A Conceptual Model to Evaluate Virtual Learning Environment among Malaysian Teachers

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***Abstract*—The sophisticated development of Information and Communication Technology (ICT) has sparked new inventions in teaching and learning approach. These positive technological advantages therefore inspired the Malaysian Ministry of Education (MOE) to invest in digitalizing the Malaysian schools, including the implementation of Frog Virtual Learning Environments (VLE). Despite this huge investment, the ratio of usage is relatively low, especially among the teachers. This evidence indicates that there is an urgent requirement to conduct a post-implementation evaluation to investigate the factors behind the issue. Therefore, this study is conducted to develop a conceptual model based on the updated DeLone and McLean IS Success Model to evaluate the Frog VLE success among Malaysian teachers. This paper will present the initial investigation that leads to the development of the conceptual model. Researchers in this field can use the model in different populations and settings, and thus create an avenue in apprehending the factors that contribute to the VLE success.**

***Index Terms*—DeLone and McLean IS Success Model; Evaluation of IS Success; Frog VLE; Learning Management System.**

I. Introduction

The sophisticated development of Information and Communication Technology (ICT) has sparked new inventions in teaching and learning approach. Currently, most educational institutions have implemented various forms of teaching style such as blended and online learning. Blended learning combines face-to-face teaching with an unusually high percentage of autonomous learning and online tutoring. These new teaching styles are made possible through Virtual Learning Environments (VLE) [1]. VLE is defined a decade ago as computer-based environments that are relatively open systems, allowing interactions with other participants and access to a wide range of resources [2]. The introduction of VLE technology in education has significantly shifted the nature of traditional learning in six aspects; time, place, space, technology, interaction, and control [3]. It is commonly recognized as an Internet-based platform that supports various educational activities including online courses, quizzes, and tutorials [4].

II. Literature Review

The VLE technology implementation in Malaysia was initiated by Ministry of Education (MOE) through the 1BestariNet project to improve the previous version of SchoolNet service [5]. Through the initiative, MOE aims to connect approximately over 10,000 schools across the nation via cloud-based virtual learning environment, supported by high-speed 4G Internet connections by the end of 2013 [6]. As a long-term investment, the 1BestariNet executions is expected to run for at least thirteen years and MOE believed that it would transform Malaysian education sector by promoting sustainable use of ICT in both areas of pedagogy and education management [7].

However, the current report indicates low usage of Frog VLE, which is between 19.5% to 33.5%, with only 0.57% to 4.69% of teachers' usage [8]. The low utilization of Frog VLE in schools is associated with at least two issues. First, recent evidence has demonstrated that some teachers refuse to continue using the system, although they agreed on the benefits offered by Frog VLE [9]. Second, some studies also suggest an association between user satisfaction and the actual usage of Learning Management System (LMS) [10], [11]. This notion implies that the teachers who are not satisfied with the Frog VLE will most likely refuse to continue using it and henceforth contribute to the overall statistic of low usage. Nevertheless, the current literature on Frog VLE is found to be widespread with the lack of empirical evidence on its continuous usage and user satisfaction. Therefore, there is a need to examine the factors behind both of these issues, particularly among the teachers.

Regarding the trend of recent studies in Frog VLE, it is becoming extremely difficult to ignore the existence of teachers' excessive workload as a major hindrance to its utilization [9]. While the body of research in the area suggests that excessive workload may also have some impact on the use of Frog VLE [12], empirical evidence on this is still lacking. Moreover, the literature is yet to reveal any attempt to structurally map out the relationship between workload and usage in the context of IS success.

Equally important, the Personal Characteristics like Age, Gender and Experience are found to be influential in IS adoption especially in determining the strength of usage [13]. However, the plausible effect of these Personal Characteristics in evaluating Frog VLE success has not yet been clarified, so it is not obvious whether these characteristics are influential or the otherwise. This implies that the existing literature on IS evaluation lies in insufficient research in determining its predictors and thus requires further investigations.

A. Theoretical Background

IS success is the interrelated dimensions, therefore it should not be measured based on only single dimension [14]. This stance implies that several studies that examine certain dimension, for example, IS usage [15], [16] and user satisfaction [17], [18] did not represent the whole concept of IS success. In addition, the continuous use during the post-

implementation stage is more significant in determining the IS success compared to initial use during pre-implementation [19]. As for the study, the continuous usage is identified as a prominent issue, illustrated by the low usage of ICT and Frog VLE [20]. Even though the majority of the teachers have the initial Frog VLE experience, the current finding shows that they refused to continue using the system [21], [22], which reflect that the system is not on the right track of success. From the literature, the study found that these issues could be engaged using the updated DeLone and McLean IS Success Model (D&M) [14]. Previous studies have proven that this model fits all the measurement for IS success evaluation [11], [23]. Although the updated D&M IS Success Model was developed for measuring e-commerce, its applicability in other IS streams has been proven by many studies. This model was introduced in 2003 as the response to the criticisms on the original version of IS Success Model by [24].

As an enhancement model, several adjustments have been made including the inclusion of Service Quality (SeQ) and the combination of Individual Impact and Organizational Impact into the single dimension known as Net Benefits (NB). Furthermore, the updated D&M aim to produce a comprehensive understanding of IS success by describing the inter-relationship between six identified dimensions, namely Information Quality (IQ), System Quality (SyQ), Service Quality (SeQ), Intention to Use (ITU) or Use (U), User Satisfaction (US) and Net Benefits (NB). [14] suggested that their model should be continuously tested and challenged under various context, in order to increase its validity and reliability. For this reason, the previous researchers have made various alterations and refinement to the model. Despite that, the majority of researchers still believed that most of the constructs in the model are relevant for the evaluation of IS Success across different context and should be retained [25], [26].

Based on the preceding discussion, the study concludes that the entire constructs in D&M are relevant to model the Frog VLE success among Malaysian teachers. More importantly, the preservation of all IS Success dimensions is congruent to the suggestion of [14] to provide a comprehensive understanding of IS success while at the same time retaining the nature of interdependence between these dimensions. However, to investigate the issue of continuous usage, this study uses both ITU and U while also adding the new relationship from U to ITU. Although the ITU was introduced by [14] as an alternative measurement for U, the separation of these two constructs will enhance the explanatory power of D&M [27]. In addition, the study also incorporates the Workload (WL) as the moderator since it has identified as a major issue that affects the ICT integration in education including Frog VLE [9]. Finally, the Personal Characteristics, which consist of Age, Gender and Frog VLE Experience, is added to the D&M as another moderating variable, which is expected to influence the relationship between the Quality Dimensions (IQ, SeQ and SeQ) and ITU.

III. CONCEPTUAL MODEL

The Conceptual Model for the study, as shown in

Figure 1, is based on the updated D&M IS Success Model [14]. It suggests that the Quality Dimensions (IQ, SyQ, and SeQ) will significantly influence the ITU and US. Furthermore, the Personal Characteristics (Age, Gender and Frog VLE Experience) may moderate the relationship between the Quality Dimensions and ITU. At the second level, the increasing ITU should lead to more U of the Frog VLE. In the same manner, the initial U may also affect future ITU, with the mediating effect of US. As a result of these U and US, certain NB will occur, that will further lead to improvement of ITU (moderated by WL of the teachers) and the US. At the same time, the teachers' WL is also expected to moderate the relationship between ITU and U of Frog VLE. The antecedent of this Conceptual Model will be thoroughly discussed in the following subsections.

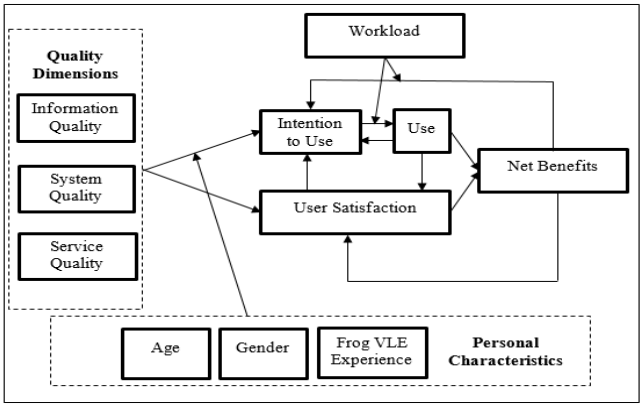

Figure 1: The Conceptual Model of VLE Success among Malaysian Teachers

A. The Quality Dimensions

The Quality Dimensions should influence the ITU of Frog VLE among Malaysian teachers in the positive relationship, as supported by previous studies [23], [28]. First, the quality of information provided by Frog VLE is one of the crucial success criteria in ensuring the continuous usage of the system [23]. Several recent studies investigating the relationship between IQ and ITU have been carried out by IS researchers, which in turn proved to be significant [23], [29]. Second, SyQ should have directly affected the ITU; even though the density of the relationship may vary across different IS atmosphere [30]. In this sense, the Frog VLE that always available, easy to use and convenient to access will lead to greater ITU in the future by the teachers. Third, on the practical basis, good support services by Frog VLE and 1BestariNet should motivate the teachers to continue using the system in the future as proved by [23].

On the other hand, the Quality Dimensions are also expected to influence the US of Frog VLE among Malaysian teachers, as demonstrated by several previous studies [23], [31]. In like manner, IQ will positively influence the US on the direct relationship [14] or, the user will be satisfied if the IS produced precise, updated, relevant, and appropriate information. Thus far, a growing body of empirical research that examined the correlation between these two IS success dimensions can be found [23], [32]. Hence, the good quality of information provided by Frog VLE should increase the teachers' satisfaction. Furthermore, SyQ was also found to have a strong positive relationship with the US by a number of studies conducted to date [33]. Therefore, the study assumed that the good quality of Frog VLE would lead to positive teachers' satisfaction. Complementary to this, higher SeQ is also expected to lead to higher US at the individual level of analysis [14]. This implies that if the teachers

received the good services from Frog VLE and 1BestariNet, they will likely to feel satisfied and intend to continue using the system.

B. Intention to Use

The concept of people's intention to use certain technology was introduced by [34] in Technology Acceptance Model (TAM). This model uses the 'Behavioral Intention to Use' construct as an antecedent to predict the actual Use of the specific technology. This positive use will later cause satisfaction and intention for future use and so on. Based on this premises, [35] also suggest that the ITU should be the predictor of U in D&M. In addition, this relationship between ITU and U has also been supported by a number of empirical studies [11], [23].

C. User Satisfaction

If the teachers satisfied with the Frog VLE, they would be inspired to use it again in the future. This notion is supported by [23] who suggest that the individual who satisfied with the technology may have higher intention to use it in the future due to the positive reinforcement of attitude toward the technology. Moreover, the relationship between the US and ITU has been supported in a number of empirical studies [23], [36]. Meanwhile, certain NB will occur as a result of U and US [14]. On the practical basis, the teachers who are satisfied with the Frog VLE should believe that they would save time, improve productivity and increase their personal value when using it. A review of the current state of research on D&M by [33] has shown that the relationship of US and NB were strongly supported by the previous empirical studies including those conducted by prominent researchers such as [37] and [36]. Indeed, [14] also suggested that the good experience with the initial U of Frog VLE is expected to cause the positive US, and further lead to increase in ITU. In this sense, the positive relationship between U and ITU should exist with the mediating effect of US. In other words, the teachers (who have already experienced the initial use) are assumed to have an intention for future use, only if they were satisfied with the initial use of Frog VLE.

D. Use

According to [14], the initial use and the intention to use in the future can be different under certain circumstances. By referring to two important studies by [27] and [38], the D&M described that the positive experience with the initial U should lead to the US and thus increase the attitude toward usage in the future. Likewise, the updated D&M posits that the positive experience with the initial U of IS will lead to higher US [14]. In light of this, the teachers are expected to feel satisfied if they have experienced the positive use of Frog VLE. In addition, [14] suggested that certain NB would occur when the user used the particular IS. Hence, the study hypothesizes that the teachers will capture some benefits in term of time-saving, improved productivity and personal valuation when they use the Frog VLE.

E. Net Benefits

The positive NB should lead to future ITU [14]. Practically, the teachers will intent to continue using Frog VLE if they perceived that the system is beneficial to them, as exhibited by a number of empirical studies [23], [39]. In addition, the updated D&M also suggest that the NB should have the correlation to the US [14]. The positive NB supposed to trigger the positive US and the other way around. In fact, this reversed back effect from NB to the US has shown to be very robust [33]. Build on the preceding arguments; the study postulates that the positive NB provided by Frog VLE will increase the teachers' satisfaction toward the system itself.

F. The Personal Characteristics

The Personal Characteristics, which consist of Age, Gender and Frog VLE Experience, are posited to play the moderating role in the relationship between Quality Dimensions and ITU. During the past 50 years, much more evidence has become available on the effect of age toward IS adoption, especially in the context of intention to use the technology [40], [41]. Some researchers suggest that the age reflects the variation of human capability in processing information that further interfere with their reaction toward the IS [13]. Compared to the younger people, the older people are found to rely more on automatic information processing [42], and therefore require the better quality of information. Hence, the older teacher is expected to feel less interested in using Frog VLE if they found that the information and system quality is low. The previous studies have also explained that the older worker tends to require more assistance and help in performing the job, which is usually caused by the physical and cognitive limitation associated with the aging process [43]. Therefore, the study posits that the older teachers will require better IQ, SyQ and SeQ from Frog VLE in order to integrate it into their teaching activities, congruent to the findings of several past studies [12], [44].

Meanwhile, the empirical evidence shows that perceived usefulness (one of the measurements for IQ) was more salient for men compared to the women [43]. Men are commonly task-oriented, and thus the desired quality of information is important to perform a certain task [43], such as for teaching. On the other hand, women are found to be more sensitive and detailed especially in making decisions [45]. In light of this, [13] suggested that the women will be more sensitive to changes in the environment that will further affect their intention. This notion was also supported by a number of empirical IS studies that uncover the greater effect of perceived ease of use (one of the measurements for SyQ) among the women [43], [46]. This evidence indicated that women require better SyQ [43] and henceforth if they perceived that the particular system is complex, they will likely demand the greater SeQ. Literally, the factor of age and gender are closely related to each other and should be examined together [47]. Gender differences and the dependence on SeQ will become more salient with the increasing age [48].

Frog VLE experience can also moderate the relationship between SeQ and ITU, as suggested by [13]. By referring to the groundbreaking studies conducted by [49] and [13], the greater experience is expected to lead to greater familiarity with the specific system and thus reducing the reliance to the external supports. Even though the factors of age and gender are found to be influential in the previous studies, the effect of these factors were also expected to decrease with the increasing of experience [43]. As the men are most likely will process information based on their preceding experience, the older women tend to process the information in more detailed and cautious manner [13]. In this sense, the older women are expected to be less influenced by their heuristic experience. Similarly, the dependency on the external support is usually more noticeable for the less experienced people [50]. The

experience can also be a moderator between SeQ and ITU because the increasing familiarity to the IS will enhance the user's knowledge structure that will assist the learning process, and hence reducing the dependency to the external supports or services [49].

G. Workload

In the context of VLE implementation, WL is considered as one of the factors that possibly influence the utilization of the particular system. The issue of excessive WL has been acknowledged by many previous researchers, particularly in the field of ICT in education [9], [51]. For instance, the case study by [9] found that WL is one of the major influence that interferes with their predetermination to use of Frog VLE, even though they are aware of those particular benefits. Since the last century, the task of teachers has rapidly grown and the complaints of heavy WL has become common among them [52]. In light of this, [53] suggested that the future research on ICT integration in education should include the factor of WL, as they believed that it would extend the explanations from the existing literature.

IV. Model Validation

In order to comprehend the factors that potentially significant for the evaluation of Frog VLE success among the teachers, two methods of acquiring and validation are applied in the current study. Initially, the literature review is conducted to search for the relevant factors related to the VLE success, as discussed in the previous sections. These selected factors were then given to the experts for confirmation on the appropriateness and suitability to be used in the Frog VLE evaluation model. To ensure the validity of this procedure, the current study has chosen the experts based on two criteria.

First, the teachers should have seven years of teaching experience as the minimum requirement to be appointed as experts [54]. This criterion is important to the current study as the selected experts will review and determine the significance of the proposed factors from the perspective of the teachers. Second, the experts in E-Learning should have at least three years of experience in the particular system [55]. As for the current study, this criterion will ensure that the experts are familiar with the Frog VLE especially in term of the system, information and service quality. Therefore, four experts were selected based on their experience as the teachers (over seven years) and experience in dealing with Frog VLE (over three years). The finding of the expert review is shown in

Table 1. In addition, all the experts acknowledged the possible influence of personal characteristics on the usage, and therefore should also be considered in the model.

V. Conclusion

The study seeks to contribute some understandings on how the new Conceptual Model that is developed based on the D&M IS Success Model can predict the success of Frog VLE among Malaysian teachers. It is usable for researchers in IS and education that interested in investigating the factors that contribute to the success of VLE in other setting and population. In conclusion, the study aims to fill the gap as none of the existing studies to the knowledge of the researcher provides the determinants of Frog VLE success. The successful implementation of LMS relies on its ability to meet the users' requirement and expectation, while at the same time provide the net benefits for its users, regardless of the location, urban and rural. Thus, the outcome of the study will provide the guidelines for Malaysian policymakers especially the MOE to spot the weaknesses in the current practice of Frog VLE.

Table 1
Model Validation by the Experts

Factor	Suggested by	Expert Review
Information Quality	[14], [24]	All the experts rate this factor as very significant.
System Quality	[14], [24]	All the experts rate this factor as very significant.
Service Quality	[14]	All the experts rate this factor as very significant.
Net Benefits	[14]	All the experts rate this factor as very significant.
Intention to Use	[14], [27]	All the experts rate this factor as very significant.
Use	[14], [24]	All the experts rate this factor as very significant.
User Satisfaction	[14], [24]	All the experts rate this factor as very significant.
Workload	[9], [51], [56]–[58]	All the experts rate this factor as very significant.

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