LMS which facilitates the learning process (Hassanzadeh et al., 2012). In fact, educational quality refers to the process of managing a conducive learning environment (Hassanzadeh et al., 2012; Kim et al., 2012). The results of several studies indicated that this external factor has an important role in satisfaction and LMS intention to use of learners. For example, the results of a study investigating the influence of educational quality on satisfaction and LMS intention to use of 390 Iranian university students showed that educational system quality has a significant effect on satisfaction and student LMS intention to use (Mohammadi, 2015). Further research results indicated that educational system quality has a significant influence on satisfaction of 369 Iranian LMS users (students, instructors and alumni). Since system quality is regarded as a new component to an information system (Mohammadi, 2015), it is recommended that further studies incorporate this external variable on Technology Acceptance Model and study its influence on technology acceptance.

Social influence

Social influence includes a variety of social processes and mechanisms that lead users to formulate perceptions of different aspects of a system (Venkatesh & Bala, 2008). The literature review of this study indicated that the variable which encompasses social influence was limited to a subjective norm.

Subjective norm

In most of the TAM literature, social influence is considered a subjective norm. The construct of subjective norm investigates the influence of people who are important to us and influence our behaviour (Venkatesh & Bala, 2008). Therefore, in the domain of LMS utilization, the components of subjective norm can be regarded as peer and instructor subjective norm (Cheung & Vogel, 2013). Although subjective norm does not belong to TAM, Davis et al. (1989) suggest that its influence be investigated in future studies. Thus, further studies such as testing TAM 2 and TAM 3 examined the influence of subjective norm on technology use and it was found that subjective norm can be considered a strong predictor of perceived usefulness and behaviour intention to use (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008).The outcomes of several studies also revealed that subjective norm is a strong predictor of LMS use (Wang & Wang, 2009; Van Raaij and Schepers, 2008; Teo, 2010; De Smet et al., 2012). Therefore, it can be considered as an external variable.

Facilitating conditions

Facilitating conditions which sometimes called organizational support, are an important factor which may impact on user acceptance (Davis et al., 1989). Facilitating conditions enhance satisfaction and have a critical effect on user beliefs in accepting or rejecting a system and may include management support or user support (Venkatesh & Bala, 2008; Igbaria et al., 1995).

Technical support

Technical support is the assistance given to solve problems encountered when working with an information system (Ngai et al., 2007). This technical support may encompass a hotline for receiving suggestions or dealing with user complaints regarding fax, email enquiry, online support services etc. In each organization, provision of a good service for technical support will enhance satisfaction and favourable attitudes (Ngai et al., 2007).There are several studies that incorporated TAM with technical support and found this external variable has a significant effect on LMS use (Wang and Wang, 2009; Sánchez and Hueros, 2010; Ngai et al., 2007).

Service quality

Service quality includes effectiveness and quality of the support that users receive through an information system (Wang & Wang, 2009, Mohammadi, 2015). The results of previous research in the domain of investigating the role of service quality on LMS use revealed that there was a positive relationship between service quality and LMS intention to use (Mohammadi, 2015; Wang & Wang, 2009). Urbach et al.(2010) also found that service quality had a strong influence on 6210 Germans. This finding suggests that further studies consider service quality as an external variable and study its influence on LMS use.

Theoretical framework of the study

The present study regarded Learning Management System (LMS) as an Information System (IS) investigated the external variables that affect LMS use. Figure 4 below is the conceptual framework of the study based on related literature and theoretical framework of Vankatesh and Bala (2008). Although there are many external variables which may affect an information system, the present study focused on external variables that influence LMS use as an information system.

Figure 4. Conceptual Framework of the Study
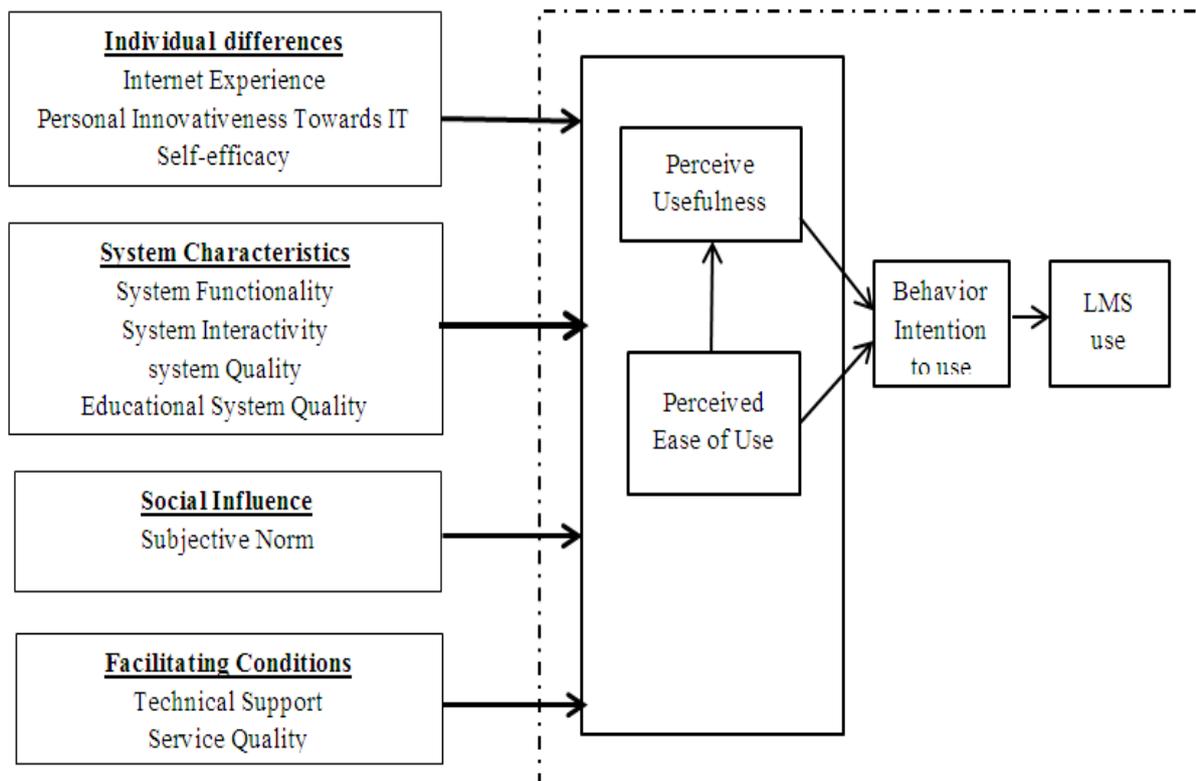
Conclusion and Recommendations

Studying the body of knowledge in the domain of TAM has revealed that there are four categories of external variables: individual differences, system characteristics, social influence, and facilitating conditions. Since external variables have a crucial role in system usage, researchers should be cautious in choosing them. In fact, without external variables the research model will not be able to explain the behaviour of a human being in a specific situation. The results of the present study's literature review suggest that in selecting the external variables, the researcher should cover four categories: individual differences, system characteristics, social influence, and facilitating conditions.

The present study focused on literature of LMS usage. Although in investigating the utilization of other information systems (e.g. tablets, software, laptop, wiki, YouTube etc.) external variables belong to the four categories (individual differences, system characteristics, social influence, and facilitating conditions), there are some external variables which are not investigated in the domain of LMS use such as openness to experience and emotional stability, habits, comfortable environment, flow experience (Svendsen et al., 2013, Park & Pobil, 2013). It is recommended that future studies investigate these external variables and their influence on other Information Systems. The present study focused on Technology Acceptance Model (TAM) and it is recommended that future studies extract external variables from other models such as Innovation-Diffusion Theory (relative advantage, compatibility) and investigate their influence on LMS use (Jongchul & Sung-Joon, 2014).

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