IMPLEMENTATION EVALUATION MODEL TO MEASURE VIRTUAL LEARNING ENVIRONMENT SUCCESS FACTORS AMONG MALAYSIAN TEACHERS

HAPINI BIN AWANG

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Awang Had Salleh
Graduate School
of Arts And Sciences

Universiti Utara Malaysia

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Abstrak

Walaupun pelbagai faedah ditawarkan oleh Persekitaran Pembelajaran Maya (VLE), kadar penggunaannya di kalangan guru-guru Malaysia masih rendah, yang menunjukkan bahawa sistem ini terdedah kepada risiko kegagalan. Oleh itu, kajian ini dijalankan untuk membangunkan model bagi mengukur kejayaan VLE di kalangan guru Malaysia berdasarkan kepada Model Kejayaan Sistem Maklumat DeLone & McLean yang dikemaskini (D&M). Kajian ini menggunakan reka bentuk *Explanatory Sequential Mixed Methods*. Lapan ratus lima puluh (850) soal selidik telah diedarkan kepada responden di wilayah utara Malaysia menggunakan prosedur persampelan rawak mudah. Kod QR telah digunakan untuk mempercepatkan proses kutipan data tanpa melanggar syarat persampelan berkebarangkalian. Hasilnya, 719 borang soal selidik telah dikembalikan dan 643 boleh diguna pakai untuk analisis utama. Analisis data kuantitatif dilakukan menggunakan *Partial Least Squares-Structural Equation Modeling* (PLS-SEM). Kebanyakan hipotesis hubungan langsung telah disokong, kecuali Penggunaan kepada Niat Penggunaan, yang didapati diantarakan sepenuhnya oleh Kepuasan Pengguna. Di samping itu, hasil kajian juga mengesahkan peranan Beban Kerja sebagai penyederhana. Walau bagaimanapun, kesan penyederhanaan Ciri Peribadi tidak disokong. Seterusnya, isu hubungan rekursif yang menghasilkan dua nilai R^2 dan Q^2 dalam pembolehubah endogen tertentu telah disiasat dengan membandingkan lima model yang mungkin. Hasilnya, model akhir yang dihasilkan dapat dianalisis dalam satu model struktur dan oleh itu, memberikan nilai ramalan ketepatan dan ramalan kerelevanan yang sah. Berdasarkan model ini, strategi pelaksanaan VLE telah dihasilkan dan dibentangkan kepada 14 orang pengamal pendidikan. Selanjutnya, pengesahan dilakukan menggunakan analisis kandungan kualitatif. Hasil analisis menunujukkan bahawa strategi pelaksanaan ini sesuai dilaksanakan di sekolah-sekolah Malaysia. Keseluruhannya, kajian ini menyumbang kepada ilmu pengetahuan dengan menyediakan model untuk mengukur kejayaan VLE di kalangan guru.

Kata kunci: Model Kejayaan Sistem Maklumat DeLone & McLean, E-Pembelajaran, Frog VLE, Persekitaran Pembelajaran Maya, Model Kejayaan VLE

Abstract

Despite the various benefits offered by Virtual Learning Environment (VLE), its usage among Malaysian teachers is still low, indicating that the system is not in the right track of success. Therefore, this study aims to develop a model to measure VLE success among Malaysian teachers based on the updated DeLone & McLean IS Success Model (D&M). This study employed an explanatory sequential mixed method design. Eight hundred and fifty (850) questionnaires were distributed to respondents across the northern region of Malaysia using simple random sampling procedure. The QR code was used to speed up the data collection without violating the rules of probability sampling. As a result, 719 questionnaires were returned and 643 are usable for the main analysis. The quantitative data analysis was conducted using Partial Least Squares-Structural Equation Modeling (PLS-SEM). Most of hypothesized direct relationships are supported, except for Use to Intention to Use, which is fully mediated by User Satisfaction. The result also confirmed the positive moderating role of Workload. However, the moderating role of Personal Characteristics is not supported. Furthermore, the issue of recursive relationships, which produced two R^2 and Q^2 in certain endogenous variables, was investigated by comparing five possible models. Consequently, the produced model can be analyzed on a single structural model and therefore, provides valid predictive accuracy and relevance. This analysis has become a major methodological contribution of the study that provides a foundation for further investigations on the relevancy of the recursive relationships in D&M. Based on the final model, the VLE implementation strategy was produced and presented to 14 practitioners. Next, the validation was done using qualitative content analysis. The result indicates that the implementation strategy can be applied in Malaysian schools. Finally, this study contributes to the body of knowledge by providing a model to measure VLE success among teachers.

Keywords: DeLone & McLean IS Success Model, E-Learning, Frog VLE, Virtual Learning Environment, VLE Success Model

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In the name of ALLAH, Most Gracious, Most Merciful. Praise and peace be upon our Prophet Muhammad, to his family members, companions and followers.

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List of Abbreviations

ANOVA	Analysis of Variance
APDM	Aplikasi Pangkalan Data Murid
AVE	Average Variance Extracted
BPSH	Bahagian Pengurusan Sekolah Harian
CB-SEM	Covariance Based-Structural Equation Modeling
CFA	Confirmatory Factor Analysis
CMV	Common Method Variance
CR	Composite Reliability
CVI	Content Validity Index
D&M	DeLone & McLean IS Success Model
DOI	Diffusion of Innovation
DV	Dependent Variables
EFA	Exploratory Factor Analysis
EIS	Educational Information Systems
EMIS	Education Management Information System
EPRD	Educational Planning and Research Division
ETM	Educational Technology Evaluation Model
f^2	Effect Size (R-Squre)
HTMT	Heterotrait Monotrait Ratio
ICT	Information and Communication Technology
IQ	Information Quality
IS	Information Systems
ISD	Information System Development
IT	Information Technology
ITU	Intention to Use
IV	Independent Variables
JPN	Jabatan Pelajaran Negeri
KMO	Kaiser-Meyer-Olkin Test
KMS	Knowledge Management Systems
KPI	Key Performance Indicator
LMS	Learning Management System(s)
MOE	Ministry of Education, Malaysia
NB	Net Benefits
OLS	Ordinary Least Square
PLC	Project Life Cycle
PLS-MGA	PLS-Multi Group Analysis
PLS-SEM	Partial Least Squares-Structural Equation Modeling
PPD	Pejabat Pendidikan Daerah

PPDCH	Pejabat Pendidikan Daerah Cameron Highlands
q^2	Effect Size (Q-Square)
Q^2	Predictive Relevance
R^2	Coefficient of Determination
SD	Standard Deviation
SDLC	System Development Life Cycle
SEM	Structural Equation Modeling
SeQ	Service Quality
SK	Sekolah Kebangsaan
SLR	Systematic Literature Review
SMK	Sekolah Menengah Kebangsaan
SMM	Sistem Maklumat Murid
SPS	Sistem Pengurusan Sekolah
SPSS	IBM SPSS Statistics
β	Path Coefficient
SyQ	System Quality
TALIS	Teaching and Learning International Survey
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Actions
U	Use
US	User Satisfaction
UTAUT	Unified Theory of Acceptance and Use of Technology
UUM	Universiti Utara Malaysia
VIF	Variance Inflation Factor
VLE	Virtual Learning Environment
WL	Workload
X^2	Chi-Square
z-score	Standardize Score
α	Cronbach's Alpha
√AVE	Square-Root of AVE

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

In the last few decades, Information and Communication Technology (ICT) bombardment has shown significant impacts in every aspect of human daily lives (Livingstone, 2012). The advancement of ICT hardware and software has enabled humans to communicate with each other regardless of time and locations. Accordingly, it also has a significant effect in various fields, including education (Player-Koro, 2012). The past decade has seen the rapid changes in teaching and learning practices, precipitated by the integration of ICT into education (Ghavifekr et al., 2014). Recently, many countries have rapidly progressed in terms of infrastructures, support mechanisms and aligning ICT policy with educational vision (Hinostroza, 2018). This has resulted in a successful implementation of educational ICT initiatives in many modern countries, for example the United States of America, Australia and Japan (A. I. Khan, Al-Shihi, Al-Khanjari, & Sarrab, 2015).

Notwithstanding, most of developing countries are still out of the race, indicated by the low usage of ICT especially among teachers (Cheok, Wong, & Ahmad Fauzi Ayub, 2017; Ibieta, Hinostroza, Labbé, & Claro, 2017; Rolando, Salvador, & Luz, 2013). Issues such as inadequate ICT facilities and support, lack of ICT readiness as well as the heavy workload carried by teachers are among the commonly heard factors that contribute to the low ICT usage in schools (Cheok & Wong, 2016; Copriady, 2015; Kihoza, Zlotnikova, Bada, & Kalegele, 2016; Solar, Sabattin, & Parada, 2013; Surif,

Ibrahim, & Hassan, 2014). Without proper planning and evaluation, these issues could lead the implementation of educational ICT initiatives in the particular developing countries into a failure.

Nevertheless, the flaws in ICT implementation cannot deny the plentiful benefits offered by ICT in education such as the ability to support constructivist pedagogy, facilitate student-centered learning environments and improving student's 21st century skills (Vanderlinde, Aesaert, & Van Braak, 2014). Consequently, these positive technological advantages have sparked the attention of the Ministry of Education, Malaysia (MOE) to invest approximately USD 1.6 billion in the past decade in the effort to digitalize Malaysian schools (Xchanging, 2014). In this regard, the Educational Information Systems (EIS) was introduced as part of the MOE's long-term ICT plan. EIS constitute of all Information Systems (IS) that have been implemented in the education sector (Y.-T. Lee & Ryu, 2013). The EIS was introduced as one of the strategies for solving problems related to the increased teachers' workloads due to the rapid changes in education demands (Kementerian Pendidikan Malaysia, 2013). There are two main areas in education that have been positively affected by the EIS implementation, which are (i) education management, and (ii) teaching and learning (Kementerian Pendidikan Malaysia, 2013; Surif et al., 2014).

Initially, the EIS introduced by the MOE was specifically designed to improve the mechanism of education management, such as the *Sistem Pengurusan Sekolah* (SPS) and *e-Operasi* (Norin Farizah, 2013; Sektor Operasi Pendidikan, 2015). As good education management practices are one of the core principals in Malaysian education philosophy (Kementerian Pendidikan Malaysia, 2006), the EIS was also implemented

in education management as part of the strategy to integrate and automatize educational data (Kementerian Pendidikan Malaysia, 2013). In the effort to improve the standard of teaching and learning, a number of Learning Management Systems (LMS) such as *Sistem Pengurusan Pelajaran* (SPP) (Kementerian Pendidikan Malaysia, 2016d), i-Think (Jabatan Pendidikan Negeri Perak, 2016) and Frog Virtual Learning Environment (VLE) have been implemented (Kementerian Pendidikan Malaysia, 2014). Through these initiatives, the MOE was hoping to cope with the 21st-century learning strategy which drives the shifts from the conventional teacher centered into a more student-centered ICT based pedagogy (Norazilawati, Noraini, Nik Azmah, & Rosnidar, 2013).

VLE is often referred to e-learning or Learning Management System (LMS) (Cavus, 2011). It is defined as a category of IS that provides schools with the ability to assist resources administration, standard classroom learning activities, as well as distance education (Al-Busaidi & Al-Shihi, 2012). The basis of this system is how it gives users the power to teach and learn without much consideration for normal obstacles such as time, distance and location, as it allows asynchronous pedagogy where the teachers and student no longer have to be physically present at the same place (Cavus, 2011). However, VLE retains the elements of conventional education in terms of standard activities like such as administration, tests, communication and scheduling. Since it was first introduced, many types of VLE have been developed to suit the various educational contexts, including higher institutions and schools. The most prominent VLEs are Blackboard, Moodle, Edmodo and Frog (Ferriman, 2017).

Frog VLE is an award-winning, cloud-based virtual learning environment invented and originally used in the United Kingdom (UK). It is also the newest LMS that has been used in Malaysian schools under the 1BestariNet project (Nor Azlah & Fariza, 2014) with an allocation of RM1.475 billion (Kementerian Pendidikan Malaysia, 2014). Up to 2014, MOE has spent RM250.50 million for the Frog VLE license and another RM262.81 million for the maintenance of the system under a two and a half years' contract (Kementerian Kewangan Malaysia, 2014). Among the most important aims of this specific endeavor is to eliminate the chasm in educational standards between city schools and their counterparts in the rural areas by means of equal access to digital education for every student, no matter where they're located (Xchanging, 2014). More than 10,000 public schools, 5 million students, 500,000 teachers, and 4.5 million parents will hopefully be linked in this virtual learning environment. The expected result is a major rise in the standards and quality of the Malaysian education system (Campbell, Harthi, & Karimi, 2015; Kementerian Pendidikan Malaysia, 2014).

Even though most of the currently implemented EIS is mandatory, their usage is not regular and is limited to certain purposes and only used by specific teachers. For example, *Sistem Analisis Peperiksaan Sekolah* (SAPS) is a compulsory system that is used by certain groups of teachers, specifically for examination management purposes (Kementerian Pendidikan Malaysia, 2011). Another system is *Sistem Pengurusan Sekolah* (SPS), which integrates all of the existing EIS into a single sign-on platform consisting of 22 modules (Mohamad Khairul Nizam, 2013). However, only some users have access to specific parts of these modules (Bahagian Teknologi Pendidikan, 2013). For example, the use of the *"Pengurusan Disiplin"* module is only compulsory for

discipline teachers. Meanwhile, the use of Frog VLE is on a voluntary basis for all teachers (Kementerian Pendidikan Malaysia, 2015b). Nevertheless, its use has been recognized as part of the Key Performance Indicator (KPI) for every party/level involved, starting from the school up to ministerial levels. As it has been set as the KPIs for MOE, each school and department is required to reach the targeted number of access to the Frog VLE each month (Kementerian Pendidikan Malaysia, 2015a).

The main intention of implementing various ICT initiatives is to mediate the objective of providing the equal quality of education to all students regardless of their localities (Raman & Yamat, 2014), while, at the same time, help teachers in performing their tasks. However, thus far, the outcomes are contradictory as recent evidence and figures suggest the low level of ICT usage among teachers (Xchanging, 2014). Thus, there is an urgent need to conduct a post-implementation evaluation for all the ICT initiatives that have been implemented until now, including Frog VLE. Besides that, the evaluation of VLE success has been recognized as an essential process in managing this kind of system (Alsabawy, Cater-Steel, & Soar, 2013).

Evaluation, in the context of IS is generally understood as a systematic procedure to measure the impact of the respective systems (Centers for Disease Control and Prevention, 2014). As the development and implementation of VLE are costly, its applications require strong justifications, especially on the benefits that it could convey to teachers. Hence, evaluation is a process of measuring the beneficial impacts that can be further examined to determine success or failure of the system. There are two types of evaluation, formative and summative (National Science Foundation, 2002), which are also known as pre-implementation and post-implementation (Zhou, 2013). The

post-implementation evaluation is acknowledged as the best suited for impact studies because it is conducted after the implementation of a particular IS. In addition, the post-implementation evaluation provides practical justification in deciding whether to retain or terminate the use of the IS (Hamilton & Chervany, 1981a).

VLE has become a popular subject in western studies since the last decade (Halonen, Thomander, & Laukkanen, 2010; Mueller & Strohmeier, 2011; Sumak, Polancic, & Hericko, 2010) and at present, this topic has been gaining considerable attention from Malaysian researchers as well. A number of local researchers have attempted to investigate the implementation of VLE; a majority of them was inclined to the aspect of pedagogy (Nor Azlah & Fariza, 2014; Norazilawati et al., 2013; Ummu Salma & Fariza, 2014) and adoption of the VLE (Cheok & Wong, 2014; Kaur & Hussein, 2015; Saiful Afzan, Lazim, Azwadi, & Hafiz, 2014). Out of these studies, only a limited number of researchers such as Cheok and Wong (2014) and Thah (2014) have attempted to explore success factors pertaining to VLE. Cheok and Wong (2014) only focused on usage and user satisfaction, while Thah (2014) only evaluated the technical aspect of VLE (system quality). Collectively, both of these studies have only assessed a portion of IS success dimension and neglected the aspect of net benefits, which is crucial in IS evaluation (DeLone & McLean, 2003).

Conducting a post-implementation evaluation could provide the decision point that determines the success or failure of the VLE (Hamilton & Chervany, 1981a; Solar et al., 2013). For this reason, Jiang, Muhanna, and Klein (2000) believed that understanding the determinants of success is the main concern in IS studies, which is

expected to counter the current scenario of VLE rejection (refuse to continue using the system in future). However, post-implementation evaluation can be challenging if there is no proper evaluation model to follow (Tang, 2009). Hence, a specific evaluation model is required to examine VLE success among the teachers in Malaysia.

1.2 Problem Statement

Despite the large-scale investment in ICT made by the Malaysian MOE, an audit report indicates that the usage of ICT among school teachers is still very low as it was reported that 80% of teachers only use ICT, including VLE for less than an hour in a week and that the use of VLE only makes up between 19.5% to 33.5% of the overall ICT use (Xchanging, 2014). Furthermore, based on the analysis conducted between 1st of March to 31st March 2014, the use of VLE only constitutes between 0.57% to 4.69% of ICT use for that particular time. These figures are further supported by a more recent report of studies and observation by the Education Technology Division, MOE that shows the majority of teachers only use VLE between one to five times in a month (Bahagian Teknologi Pendidikan, 2017). The low utilization of VLE is regarded as an early symptom of system failure as it reflects users' (primarily teachers) refusal to use the system (Zhou, 2013). The issue of low usage has been shown by both local (Ghavifekr et al., 2014; Narinasamy & Mamat, 2013; Rahman, Nordin, & Alias, 2013) and international empirical studies such as in Chile (Hinostroza, Labbé, Brun, & Matamala, 2011), Vietnam (Peeraer & Van Petegem, 2011) and Turkey (Tezci, 2011a). This indicates that the low level of usage is a universal issue in VLE research. It has caused heated discussions and is highly noticeable in studies on both IS and education in recent

decades (Gu, Zhu, & Guo, 2013; Hakkarainen et al., 2001; Johari & Siti Norazlina, 2010; Kramer, Walker, Brill, & Walker, 2007).

The previous studies have exposed that most developing countries faced similar challenges in implementing VLE in schools. Among the most common issues are the improper facilities, limited support and inadequate maintenance as can be seen in India (Roy, 2012), Namibia (Jackson, Pompe, & Krieshok, 2011) and Bangladesh (M. S. H. Khan, Hasan, & Clement, 2012). In the case of Malaysia, Teaching and Learning International Survey (TALIS) has reported that 53% of schools have insufficient number of computers for educational purposes, 57% do not have Internet access, and 41% still lack the necessary courseware for classroom learning (Bahagian Pendidikan Guru, 2016). This evidenced that limited infrastructure and support services are the major obstructions preventing the usage of ICT in schools.

Most researchers agree that the degree of utilization is a crucial part of IS success (DeLone & McLean, 2003; Eom, Ashill, Arbaugh, & Stapleton, 2012; Iivari, 2005). Although past researchers have introduced various dimensions including user satisfaction (H. H. Chang, Wang, & Yang, 2009; Cheok & Wong, 2014; Dai, Kao, Harn, Yuan, & Chen, 2011), and VLE effectiveness or impact (Eom, 2012; Eom et al., 2012) to evaluate VLE success, these dimensions are abstract, lack actual evidence, and are often being projected in form of usage. In addition, the low utilization of VLE is associated with several different circumstances, as follows.

First, relatively new findings have indicated the refusal of some teachers to keep on using the system. This is not withstanding the fact that they saw the benefits proffered

by the use of VLE (Cheok & Wong, 2016; Jani, Muszali, Nathan, & Abdullah, 2018). DeLone and McLean (2003) have previously argued that initial usage encounters were an important indicator in predicting whether users would be inclined to continue using the system. An enjoyable first use of VLE will subsequently encourage the teachers to utilize it frequently. Secondly, some cross-sectional studies have suggested the association between user satisfaction and the actual usage of VLE (Al-Debei, Jalal, & Al-Lozi, 2013; Eom et al., 2012; Mohammadi, 2015). The implication here is teacher dissatisfaction with the VLE will obviously lead to refusal to use it and thus lowering the usage statistics. In addition, user satisfaction is also related to the overall benefits (net benefits) of using VLE. If teachers deem VLE as beneficial, especially in performing their tasks, this will increase their satisfaction and also strengthen their intention to continue using the system (Al-Debei et al., 2013; DeLone & McLean, 2003). In the meantime, even though the use of VLE among Malaysian teachers is not mandatory, there is a KPI for its usage (Kementerian Pendidikan Malaysia, 2015a) and some school leaders, to a certain extent, have made it compulsory by stipulating minimum hours of usage for their teachers (Cheok & Wong, 2016). In this sense, the level of usage has become less significant and user satisfaction is the most appropriate measure to examine the interaction between end user and the system (DeLone & McLean, 1992).

User satisfaction is usually attributed to the quality dimensions, namely the information, system, and service quality. In terms of information quality, most teachers agree that VLE provides a good platform for information retrieval, sharing and transfer. Besides that, the information delivered by the system is found to be germane to today's

educational environment (Cheok & Wong, 2016; Ummu Salma & Fariza, 2014). Notwithstanding, the issues of system and service quality provided by VLE are consistently debated by previous researchers. Among the most pronounced are poor accessibility (Cheok & Wong, 2016; Norazilawati et al., 2013; Shahaimi & Fariza, 2015), ease of use (Hiong & Umbit, 2015) and poor technical support (Cheok & Wong, 2016). For example, a qualitative case study by Cheok and Wong (2016) revealed that some teachers had voiced their complaints about the poor quality of VLE, which is a sign of dissatisfaction among them. Research on VLE currently are found in abundance. However, verifiable data that illustrates continuous usage and user satisfaction are still visibly lacking. Therefore, the factors behind both of these issues should consequently be studied and rectified.

The latest research on VLE points to the issue of the heavy workload of teachers as a major hindrance of its utilization in schools (Cheok & Wong, 2016; Norazilawati et al., 2013). While the body of research in this area suggests that excessive workload may also have some impact on the use of VLE (Abuhmaid, 2011; Hu, Clark, & Ma, 2003; Inan & Lowther, 2009; Raman & Yamat, 2014), the empirical evidence on this issue is still scarce. Moreover, the existing literature is yet to reveal any attempt to structurally map out the relationship between workload and usage in the context of VLE success. Equally important, the personal characteristics like age, gender and experience are found to be influential on IS adoption (Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012), especially in determining the strength of usage. It is still not clear however, whether these attributes are actually affecting the success of VLE since there has been no credible research indicating their impact one way or

another. This signifies that VLE success predictors have not been adequately studied, making it imperative that further empirical research to determine their effects be conducted. Moreover, this circumstance is incongruent to the prevailing trend in VLE research.

To summarize the aforementioned discussion on the research problem, the current study has identified low usage as the main issue in the implementation of VLE in Malaysia, which is probably attributed to teachers' refusal to continue using the system, user satisfaction, net benefits, heavy workload, the quality dimensions and the influence of personal characteristics. Nevertheless, there is still no rigorous evaluation study to capture the issue. Therefore, the current study seeks to investigate the significant factors contributing to the success of VLE among Malaysian teachers.

1.3 Research Questions

The problem statement presented that teachers in Malaysia are not fully using VLE. However, no research so far has delved into the reasons for this situation, nor any has attempted to identify specifically the factors that influence the VLE success among the teachers. Consequently, the current study seeks to address the following major research questions:

i. Why are the teachers not using the VLE?
ii. Is the modified DeLone and McLean IS Success Model (D&M) suitable for the post-implementation evaluation of VLE?

1.4 Research Objectives

The primary objective of the study is to develop and validate a VLE Success Model among teachers. Therefore, the sub-objectives are:

i. To identify the significant factors that influence Intention to Use of VLE among teachers.

ii. To identify the significant factors that influence Use of VLE among teachers.

iii. To identify the significant factors that influence User Satisfaction of VLE among teachers.

iv. To identify the significant factors that influence Net Benefits of VLE among teachers.

v. To test the moderating effect of personal characteristics on the relationship between Quality Dimensions and Intention to Use of VLE among teachers.

vi. To test the moderating effect of teacher's workload in the relationship between Intention to Use and Use, and Net Benefits to Intention to Use of VLE among teachers.

vii. To test the mediating effect of User Satisfaction in the relationship between Use and Intention to Use VLE among teachers.

viii. To identify the suitable model for post-implementation evaluation of VLE.

1.5 Scope

There are 421,259 teachers scattered across 10,192 public schools throughout Malaysia. However, the study only focus on rural and urban schools in Northern Region of Malaysia (Perlis, Kedah, Penang and Perak) with the estimated population of 96,748 teachers from 2349 schools (Kementerian Pendidikan Malaysia, 2017). The domain of

IS for the study is VLE, using Frog VLE as the case study. The study uses the updated D&M by DeLone and McLean (2003) as the base theory. Table 1.1 simplify the scope of the study.

Table 1.1

Scope of the Study

Scope	
Type of Study	Evaluation of IS Success
Domain of IS	E-learning / Virtual Learning Environment
Type of VLE	Frog VLE
Evaluation Type	Post-Implementation
Theory	The Updated DeLone and McLean IS Success Model.
Field Study	Schools in the Northern Region of Peninsular Malaysia.
Respondents	Teachers

1.6 Motivation of the Study

Based on personal experience as a teacher for eight years in Sekolah Kebangsaan Telanok (JHEOA), Cameron Highlands, the researcher believed that the level of success of VLE is still below the expectation. Even though the 1BestariNet project is now in the second phase of implementation (Kementerian Pendidikan Malaysia, 2016a), the researcher found that it still did not contribute much to the teaching and learning practices among Malaysian teachers. Besides, the researcher believed that the factors of workload (see Hu, Clark, & Ma, 2003; Raman & Yamat, 2014) as well as continuous usage and user resistance (see Hirschheim & Newman, 1988; Hu et al., 2003; Sanchez & Aleman, 2011) are among the major obstacles that hindered teachers

from employing VLE and other EIS. Moreover, this belief is supported by the preliminary study, which indicated that these factors are relevant for further investigations.

1.7 Significance of the Study

The study intends to evaluate the VLE success among teachers that will also represent EIS implementation in general. Thus, the study is significant to be conducted, as it contributes to the theory and practice. Theoretically, this study has expanded the applicability of D&M in evaluating VLE success among teachers. Furthermore, this study has also extended the D&M by (i) examining the role of Workload and Personal Characteristics as the moderating variables, and (ii) using both Intention to Use and Use. The body of literature on D&M thus far only calibrated to the assessment of the existing constructs or with the inclusion of certain external independent variables to fit the issues at hand. Nevertheless, research work that investigated the moderating effects are surprisingly scarce in D&M based literature. Similarly, although Intention to Use is introduced as an alternative for Use (DeLone & McLean, 2003), both of these constructs are still meaningful, particularly to capture the issue of continuous usage.

An effectual application of VLE is contingent on its capacity to meet user requirements and expectations, while simultaneously rewarding the system's users with benefits regardless of where they are located. Thus, the outcome of the study provides input and evidence for Malaysian policy makers especially MOE to design, develop and implement VLE technology in schools. Finally, the study is also beneficial for MOE to spot the weaknesses in the current practice of VLE, for future improvement (Centers

for Disease Control and Prevention, 2014), as well as to justify their investment (Alhendawi & Baharudin, 2014).

1.8 Definition of Terminologies

For the purpose of clarification, the following terminologies are operationally defined according to the context of the study.

i. VLE Success: IS success is a multidimensional and interdependent abstraction that is assessable at various degrees of analysis (DeLone & McLean, 1992, 2003; Molla & Licker, 2001). Therefore, VLE success in the study is defined as the level of satisfaction and the extent of net benefits, which lead to the continuous usage of VLE among teachers.

ii. Educational Information Systems (EIS): EIS usually refers to the information systems implemented at all levels of education including schools and universities. This term is regularly used by several researchers (e.g., Chen, Liu, & Lin, 2014; Lee & Ryu, 2013; Shafique & Mahmood, 2015) as a general reference for all types of IS used for education management as well as for teaching and learning. In the current study, EIS refers to all information systems implemented in Malaysian schools (pre-schools, primary and secondary) such as *Sistem Pengurusan Sekolah* (SPS), *Sistem Analisis Peperiksaan Sekolah* (SAPS) and VLE. More examples of EIS are listed in Appendix C.

iii. Evaluation: Centers for Disease Control and Prevention (2014) defines evaluation as "a systematic process to understand what a program does and how well the program does it." As for IS evaluation, it is understood as a process to measure IS effectiveness (Hamilton & Chervany, 1981a) or IS success (DeLone & McLean,

1992). In the context of this study, evaluation is referred to summative evaluation, or also known as post-implementation evaluation to measure the success of VLE among teachers. Therefore, the term 'Evaluation', 'Summative Evaluation' and 'Post-Implementation' will be used interchangeably in the study.

iv. Virtual Learning Environment (VLE): VLE is defined as "a system that delivers learning materials to students through the Internet. This system includes assessment, student tracking, collaboration and communication tools" (Oxford University Press@Online Resource Centers, 2016). VLE is also defined by Pimentel (1999) as an efficient and effective platform that provides a better learning experience for the student. In addition, VLE is also referred to the "platform that provides virtual access to classes, class content, tests, homework, grades, assessments, and other external resources" (Xchanging, 2014). Therefore, VLE in this study refers to the most recent LMS implemented in schools across Malaysia, known as Frog VLE.

1.9 Organization of the Chapters

This thesis consists of seven chapters organized as follows. Chapter 1 is the introduction part that gives a general overview of the study. This chapter comprises of background of the study, problem statement, research questions and objectives, scope, motivation of the study, significance of the study, and definition of the terminologies. Chapter 2 presents the literature review of all concepts and issues related to the study. This chapter covers the topic of ICT in Education, VLE, IS Evaluation, Overview of Malaysian Education, Overview of IS Theories and Models, IS Success Model, and Gap Analysis. Later, in Chapter 3, the Theoretical Framework, Conceptual Model, Operational

Definition of Constructs and Hypotheses are presented. The Chapter 4 outlines the research methodology that consists of Research Approach, Research Process, Data Collection Procedure and Data Analysis Procedure. The mixed methods approach is adopted to achieve the objectives of the study. Next, the Chapter 5 presents the data analysis and results, while Chapter 6 gives the discussion of results. Finally, the Chapter 7 presents research achievements, research contribution, directions for future research and conclusion of the thesis.

1.10 Summary

In this chapter, synopsis of the study has been presented. It began by highlighting the background of the study that covered the role of ICT in education, followed by the introduction of EIS, LMS, VLE and the concept of VLE success. The entire ideas discussed in this section were briefly presented, and further details are deliberated in Chapter 2. In addition, this chapter also presented the problem statement that justifies the study, followed by research questions and objectives. In the scope section, the dimensions of the study were presented, including the research focus, the location and the population that was investigated. Later, significance of the study was presented to draw out the importance of the study. Finally, this chapter was concluded by definition of terminologies that are used throughout the study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter centers on the deliberation of theories, models, and ideas related to the current study. The review of the relevant literature also discovered previous findings, which provide the basis for the creditability of the models used for this study. The discussion starts with an insight into the perspective of ICT in Education. Next, the topic pertaining VLE in education is examined, followed by evaluation of IS and overview of the schools in Malaysia. The chapter then proceeds with a discussion of the existing IS theories and models as a justification for the selection of the D&M as the theoretical basis for the study.

2.2 ICT in Education

ICT is known as an influential change agent in the society (Ahmadi, Keshavarzi, & Foroutan, 2011; Livingstone, 2012). Various sectors have benefitted from the assimilation of ICT. Moreover, the rapid growth of ICT in every sector has significantly influenced many aspect of humans' daily life, including education (Player-Koro, 2012). ICT in education refers to the process of teaching and learning assisted by certain medium and technology (Peeraer & Van Petegem, 2011; Vanderlinde et al., 2014). It can be divided into two main classifications; synchronous and asynchronous (Oyovwe-tinuoye & Adogbeji, 2013). Synchronous ICT is the usage of multiple technologies such as television, audio graphics, and teleconference that require all participants to gather at a designated place, for instance in the classroom. As for the asynchronous

ICT, the related technology may be of the virtual conferences, multimedia products, and web-based learning formats where participants can be dispersed at a different time and places (Oyovwe-tinuoye & Adogbeji, 2013).

The level of success for integrating ICT in education differs in each country around the world. Certain countries, especially the developed countries, for example, Finland and the United States have proven that ICT is effective in teaching and learning while simultaneously being employed regularly by teachers (Aristovnik, 2012). On the contrary, other countries, especially the developing countries like Malaysia, Nigeria, and Bangladesh are still in the beginning stage of ICT integration, without a clear positive sign of revenue for the investment (M. S. H. Khan et al., 2012; Md Nor & Rashita, 2011; Yusuf, 2005). The integration of ICT into education also triggers controversial debate among scholars, respectively in both disciplines, ICT and education (Ghavifekr et al., 2014). In fact, existing literature from the past 30 years has provided many studies regarding the issues (Underwood & Dillon, 2011). Yet, the consensus concerning the impact of ICT toward education remains unclear (Aristovnik, 2012; Biagi & Loi, 2013; Hinostroza et al., 2011). This can be seen in Table 2.1 that summarizes the positive and negative impacts of ICT integration based on previous studies.

Table 2.1

The Impacts of the ICT Introduction in Education

	Impacts	Authors
Positive Impacts:	i. Potential to empower student (skills and motivation).	(Adu & Olatundun, 2013; Hinostroza et al., 2011; M. S. H. Khan et al., 2012; Narinasamy & Mamat, 2013; Sharifah Nor & Kamarul Azman, 2011)
	ii. Empower teacher (pedagogy skill and access to information).	(Ahmadi et al., 2011; Bidarian, Bidarian, & Davoudi, 2011; Hinostroza et al., 2011; M. S. H. Khan et al., 2012; Oyovwe-tinuoye & Adogbeji, 2013)
	iii. Acts as a transformation agent of schools.	(Adu & Olatundun, 2013; Livingstone, 2012)
	iv. Improve the accessibility and quality of education.	(Adu & Olatundun, 2013; Ahmadi et al., 2011)
	v. Enhance learning environment & communication of teacher-student (e.g. VLE).	(Adu & Olatundun, 2013; Ahmadi et al., 2011; Ghavifekr et al., 2014; Hinostroza et al., 2011; M. S. H. Khan et al., 2012; Livingstone, 2012; Narinasamy & Mamat, 2013; Oyovwe-tinuoye & Adogbeji, 2013; Sharifah Nor & Kamarul Azman, 2011)

Table 2.1 Continued

Negative Impacts:	i. No difference in the approaches of ICT implementation for primary and secondary education.	(Hinostroza et al., 2011)
	ii. Low usage or practice by teachers (resistance).	(Kreijns, Van Acker, Vermeulen, & Van Buuren, 2013; Player-Koro, 2012; Tezci, 2011a, 2011b)
	iii. Contradiction between the policy of implementation and ICT products, artefacts and facilities.	(Livingstone, 2012)
	iv. Unworthy investment (less influence than expected).	(Livingstone, 2012; Romeo, Lloyd, & Downes, 2012)
	v. No evidence that ICT improves education standards.	(Player-Koro, 2012; Rodríguez, Nussbaum, & Dombrovskaia, 2012; Underwood & Dillon, 2011)
	vi. Failed to provide a positive effect on children's cognitive development.	(Sharifah Nor & Kamarul Azman, 2011)

Generally, almost all developing countries faced similar limitations in incorporating ICT into education, which are poor ICT infrastructures and facilities, as can be seen in

the studies conducted by several researchers in Rwanda (Rubagiza, Were, & Sutherland, 2011), Nigeria (Oyovwe-tinuoye & Adogbeji, 2013) and Bangladesh (M. S. H. Khan et al., 2012). However, the infrastructures and facilities limitation cannot be assumed as the only failure contributors for ICT in education. Hence, previous studies in developed countries (most of these countries have sufficient ICT resources, including infrastructure) were more interested in finding other determinants that influence the success of ICT integration in schools, for example, in Australia (Romeo et al., 2012), Belgium (Vanderlinde et al., 2014), and Netherlands (Voogt, Knezek, Cox, Knezek, & Ten Brummelhuis, 2013). A good example is the case of Norway. Even though there is empirical finding that indicates Norway as one of the best countries in terms of ICT sector (Aristovnik, 2012), Wikan and Molster (2011) argued that the country still has certain difficulties to integrate ICT in education despite having the advantage of high-end infrastructures. They further added that one of the possible factors that contribute to the situation is that the teachers did not perceive the value behind it (net benefits), even though their commitment to ICT is at the highest level.

In another case, as demonstrated by Peeraer and Van Petegem (2011) through a study in Vietnam, good infrastructure does not guarantee sufficient outcomes from the introduction of ICT in education. Based on the findings, they suggested that certain factors such as ICT skills, pedagogical skills, and attitude toward ICT have a greater influence in determining the success of ICT integration in education. Similarly, these findings are further supported by two studies conducted in Turkey (Tezci, 2011b; Uslu & Bümen, 2012) which suggested that huge investment in infrastructures and facilities do not guarantee the success of ICT implementation in schools. This implies that the

success of ICT implementation is multidimensional in nature and is not limited to a single factor. Therefore, there is a need for further investigations regarding the issue.

In response to this, several studies were carried out to determine the deciding factors in successful ICT integration in schools. Referring to Table 2.2, it is apparent that majority of the researchers agreed that the social aspect such as personal attributes of teachers (e.g. age, gender, experience, skills, knowledge, and attitude), enabling environments (e.g. ICT policy, workload and leadership style) and professional development (e.g. training and support) are equally important to the technical aspects.

Table 2.2

Issues Related to ICT Integration in Education

Issue	**Authors**
ICT Resources (Infrastructure, Accommodations & Facilities)	(Aristovnik, 2012; Devi, Rizwaan, & Chander, 2012; M. S. H. Khan et al., 2012; Livingstone, 2012; Oyovwe-tinuoye & Adogbeji, 2013; Peeraer & Van Petegem, 2011; Rahman et al., 2013; Rubagiza et al., 2011; Sharifah Nor & Kamarul Azman, 2011; Solar et al., 2013; Surif et al., 2014; Tezci, 2011b; Wastiau et al., 2013)
Policy (government and schools)	(Enrique Hinostroza et al., 2011; Ghavifekr et al., 2014; M. S. H. Khan et al., 2012; Rubagiza et al., 2011; Solar et al., 2013; Erdoğan Tezci, 2011; Vanderlinde et al., 2014; Vanderlinde, Van Braak, & Dexter, 2012; Voogt et al., 2013; Yang, 2012)

Table 2.2 Continued

School leadership style	(Hadjithoma-Garstka, 2011; Livingstone, 2012; Seyal, 2013; Solar et al., 2013; Tezci, 2011a, 2011b; Vanderlinde et al., 2012; Voogt et al., 2013; Wastiau et al., 2013)
Skills and training	(Devi et al., 2012; Ghavifekr et al., 2014; M. S. H. Khan et al., 2012; Narinasamy & Mamat, 2013; Oyovwe-tinuoye & Adogbeji, 2013; Peeraer & Van Petegem, 2011; Sharifah Nor & Kamarul Azman, 2011; Surif et al., 2014; Tezci, 2011a, 2011b; Uslu & Bümen, 2012; Vanderlinde et al., 2014; Wastiau et al., 2013; Wikan & Molster, 2011)
Attitude (including resistance and readiness)	(Devi et al., 2012; Ghavifekr et al., 2014; M. S. H. Khan et al., 2012; Kreijns et al., 2013; Peeraer & Van Petegem, 2011; Player-Koro, 2012; Rahman et al., 2013; Sharifah Nor & Kamarul Azman, 2011; Tezci, 2011a, 2011b; Uslu & Bümen, 2012; Wastiau et al., 2013; Wikan & Molster, 2011; Yang, 2012)
Technical support and maintenance	(M. S. H. Khan et al., 2012; Oyovwe-tinuoye & Adogbeji, 2013; Rahman et al., 2013; Solar et al., 2013; Surif et al., 2014; Tezci, 2011b; Wastiau et al., 2013)
Teachers' workload	(M. S. H. Khan et al., 2012; Oyovwe-tinuoye & Adogbeji, 2013; Rahman et al., 2013)
Personal characteristics	(Abdulwahab & Zulkhairi, 2012; Alba & Hutchinson, 1987; Cheok & Wong, 2016; Venkatesh et al., 2003, 2012)

In Malaysia's context as one of the developing countries that is affected by the implementation of ICT in education, the use of ICT tools are considered vital in several aspects such as:

i. School administration (Mohd Faizal, Muhammad, & Sulaiman, 2014; Sektor Operasi Pendidikan, 2015; Zawiyah & Mariah, 2008).
ii. Management of educational data (Mohd Faizal et al., 2014; Norin Farizah, 2013; Sektor Operasi Pendidikan, 2015; Zawiah & Mariah, 2008).
iii. An alternative communication medium between school and parents, *Pejabat Pendidikan Daerah* (PPD)*, Jabatan Pelajaran Negeri* (JPN) and MOE (Mohd Faizal et al., 2014; Norin Farizah, 2013; Sektor Operasi Pendidikan, 2015).
iv. A tool in strengthening the standard of teaching and learning (Narinasamy & Mamat, 2013; Rahman et al., 2013).

Studies conducted by Malaysian researchers shared similar characteristics with international studies, whereby majority of them highlighted the aspect of teaching and learning as shown in Appendix D_1.

2.3 Educational Information Systems

The role of teachers has expanded over the years because of school's transformation toward a new era of education. For example, competency in computer and Internet utilization has become the basic requirement for teachers nowadays. In addition, dealing with data, information and files are among extra workload for the teachers. Therefore, ICT is identified as one of the tool to facilitate the process. Nowadays, many ICT innovations have been introduced to improve the quality of education, including

EIS. Generally, EIS refers to any information systems that are implemented in various stages of education, including schools and higher institutions (Y.-T. Lee & Ryu, 2013).

The main objective of EIS implementation in Malaysian schools is to augment the procedure of teaching and learning as well as to facilitate education management. Thus, EIS can be divided into two categories; (i) teaching and learning (e.g., i-THINK and Frog VLE) – usually consist of e-learning systems, and (ii) education management (e.g., SPS and APDM) (Kementerian Pendidikan Malaysia, 2013; Surif et al., 2014). As a part of ICT integration in education, EIS offers unlimited opportunities for educators (teachers and school administrators) to explore the potential of ICT. Moreover, it is one of the means to facilitate teachers in dealing with various types of data, while concurrently improving the environment of classroom education. Appendix C lists some examples of EIS that are implemented in Malaysian schools.

An increasing number of research have recognized the importance of EIS in school education. At the international level, EIS has become the subject of interest for many researchers from the education and IS domain. For example, Islam (2014) has conducted a study to investigate the factors that influence user satisfaction and dissatisfaction during post-adoption usage of LMS. The finding has shown that user satisfaction is caused by environmental and job-specific factors. In another study, the implementation of Education Management Information System (EMIS) has become an extra workload for Pakistan teachers, due to poor implementation strategies, including manual database integration and backups, delay in planning and decision making, and poor system quality (Bhatti & Adnan, 2010). Notwithstanding, Y.-T. Lee and Ryu

(2013) claimed that EIS has produced ample benefits to the teachers, for example, reducing workload, enhancing teachers' satisfaction and building trust between teachers and parents. Correspondently, further analysis of those studies has suggested that the quality of planning and implementation strategies are influential in determining the outcomes, whether the particular EIS is accepted as a success or failure by teachers.

Nevertheless, EIS studies in Malaysia especially under the school environment are still scarce. Moreover, the existing EIS studies in Malaysia tend to focus on VLE system (see Appendix D_2), with only a few studies explored another type of EIS, including *Sistem Maklumat Murid* (SMM), *Aplikasi Pangkalan Data Murid* (APDM) and *Sistem Pengurusan Sekolah* (SPS) (Anuar & Mohd Nordin, 2015; Mohd Faizal et al., 2014; Norashikin, Mohd Jasmy, Norahsikin, & Mohd Jasmy, 2014; Norin Farizah, 2013). Majority of these studies focused on two mainstreams of EIS research, which are pedagogy and adoption. In the aspect of adoption, a number of local researchers have chosen to examine the acceptance of EIS such as SMM and APDM (Norin Farizah, 2013), SPS (Norashikin et al., 2014) and Frog VLE (Hiong & Umbit, 2015; Kaur & Hussein, 2015; Mohd Rosli, Maarop, & Narayan Samy, 2015; Saiful Afzan et al., 2014). The literature analysis of recent EIS studies also unveiled Technology Acceptance Model (TAM) as the most frequently applied model by the local researchers (Cheok & Wong, 2014; Hiong & Umbit, 2015; Kaur & Hussein, 2015; Mohd Rosli et al., 2015; Norashikin et al., 2014; Norin Farizah, 2013), while several other prominent models and theories such as Unified Theory of Acceptance and Use of Technology (UTAUT) , D&M, Theory of Reasoned Actions (TRA) and Theory of Reflective Model have also been recorded.

On the other hand, the aspect pedagogy has also attracted a large number of researchers (Campbell et al., 2015; Cheok & Wong, 2016; Nor Azlah & Fariza, 2014; Norazilawati et al., 2013; Ummu Salma & Fariza, 2014). However, the evaluation studies that measure EIS success is unavailable thus far. Although some researchers (Cheok & Wong, 2014; Mohd Faizal et al., 2014; Thah, 2014) have evaluated certain aspect of EIS success like user satisfaction, net benefits, and system quality, their attempts are still unsatisfactory. This is mainly due to the fact that the success of IS involves interdependent constructs, and therefore should be measured together to maintain its nature of interdependency (DeLone & McLean, 2003).

2.4 Virtual Learning Environment

Virtual Learning Environment is a type of e-learning system that is implemented in various educational settings such as universities, training centers and schools to systematically support the online learning and administration (Mueller & Strohmeier, 2011). It is universally identified as an Internet-based platform that underpins different educational undertakings, including online courses, quizzes, and tutorials (Abdelhag & Osman, 2014; Jain, 2015). VLE has positively influenced educational technology administration, teaching and learning flexibility as well as digital proficiency among the stakeholders (Nor Fadzleen & Halina, 2013). VLE usually uses Web 2.0 technology that could support distance learning as well as blended learning (Abdelhag & Osman, 2014). Consequently, the implementation of VLE technology in education has positively affected parents, students, and teachers (Nor Fadzleen & Halina, 2013) by encouraging dynamic learning particularly in terms of removing the obstacles of time and locality (Uzunboylu, Bicen, & Cavus, 2011). Moreover, it also gives users the

ability to reciprocally communicate with each other, in both techniques, synchronous and asynchronous (Halonen et al., 2010). Therefore, Piccoli, Ahmad, and Ives (2001) have concluded that the application of VLE technology in education has greatly changed the essence of conventional learning in six facets; time, place, space, technology, interaction, and control. Besides that, the reputation of VLE as a well-established technology that is implemented in schools worldwide has positively facilitated the process of knowledge retrieval and online learning management (Nor Fadzleen, Halina, & Haliza, 2013).

The implementation of VLE technology in Malaysia, known as Frog VLE was a part of EIS expansion initiated by the MOE through 1BestariNet project to improve the previous version of SchoolNet service (Kementerian Pendidikan Malaysia, 2014). The MOE's purpose is to connect about 10,000 schools across the country through a cloud-based virtual learning environment, supported by high-speed 4G Internet connections by the end of 2013 (Frogasia, 2012; Kementerian Pendidikan Malaysia, 2012a; Norazilawati et al., 2013). Furthermore, the main objective of Frog VLE is to transform the Malaysian education platform while at the same time to reduce the digital divide between urban and rural schools by connecting them via virtual learning community (Xchanging, 2014). Viewed as an investment for the long haul, the 1BestariNet (including Frog VLE) execution is predicted to be used for at least 13 years and MOE believes that it will change the Malaysian education landscape by advancing an enduring utilization of ICT in both facets of pedagogy as well as education management (Cheok & Wong, 2014; Nor Fadzleen & Halina, 2013; Norazilawati et al., 2013). Indeed, Frog VLE that is adopted from the United Kingdom has an astonishing success

record of 13 years and is currently adopted by many countries across the globe (Nor Azlah & Fariza, 2014). Figure 2.1 illustrates the architecture of Frog VLE technology in Malaysia.

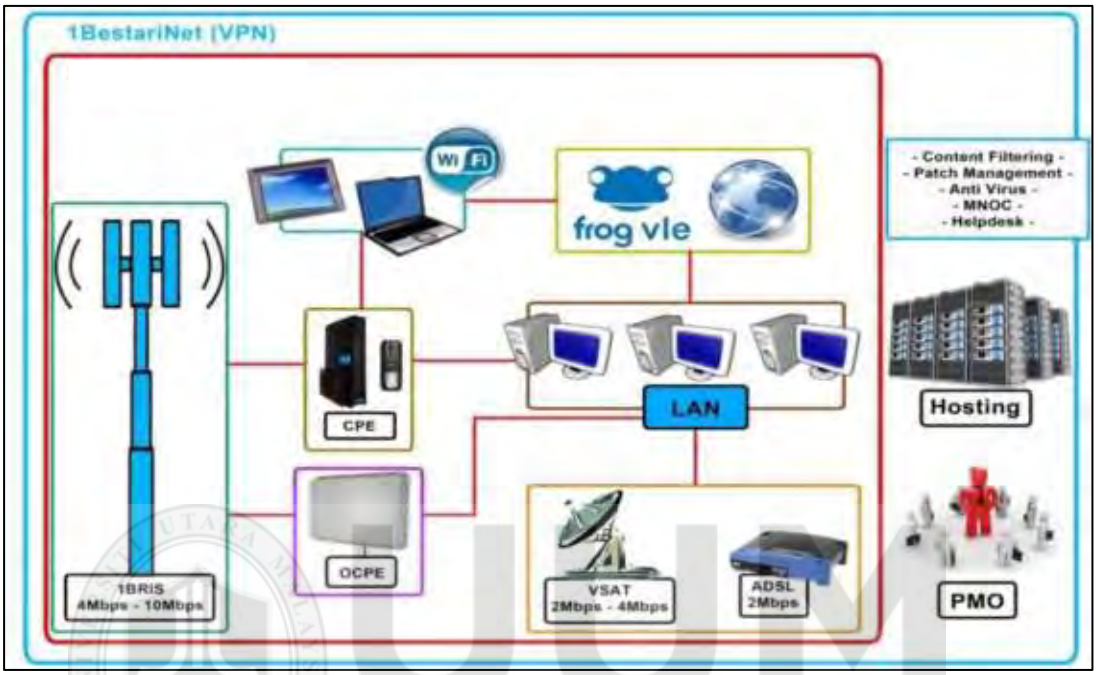


Figure 2.1. Frog VLE Architecture. Illustration adapted from Kementerian Pendidikan Malaysia (2014).

Although Frog VLE has a reputation of successful implementation in several countries such as the United Kingdom, United States of America, Hong Kong and Singapore (Norazilawati et al., 2013), it is considered as a new experience for a developing country like Malaysia and therefore the full potentials are yet to be discovered (Ummu Salma & Fariza, 2014). From the literature, previous researchers have listed several opportunities offered by Frog VLE. First, Frog VLE offers more convenience learning experience by integrating both conventional and virtual learning methods (Nor Azlah & Fariza, 2014). For example, the quiz and assessment can be conducted anytime and anywhere, unlike traditional classroom-based learning. Hence, it gives the teachers and

students' flexibility while at the same time provide motivations for both sides. Second, Frog VLE provides a better platform for a parent to supervise student's learning activity (Nor Azlah & Fariza, 2014), as it allows parents to communicate with teachers and monitor the school's activity. Third, the Frog VLE also offers a great medium for many kind of collaborations, including teachers to teachers, teachers to parents, and teachers to students (Nor Fadzleen & Halina, 2013; Norazilawati et al., 2013). The ability to discuss, collaborate and share resources are probably among the most interesting part of Frog VLE that will further lead to enhancement of intellectual composition, as well as improvement of pedagogical practices toward more captivating and interactive methods (Nor Fadzleen et al., 2013). Some of the functions and features of Frog VLE are illustrated by the following examples (Frogasia, 2013).

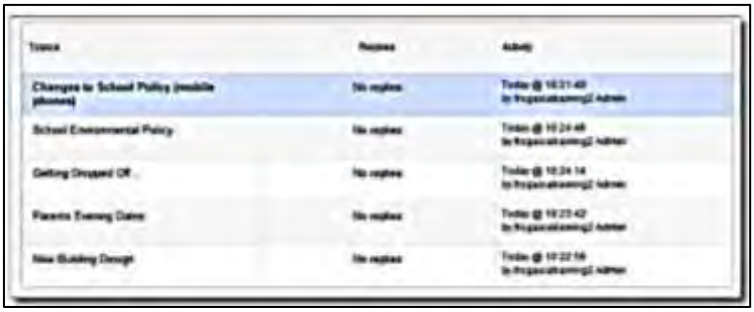
a) Assignments (Assessment)

There are three types of users for this features namely teachers, students and Frog Administrator. This feature allows teachers to distribute, mark, comment and modify the assignment online.

b) School Documents (Education Management)

This function is specifically designed to allow teachers to manage and share educational documents with other teachers and students.

c) Forum (Communication)



The Forum enables teachers and students in the particular school to discuss a certain topic that has been created by Frog Administrator. Every information has date to allow teachers to check the participant of the discussion.

d) Sites (Information)

This feature enables teachers to manage the sites that have been created in Frog VLE and will be listed in “My Sites” under the “Resource Manager”. These sites are used to provide information to other Frog VLE users, particularly among students.

e) Resource Manager (Educational Resources)

Resource Manager is the main application that enables teachers to access, store, modify, share and create the resources via Frog VLE. There are several sections of this application such as Latest Files, Favorites, My Documents, Applications, Schools Documents and Lesson Resources.

Interestingly, Malaysia has been acknowledged as the first country in the world that employs Frog VLE at the nation-wide scale. Through this initiative, an entire nation will be united under a single cloud-based learning environment, which involves approximately 5 million students, 500,000 teachers and 4.5 million parents (Xchanging, 2014). This enormous investment is therefore hoped to eliminate the gap between urban and rural education and further transform Malaysia to the next generation of education.

However, it is not easy to equally deliver world-class digital education to over 5.5 million children scattered across 10,000 schools, over 329,847 square kilometers (Xchanging, 2014). The present evidence has demonstrated the low usage of Frog VLE among teachers, students, and parents (Shahaimi & Fariza, 2015). The indication of this can be clearly seen in the report of studies and observation by the Education Technology Division, MOE that exhibits most of teachers only use VLE between one to five times in a month (Bahagian Teknologi Pendidikan, 2017). Correspondently, the

adoption issues such as technical aspects, training, and monitoring were identified as major hindrances that possibly lead to low usage of Frog VLE (Norazilawati et al., 2013). In addition, a number of researchers have highlighted the issue of excessive workload that could possibly hinder the teachers from using Frog VLE (Cheok & Wong, 2016; Norazilawati et al., 2013).

On the contrary, Norazilawati et al. (2013) stated that VLE technology is common and had been successfully implemented in other countries such as Finland (Halonen et al., 2010), Slovakia (Burgerova & Cimermanova, 2014), United Kingdom (Broadie, 2010), Portugal (Loureiro, Messias, & Barbas, 2012) and Middle East (Abdelhag & Osman, 2014). Therefore, further investigation of the factors of VLE success is urgently needed, in order to improve its implementation in Malaysia as well as to justify MOE's investment. Appendix E_1 summarized previous studies on VLE in Malaysia. From the analysis of studies provided in this table, it is apparent that most of the studies conducted thus far have overlooked the aspect of post-implementation evaluation of VLE. This tendency of research indicates that an evaluation study is necessary to understand further the concept of VLE success.

2.5 Evaluation of Information Systems

Evaluation of IS is a systematic procedure to measure the impact of IS implementation based on two common features; effectiveness and success. Frequently, evaluation is closely associated with the effectiveness of the program (Centers for Disease Control and Prevention, 2014; Kizlik, 2012; Lee, 1999; National Science Foundation, 2002; Skeff, 1988; Suchman, 1990). As in the context of IS evaluation, Hamilton and

Chervany (1981a) suggested that there are two viewpoints to consider pertaining the definition and measurement of IS effectiveness as shown in Table 2.3 below.

Table 2.3

Viewpoints of Information Systems Evaluation

No	Type of View	Description
1.	Goal-Centered View	To measure the effectiveness based on pre-determined objectives of the system.
2.	System-Resource View	The effectiveness is measured based on resource viability, for example, job satisfaction.

Note. Adopted from Hamilton & Chervany (1981a).

As mentioned previously, the main aim of conducting IS evaluation is to assess the success and failure of the IS implementation (Hornik & Yanovitzky, 2003; Pangaro, 2005; Suchman, 1990). Complementary to this opinion, scholars agree that the effectiveness and success convey similar perspective in IS evaluation (DeLone & McLean, 1992, 2003; Hamilton & Chervany, 1981b). Moreover, the two views of IS evaluation in Table 2.3 are crucial in assessing IS effectiveness, whether a success or vice versa (Hamilton & Chervany, 1981a). Another essential point is that the effectiveness and user satisfaction (one of the important determinants in IS success) are the positive consequences of good IS implementation (Aggelidis & Chatzoglou, 2012). Hence, it can be concluded that evaluation is a critical process in every IS implementation. Reports produced by the evaluation will be a precious information, particularly for stakeholders and developers, especially for the purpose of

improvisation and debug as well as a guideline to design appropriate training for the end users (Cheok & Wong, 2014; Sun, 2013).

Traditionally, there are two major types of evaluation, formative and summative. Formative evaluation is conducted during the implementation of the program while summative evaluation is typically held after the implementation (Centers for Disease Control and Prevention, 2014; Kizlik, 2012; Lee, 1999; National Science Foundation, 2002; Pancer & Westhues, 1989; Pangaro, 2005; Skeff, 1988). There are two basic approaches currently being adopted in formative evaluation research. One is the need assessment approach and the other is process evaluation. According to Centers for Disease Control and Prevention (2014), need assessment refers to the feasibility analysis (how extreme the need is and how to achieve the need), whereas the process evaluation indicates the progress of the program (in this case, it refers to the development process of IS). In general, the key characteristics of formative evaluation are; first, it is conducted during the process/development and second, it measures the quality of the system and support provided during the implementation (Hamilton & Chervany, 1981a; E. B. Lee, 1999; Pancer & Westhues, 1989).

On the other hand, summative evaluation is also known as an outcome or impact evaluation (National Science Foundation, 2002), and hence, these two types of evaluations convey identical meaning. However, the aforementioned characteristics of evaluation are in contrast with the idea of Centers for Disease Control and Prevention (2014) that describes outcome evaluation and impact evaluation in two distinctive perspectives. In the same sense, they further added that outcome evaluation measures

short-term outcomes while impact evaluation focuses on long-term results. Table 2.4 simplifies the categories of evaluation according to Centers for Disease Control and Prevention (2014).

Table 2.4

Evaluation Types

Program Stage	**Before Implementation**	**During Implementation**	**Post Implementation**	**Mature IS**
	Formative		**Summative**	
Evaluation Type	Need Assessment	Process Evaluation	Outcome Evaluation	Impact Evaluation

Note. Adapted from Centers for Disease Control and Prevention (2014).

It has been shown that both types of evaluation will provide a useful evaluative report in IS implementation (Hamilton & Chervany, 1981a; Skeff, 1988). However, for evaluating the VLE in Malaysia, summative evaluation (impact evaluation) is the most appropriate to choose, especially to evaluate the system that is already in the implementation phase.

ICT plan has become a requirement for schools nowadays (Solar et al., 2013). This plan typically consists of a series of strategies in implementing ICT for both teaching and learning as well as education management. Unfortunately, Solar et al. (2013) stressed that the evaluation is usually the weakest component of ICT plans. As described in the earlier section, the quality of ICT plan, either in schools or in a higher level of decision

maker, is known as the major factors in determining the successful of ICT implementation (see Bhatti & Adnan, 2010; Y.-T. Lee & Ryu, 2013). However, the evidence from the literature till now have demonstrated that evaluation is the most uncertain part of ICT plan (Liang & Wang, 2009), which is always taken for granted by the developers and stakeholders (Hamilton & Chervany, 1981a; Solar et al., 2013).

Similarly, the evaluation of VLE, especially at the school level thus far did not receive adequate attention from the stakeholders. In the case of Malaysia, MOE has invested a huge amount of budget for the VLE initiative. Hence, without proper post-implementation evaluation, it would be difficult for them to justify their investment (Alhendawi & Baharudin, 2014) and to look for current weaknesses that can be a guideline for future improvement (Centers for Disease Control and Prevention, 2014; Thah, 2014). Moreover, Ramayah, Ahmad, and Lo (2010) argued that despite the huge investments, the VLE would be deemed as a failure if it is not fully utilized by the teachers, or did not produce expected benefits.

The literature analysis also uncovered the various evaluation models used to evaluate different types of EIS, including VLE. Among those are Technological Pedagogical and Content Knowledge (TPACK) framework (Campbell et al., 2015), IS Success/Impact Measurement Framework (Alkhalaf, Drew, AlGhamdi, & Alfarraj, 2012), Educational Technology Evaluation Model (ETM) (Almrashdeh, Sahari, Zin, & Alsmadi, 2011), combination of TAM and D&M (Dai et al., 2011; Elmorshidy, 2012) and D&M (Halonen et al., 2010; Mohd Faizal et al., 2014; Yengin, Karahoca, & Karahoca, 2011). In light of this, Eom et al. (2012) suggested that D&M is the most

appropriate model to measure the success of VLE. However, the studies still indicated the need to produce an evaluation model that fits the specific context, especially to measure usage, intention to use, user satisfaction and the benefits of using VLE (Almrashdeh et al., 2011). Therefore, the current study aims to contribute to the body of knowledge in e-learning research stream by developing the evaluation model based on the updated D&M, which will be useful to evaluate VLE success among teachers.

2.5.1 Information Systems Project Management

Information Systems project management is usually associated with three main concepts, namely Information System Development (ISD), Systems Development Life Cycle (SDLC) and Project Life Cycle (PLC). ISD is a process of implementing IS that involves a systematic series of steps such as analysis, design, implementation, introduction and sustained support (Mursu, Soriyan, Olufokunbi, & Korpela, 2000). This definition is supported by Turban, Rainer, and Potter (2003) who mention that ISD is a whole set of the process for system development, as a solution to organization or business requirements. This process also includes the activities of project management, quality assurance, and system process improvement (Mursu et al., 2000). On the other hand, SDLC is broadly understood as a framework of ISD process (Turban et al., 2003). This framework usually consists of the stages as discussed by Mursu et al. (2000) and numerous activities within each stages (Haag & Cummings, 2009). Finally, SDLC is also accepted as a part PLC. While PLC focuses on the management of project resources, tools and human resources, SDLC generally focuses on developing and implementing the IS (Marchewka, 2015), as illustrated in Figure 2.2.

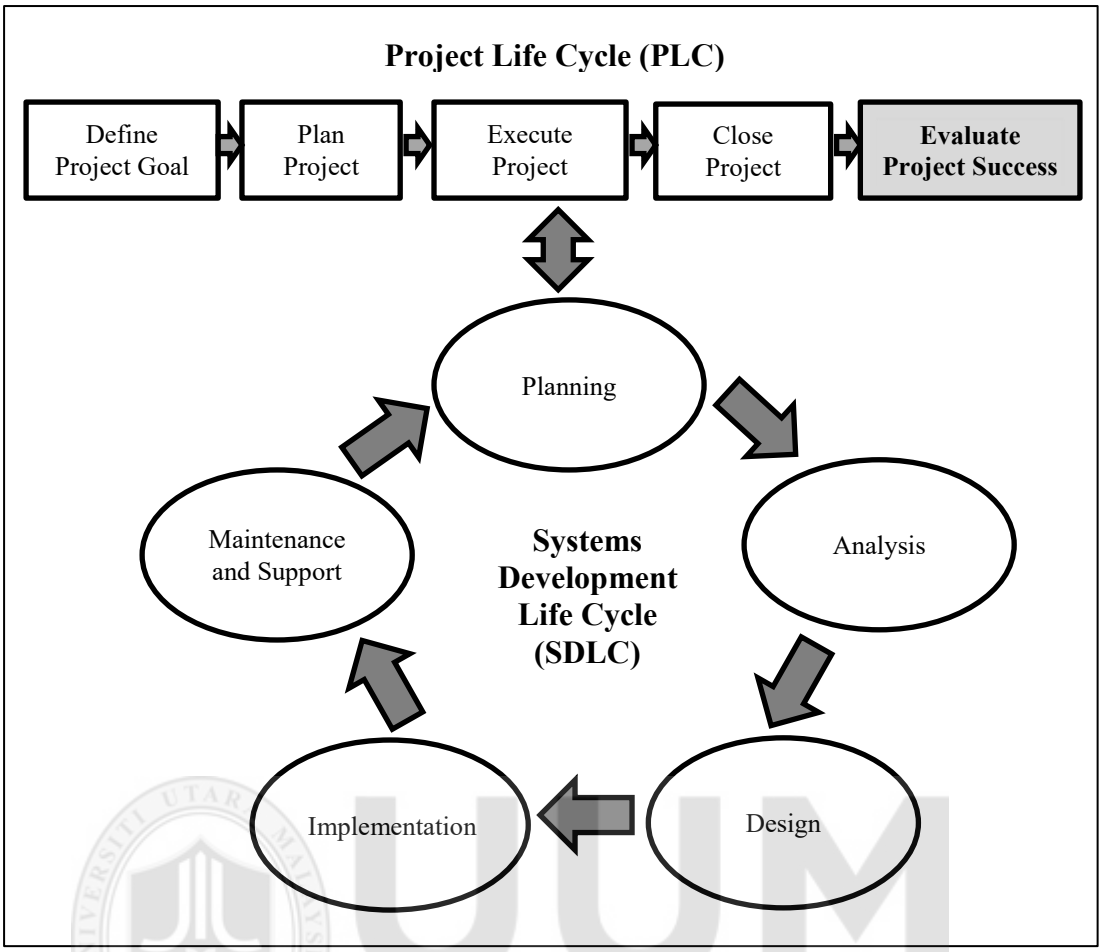


Figure 2.2. The PLC and SDLC (Marchewka, 2015).

The IS evaluation is required to avoid unrealistic expectation among users and to analyze the complexity of the problems (R. H. Adams & Ivanov, 2015). The evaluation appears in every stage of SDLC (Kocherla, 2010; McLeod & MacDonell, 2011; Seth, Goyal, & Kiran, 2015), and it will require user involvement if it is conducted during post-implementation stage (Hamilton & Chervany, 1981b; McLeod & MacDonell, 2011). Evaluation should be conducted after users are familiar with the IS, or during post-implementation stage (McLeod & MacDonell, 2011). Within the perspective of PLC, the evaluation of IS commonly took place at the last stage or after the delivery of the particular IS to evaluate the implementation success (Kocherla, 2010; Marchewka, 2015).

Nevertheless, in Malaysian environment, ISD process stops after the implementation by abandoning post-implementation issues and feedbacks. As evidence, the research carried out by Norshita et al. (2010) found that the development of IS is considered a success when it reaches the implementation stage. Consequently, the implementation of IS without further follow-up actions thus somehow will expose the IS to resistance or rejection by the end-users (Seth et al., 2015). Hence, the study to address this knowledge gap by investigating post-implementation issues of VLE. Furthermore, the evaluation is essential to measure the outcomes that IS offers to the field (Halonen et al., 2010). The evaluation process will enable the IS developer to spot the weaknesses, planning remedial actions and guide them for future improvement (Kocherla, 2010).

2.5.2 The Success and Failure of Information Systems

In the IS research discipline, various interpretations of IS successes and failures are available. Similarly, the prominent scholars within the last two decades have stressed that the IS success is a common notion in IS studies and yet the concept is difficult to be defined precisely (Dwivedi et al., 2014; Molla & Licker, 2001). Therefore, diversified definitions are obtained from previous studies. One possible explanation for this phenomena is probably due to the fact that different researcher may address the different perspective of success, for example, technical and social aspect (Agourram, 2009; DeLone & McLean, 1992; Dörr, Walther, & Eymann, 2013). Table 2.5 explains the various definitions of IS success and failure by several authors.

Table 2.5

Definitions of IS Success and Failure

Concept	Definition
IS Success:	i. IS that meets the needs of the users and improve satisfaction with the system (Aggelidis & Chatzoglou, 2012). ii. A measure of the extent to which an IS evaluator trusts the stakeholder is in an ideal situation (Alali & Salim, 2011). iii. The level of user acceptance and intention towards a regular utilization of the system (Al-Debei et al., 2013). iv. Achievement of expected consequences of IS (Eom et al., 2012).
IS Failure:	i. Abandoned or exceeded budget (money and time) project or project that fails to fulfil the requirement and the objectives. This failure resulted in management flaws and unorganized ISD process (Norshita et al., 2010). ii. Totally abandoned project (Ewusi-Mensah, 1997). iii. Failure of IS that caused by improper organization management and socio-technical aspects (Goulielmos, 2003).

Despite various definitions derived by past researchers, one general assumption can be generated is that the success or failure of IS will be decided by the outcomes, impacts or net benefits it produced to users. The positive impact will promote the sustainable usage of IS and lead to success whilst the negative impact will cause failure. Moreover, past literature also discloses several factors that may determine the success and the

failure of IS. Table 2.6 describes some of the factors of IS success and failure, extracted from the previous studies.

Table 2.6

Factors of IS Success and Failure

No	Factors	Source(s)
1.	User satisfaction	(Mohd Faizal et al., 2014; Yengin et al., 2011)
2.	Meaningful user involvement	(Halonen, 2011; Mohd Faizal et al., 2014; Pekkola, Kaarilahti, & Pohjola, 2006; Sun, 2013; Yeo, 2002)
3.	Ability to adapt to the user environment	(Langer, 2012)
4.	Policy, management, and leadership	(Ewusi-Mensah, 1997; Goulielmos, 2003; A. R. Khan, Hadi, & Ashraf, 2013; Paré, Sicotte, Jaana, & Girouard, 2008; Robinson, 2008; Warne, 1998; Yanyan & Cuifeng, 2010; Yeo, 2002)
5.	Infrastructure and user's attitude	(Ewusi-Mensah, 1997; Goulielmos, 2003; Hassel & Dean, 2015; A. R. Khan et al., 2013; Konyana & Konyana, 2013; Patil, Dhere, & Pawar, 2009; Robinson, 2008; Roy, 2012; Shafique, 2013; Tambunan, 2014; Wallet & Valdez, 2014; Yanyan & Cuifeng, 2010)
6.	Economy	(Ewusi-Mensah, 1997; Yanyan & Cuifeng, 2010)
7.	Proper documentation	(Nasution & Weistroffer, 2009)

Table 2.6 Continued

8.	Proper training of end users	(A. R. Khan et al., 2013; Konyana & Konyana, 2013; Robinson, 2008; Zawiyah & Mariah, 2008)
9.	Quality (system, information, service)	(Aggelidis & Chatzoglou, 2012; Al-Debei et al., 2013; DeLone & McLean, 2003)

Regarding the particular factors, it can be concluded that the IS success and failure is determined by socio-technical aspects (human factors and technological factors). Moreover, Dennis et al. (2009) stated that IS project is at a great risk of failure when the developer tries to build a wonderful system without proper knowledge of how IS will fit into the organization, and how it will provide value or benefits for the users. In a major study, McLeod and MacDonell (2011) have elaborated a clear example of how different interpretation of success between stakeholders and end-users may lead to IS failure. They found that in some cases, the IS is accepted as a success by stakeholders, but as a failure by its users. More importantly, this scenario proved that the stakeholders and the end users might have different definitions of success. However, the users always have greater authority in determining the success and failure of IS (McLeod & MacDonell, 2011). Moreover, IS is not necessarily a success when it reaches the implementation stage (Norshita et al., 2010), but it is considered as a success when accepted by the users. In other words, it is determined by the benefits of that particular IS conveyed to the users and the organizations (Dennis et al., 2009). If the IS failed to fulfil the requirement, it will be continuously resisted by the users, and finally, lead to total abandonment (McLeod & MacDonell, 2011). Thus, these elements are worth to be considered in every IS project to reduce risk of failure.

2.5.3 Previous Works on IS/EIS/VLE Evaluation

IS success was comprehensively studied by many researchers (Abia & Brown, 2015; Ainin, Bahri, & Ahmad, 2012; Al-Debei et al., 2013; Alali & Salim, 2011; Alia, 2014; Alkhalaf et al., 2012; Almrashdeh et al., 2011; Bruce Ho, Denis Yang, & Victor Hung, 2015). Furthermore, factors determining the success and failure of IS has been investigated by a large and increasing number of research, which frequently focuses on evaluating the success after the implementation (Kocherla, 2010).

In recent years, the studies of IS evaluation has been conducted across multiple areas, including healthcare, human resource, e-government, and education. Furthermore, several attempts were made to develop a new model or a new perspective of IS evaluation. In addition, a number of researchers have conducted a Systematic Literature Review (SLR) on IS evaluation topic (Abia & Brown, 2015; Dörr et al., 2013). Similarly, Dwivedi et al. (2014) have produced another interesting study by suggesting the future direction of research in IS success and failure based on literature review and discussion with IS experts. Collectively, all of these studies provide meaningful direction for researchers that are interested in IS evaluation and IS success studies.

As discussed earlier, the effectiveness and success are the general criteria of IS evaluation that has been collectively agreed by the majority of scholars (DeLone & McLean, 1992, 2003, Hamilton & Chervany, 1981b, 1981a). Therefore, almost all of these studies, regardless of their domain are referring to these two aspects in evaluating the IS. Table 2.7 summarizes the overall studies on IS evaluation across various domains.

Table 2.7

Summary of IS Evaluation Studies

Domain	**Authors**
Healthcare IS	(Aggelidis & Chatzoglou, 2012; Alali & Salim, 2011)
Human Resource Management IS	(Davarpanah & Mohamed, 2013; Hosnavi & Ramezan, 2010)
Industrial & Services IS	(Baraka, Baraka, & EL-Gamily, 2013; Belkhamza & Wafa, 2011; Bruce Ho et al., 2015; Davarpanah & Mohamed, 2013; Göğüş & Özer, 2014; Hazen, Huscroft, Hall, Weigel, & Hanna, 2014; Hosnavi & Ramezan, 2010)
E-Government	(Iskender & Ozkan, 2015; Jafari, Ali, Sambasivan, & Said, 2011; Jing, Wenting, Fan, & Yang, 2014; Khayun & Ractham, 2011; Khayun, Ractham, & Firpo, 2012)
Educational Information Systems	(Alkhalaf et al., 2012; Almrashdeh et al., 2011; Campbell et al., 2015; Dai et al., 2011; Elmorshidy, 2012; Eom, 2012; Eom et al., 2012; Halonen et al., 2010; Mohd Faizal et al., 2014; Yengin et al., 2011)
Web Sites and Portals	(Ainin et al., 2012; Al-Debei et al., 2013; Cheng, 2014; Lwoga, 2013; Zhu, Lee, Kuo, & Lin, 2013)

The studies of IS evaluations listed in Table 2.7 above are just a few examples to depict some of the popular domains within the IS discipline. As suggested by Benbasat and Zmud (2003), IS is inter-discipline research, therefore, the domain is unlimited.

Equally important aspect in IS evaluation research is the respondent of the study. The literature has exhibited that most of the IS evaluation researchers use the end users as respondent or sample of the studies (Aggelidis & Chatzoglou, 2012; Ainin et al., 2012; Eom, 2012; Hosnavi & Ramezan, 2010; Mohd Faizal et al., 2014). This is in line with the statement of McLeod and MacDonell (2011) who mention that users have the greatest authority in determining the success and the failure of IS. Furthermore, Aggelidis and Chatzoglou (2012) also suggest that user satisfaction is one of the critical determinants in IS evaluation, that is commonly measured by several criteria as shown in Table 3.6. User satisfaction will justify the effectiveness, that usually leads to either acceptance or resistance to the particular IS. Thus, the study pursues the approach of majority scholars by selecting the end users as respondents who will provide useful feedback for the study.

Occasionally, IS researchers use model or theory as a basis, especially for quantitative studies. For IS evaluation studies, there are numerous available models that can be applied. Indeed, most of them are empirically tested, globally established and proved to be effective in evaluating the IS. Some of the models are developed specifically for a certain domain, whereas some others are applicable across the domains. To elaborate, the models such as VLE Effectiveness Model (Piccoli et al., 2001), Educational Technology Evaluation Model (ETM) (Almrashdeh et al., 2011) and E-Commence

Success Model (Molla & Licker, 2001) are the models that are specifically developed for certain domains. On the other hand, there are also models and theories that applicable to various domains, for example, End-User Computing Satisfaction Model (Aggelidis & Chatzoglou, 2012; Doll & Torkzadeh, 1991), Socio-Technical Theory (Alter, 2015; Bostrom & Heinen, 1977), Bailey and Pearson Model (Bailey & Pearson, 1983) and D&M (DeLone & McLean, 1992, 2003).

In most cases, the research models are applied either by adapting or by adopting. Some researchers, for example, Baraka et al. (2013), Almrashdeh, Sahari, Zin, and Alsmadi (2011), Eom et al. (2012) and Sørum et al. (2012) have decided to adopt the model in their studies. The possible explanation is that they might think that the existing model is appropriate for their context of studies. However, some researchers may adapt the model by modifying, extending or combining it with other models to fit the context of their studies (Aggelidis & Chatzoglou, 2012; Ainin et al., 2012; Alia, 2014; Eom, 2012; Hosnavi & Ramezan, 2010). Therefore, new models are produced at the end of the study. Based on the literature review, it can be concluded that D&M (DeLone & McLean, 1992, 2003) is the most established model in IS evaluation studies. This model has been empirically tested across various domains, including EIS (Elmorshidy, 2012; Eom et al., 2012; Halonen et al., 2010; Mohd Faizal et al., 2014; Yengin et al., 2011). Thus, it is the most suitable model to apply in the current study.

Despite the increasing interest of EIS evaluation among researchers, it is still relatively rare to find those that were conducted in the perspective of Malaysian education, especially at the school level. Thus far, only a limited number of researchers have

attempted to evaluate EIS implementation in Malaysia, which was collectively concerned on two EIS; EMIS and Frog VLE. For example, Mohd Faizal et al. (2014) evaluate EMIS by applying the D&M model. The result shows that three factors have positive relationship toward EMIS success in schools, namely Problem Facing, User Involvement and User Satisfaction. With regards, only one original construct from the D&M (User Satisfaction) is supported in this particular study.

On the other hand, Thah (2014) has evaluated the Frog VLE based on Scriven Evaluation Paradigm and found that the Frog VLE's functionality as a pedagogical tool, user-friendliness and Frog VLE as a tool for collaboration are the critical success factors rated by the teachers. In addition, the study also reveals that the aspect of accessibility is a major concern among teachers in schools. However, the study by Thah (2014) only evaluates the aspect of a system quality, by neglecting other success dimensions. Moreover, evaluating the system quality without examining its influence toward intention to use, usage, user satisfaction and net benefits will least contribute to solve the issues of low usage and rejection toward VLE among the teachers.

Together, these past studies provide important insights for the current study, especially in choosing the suitable methodology, base model and other external success dimensions. Moreover, previous studies have demonstrated the inconsistency in defining IS success (Agourram, 2009; DeLone & McLean, 1992; Dörr, Walther, & Eymann, 2013). Although DeLone and McLean (2003) suggested that IS success involves interdependent constructs, a final construct that acts as indicator for IS success should be included. This has directed the current study to investigate more on the

concept of IS success, especially in terms of recursive relationship and its applicability in modeling the VLE success. Furthermore, based on these two examples of EIS evaluation conducted in Malaysia, the current study postulates that another study, which is more rigorous and covers all IS success dimensions should be conducted. Additionally, the issue of workload has been identified as another challenge faced by the teachers in adopting EIS, including VLE (Cheok & Wong, 2016; M. S. H. Khan et al., 2012; Letsoalo, Hove, & Karodia, 2014; Norazilawati et al., 2013; D. Wu, Hiltz, & Bieber, 2010). Therefore, it should be considered as another factor of VLE success. By doing so, the current study believed that the issues of VLE success, as indicated by the symptom of its low usage could be tackled.

2.6 Overview of Malaysian Education

Raised from a long period of colonization, Malaysia is considered as one of the fast growing countries in Asia. The key to this success lies on the high priority given by the government to the educational sector. In addition, the government also recognizes education as an important contributor to social capital that further drives the economic growth. Malaysian educational philosophy is built based on four main principles; access to education, equity in education, quality in education, as well as efficient and effective education management (Kementerian Pendidikan Malaysia, 2006). Therefore, the equality in education for every Malaysian, regardless of races, religions and locations is always on the top of the MOE priority list.

Public schools in Malaysia, which comprises of government and government-aided schools, are categorized into two main levels that are primary and secondary schools.

Statistics produced by the MOE on December 2017 indicate that there were 7,776 primary and 2,416 secondary schools, operated by 421,259 professional teachers across the nation (Kementerian Pendidikan Malaysia, 2017). These figures are illustrated in Figure 2.3.

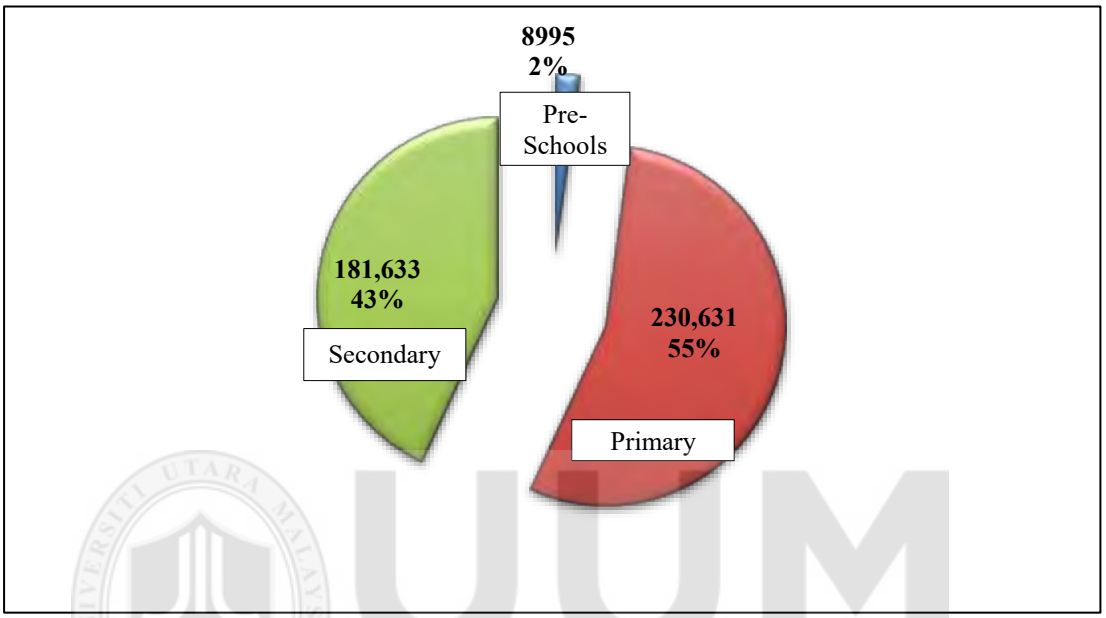


Figure 2.3. Percentage of Teachers in Malaysian Public Schools, as of December 2017.

In the context of Malaysia, high priority has been given to ICT in education since 1997, with the introduction of Smart School Project that aimed to integrate ICT into all educational activities, including curriculum, pedagogy, and assessment (Nooryusrina, 2014). Later in 2006, *Pelan Induk Pembangunan Pendidikan* (PIPP) 2006-2010 was introduced as an initiative to bridge up the digital divide between rural and urban education. A huge amount of budget was allocated to achieve the goal by improving ICT infrastructures in rural schools and introducing EIS (Kementerian Pendidikan Malaysia, 2006; Shahri@Charil, Hayati, & Faizal, 2010). Thirteen years later, this effort was extended by the *Pelan Pembangunan Pendidikan Malaysia* (PPPM) 2013-2025 (Wirawani & Rosnani, 2013). With a few improvements to the previous PIPP

plan, MOE is aimed to continuously improve the procedure of data collection and system management through several strategies, including the implementation of 1BestariNet as the platform for data integration as well as equipping the teachers with sufficient data management training (Kementerian Pendidikan Malaysia, 2012a).

The 1BestariNet is implemented in three phases (5+5+5 years), where every phase involves the enhancement of facilities and equipment (Kementerian Pendidikan Malaysia, 2014). During the first phase, MOE equipped 7000 schools with 2 Mbps (upgradeable to 10 Mbps) fiber optic connection while those in the suburban and rural areas were provided with 1 Mbps (upgradeable to 4 Mbps) VSAT connection with the contention ratio of 1:10 at the end of 2012 (Bahagian Teknologi Pendidikan, 2016). In the second phase (2016-2019), gradual improvements are made in several aspects, including the data plan (1.5 GB to 2GB), bandwidth speed (4 Mbps to and 6, 10, 15 Mbps), installation of Frog Appliance (for the schools with the VSAT and ADSL) and to equip teachers with the latest gadgets such as smartphone and tablet (Kementerian Pendidikan Malaysia, 2016b, 2016c). This high-speed network, along with high-end infrastructures in every school nationwide should promote the VLE implementation and thus assist teachers in coping with education in this digital age.

2.7 Overview of Information System Theories and Models

Theories and models are applied in academic research as a unified view of the ideas or variables related to issues under investigation (Murray & Beglar, 2009). In IS studies, the Theories of Reasoned Action (TRA), Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of

Innovation Theory (DOI), and Theory of Planned Behavior (TPB) are among the most prominent theories and models that being widely used among researchers. These theories and models describe the factors that influence IS usage. As stated in the Problem Statement, this study has identified the low usage as the symptom of failure in VLE implementation. In addition, continuous usage has been identified as a possible factor that could adjudge the success or failure of VLE. Therefore, it is essential to review these theories and models, especially to choose a suitable base model(s) as well as to investigate the likelihood of the proposed factors to be included as external dimensions in this study.

2.7.1 Theory of Reasoned Action (TRA)

Theory of Reasoned Action was originally introduced by Fishbein and Ajzen (1975) in social psychology studies as a guideline to predict human behavior. Two major focuses behind TRA are attitudes toward behavior and subjective norms (Fishbein & Ajzen, 1975). Furthermore, this model consists of two main dependent variables; Behavioral Intention and Behavior (see Figure 2.4). According to the theory, the human will behave coherently to the behavioral intention, which is usually driven by the attitude toward behavior and subjective norms (Ajzen, 2002). Attitude toward a behavior is referred to the excitement or feeling (positive or negative) toward performing a particular behavior. On the other hand, subjective norms are defined as the influences by important individuals of the subject that might change the justification of performing certain behaviors (Fishbein & Ajzen, 1975; Venkatesh et al., 2003). The TRA was applied by several prominent scholars like Davis, Bagozzi, and Warshaw (1989) and Venkatesh et al. (2003) to measure the individual acceptance of computer technology.

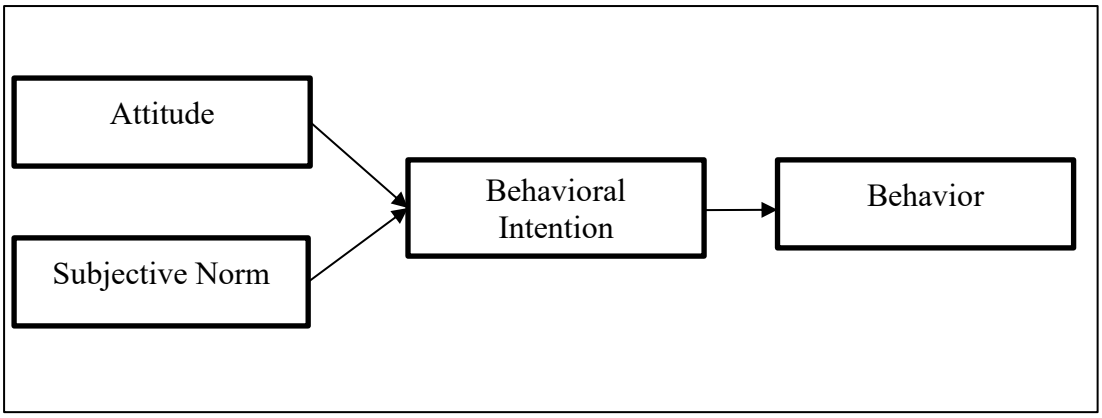


Figure 2.4. Theory of Reasoned Action (TRA). Adopted from Madden, Ellen, and Ajzen (1992).

Nevertheless, in a meta-analysis study by Sheppard, Hartwick, and Warshaw (1988), it is found that TRA fails to predict behavior in the cases of intent changes attributed by performance or the intention measure does not match the behavioral requirements such as action, target, context, time-frame, and specificity. In light of this, Hansen, Jensen, and Solgaard (2004) further added that TRA explanation power is only limited for predicting the behavior based on pre-determined intention, and neglecting the situations that are beyond the individual control, such as, in the mandatory IS. Therefore, the TRA is considered incompatible to be applied in the evaluation studies that emphasized the aspect of post-adoption, which concern with the intention to continuously use the technology, instead of pre-determined intention.

2.7.2 Theory of Planned Behavior (TPB)

Theory of Planned Behavior was proposed by Ajzen (1985, 1991) as a response to the certain limitations found in TRA. One of the weaknesses of TRA is inability to predict non-voluntary behavior because human behavior is not always on the voluntary basis (Al-Najjar, 2012). As a solution, TPB extended the previous TRA by modifying the

relationships and adding a new construct of Perceived Behavioral Control to explain the influence of resources and opportunities toward perceiving the ease of performing certain behavior (Ajzen, 1991), as shown in Figure 2.5.

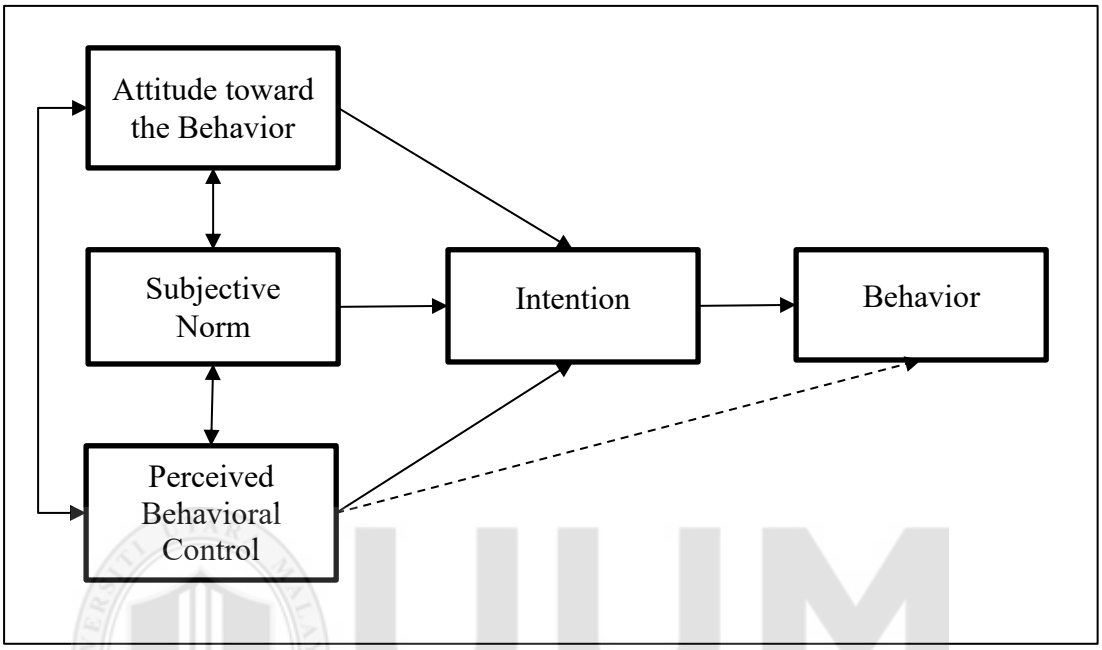


Figure 2.5. Theory of Planned Behavior (TPB). Adopted from Ajzen (1991).

Theory of Planned Behavior has been successfully used as a basis to study individual behavior in various research areas, including technology utilization and acceptance (Venkatesh et al., 2003). Nevertheless, TBP has also become the subject of criticism by several researchers such as Conner and Armitage (1998) who argued that "the consideration of volitional processes that may influence the relationship of goal intention and goal influence," and Taylor and Tod (1995) "TPB requires individual motivation beforehand to perform certain behavior." Moreover, the application of TPB in IS research only suitable for measurement of intention to use (intention) and use (behavior) (Venkatesh et al., 2003), and therefore, only covers a portion of IS success dimensions.

2.7.3 Diffusion of Innovation Theory (DOI)

Diffusion of Innovation Theory or also known as Innovation Diffusion Theory (IDT) (Venkatesh et al., 2003) is generally accepted as one of the most popular adoption (innovation) theories that is applicable in various disciplines of research (Sahin, 2006). Introduced in 1962 (Rogers, 1983), DOI concerns with the manner of how innovation communicates through certain channels over a time and within the distinctive social system (Sahin, 2006). In addition, Rogers (1983) also suggested three categories of independent variables of organization innovativeness, as shown in Figure 2.6. In most cases, the word "Innovative" in DOI is referred to "technology" and thus, the majority of DOI researches are related to technology adoption (Sahin, 2006).

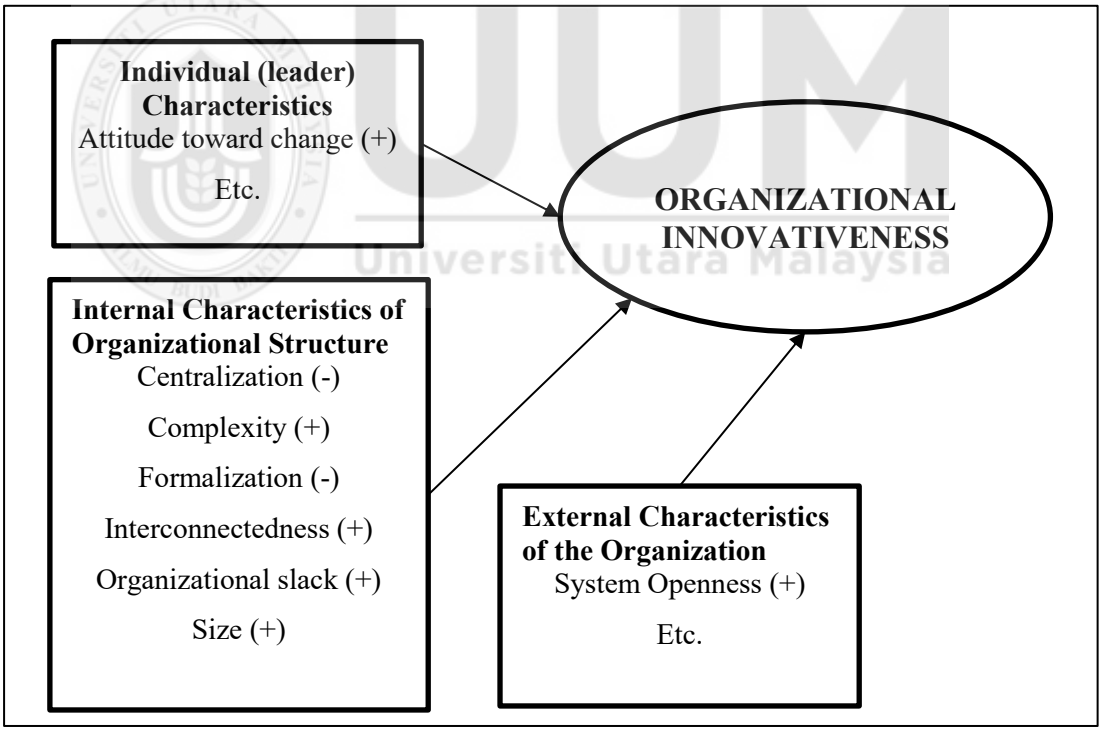


Figure 2.6. Independent Variables Related to Organization Effectiveness in DOI. Adapted from Rogers (1983, p. 360).

Similarly, DOI has provided positive consequences for IS studies (Lyytinen & Damsgaard, 2001). Based on Roger's DOI, Moore and Benbasat (1991) have proposed the refinement version that consists of seven independent variables specifically to measure IS/technology adoption, namely Relative Advantage, Ease of Use, Image, Visibility, Compatibility, Result Demonstrability and Voluntariness (see Figure 2.7). Despite the vast use of DOI, several limitations have been identified. A study by Lyytinen and Damsgaard (2001) found that DOI shows some weaknesses in predicting the adoption of complex and networked technologies. In addition, Damanpour (1996) and Greenhalgh, Robert, Macfarlane, Bate, and Kyriakido (2004) also suggested that the diffusion and innovation are difficult to measure considering the complexity of human characteristics and social networks and thus, further exploration and improvement are necessary.

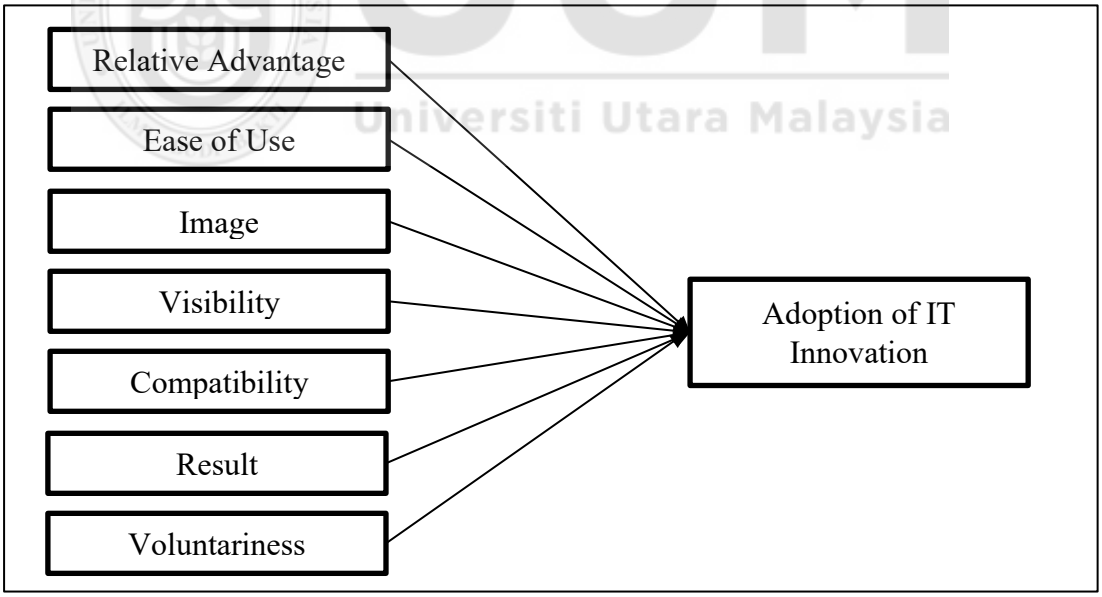


Figure 2.7. Refined DOI by Moore and Benbasat (1991). Illustration adapted from Tan (2013).

2.7.4 Technology Acceptance Model (TAM)

Among all available theories and models in IS studies, TAM is considered as the most predominant model to measure IS acceptance (Venkatesh, 2000). Unlike other theories such as TRA, DOI, and TPB, the TAM is specifically tailored for IS studies and therefore, provide more prediction power to measure IS adoption and usage (Venkatesh et al., 2003). TAM was developed based on TRA, as an attempt to better predict the reasons behind user acceptance and rejection of technology (F. D. Davis, 1989; F. D. Davis et al., 1989). Furthermore, TAM suggested two main independent variables of user acceptance, namely Perceived Usefulness and Perceived Ease of Use that will influence Intention to Use / Attitude Toward Using (F. D. Davis, 1989). In another follow-up study, F. D. Davis (1993) proposed another independent variable, System Design Features to the model (see Figure 2.8).

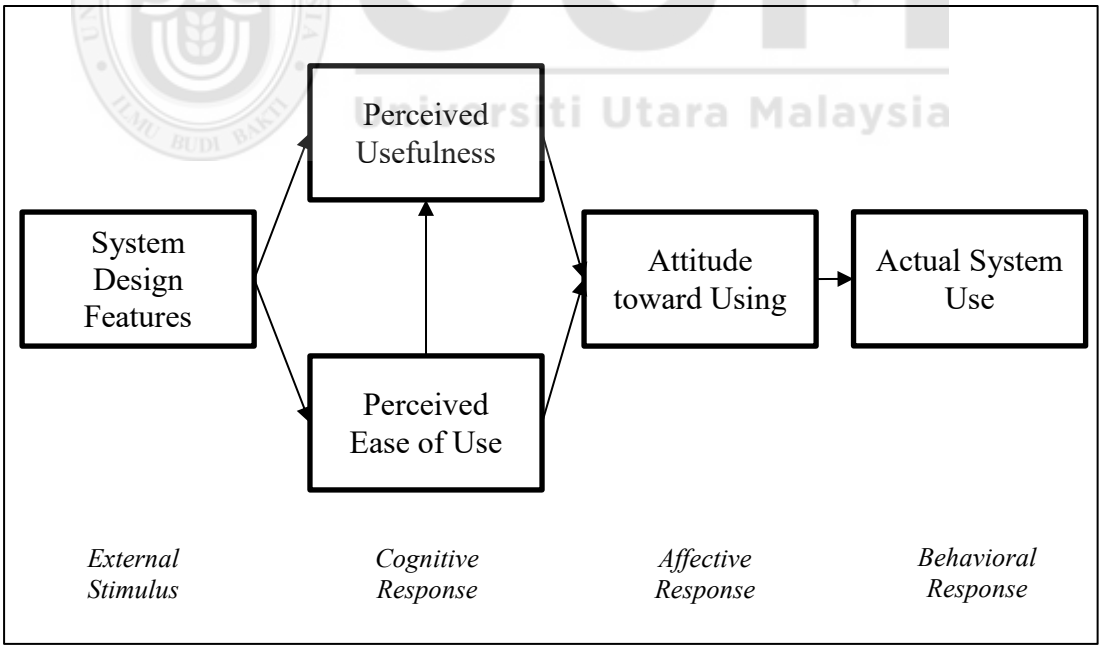


Figure 2.8. Technology Acceptance Model. Adopted from F. D. Davis (1993).

Despite its popularity, the emphasized of Perceived Ease of Use and Perceived Usefulness as a basis in TAM was criticized by Lunceford (2009) who suggested that these constructs are only focusing on the aspect of system, and argued that TAM overlook other factors such as cost and benefits that may also influence the adoption of IS. Moreover, Perceived Ease of Use is only suitable for initial stage of IS use and will slowly become insignificant over time (F. D. Davis et al., 1989) and thus will not be relevant for measurement of post-adoption or continuous usage (D. A. Adams, Nelson, & Todd, 1992), as in the case of VLE success evaluation.

2.7.5 Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology was introduced by Venkatesh et al. (2003) after reviewing eight models and theories related to IS adoption, namely TRA, TAM, Motivational Model (MM), TPB, Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), IDT, and Social Cognitive Theory (SCT). This theory emphasized on two key dependent variables; intention to use and actual usage. In addition, it theorized that Performance Expectancy, Effort Expectancy, and Social Influence will determine Behavioral Intention to use the IS, while Behavioral Intention and Facilitating Condition would influence the actual use (Venkatesh et al., 2003). These relationships will also be moderated by individual difference variables, namely Age, Gender, Experience, and Voluntariness, as shown in Figure 2.9 below.

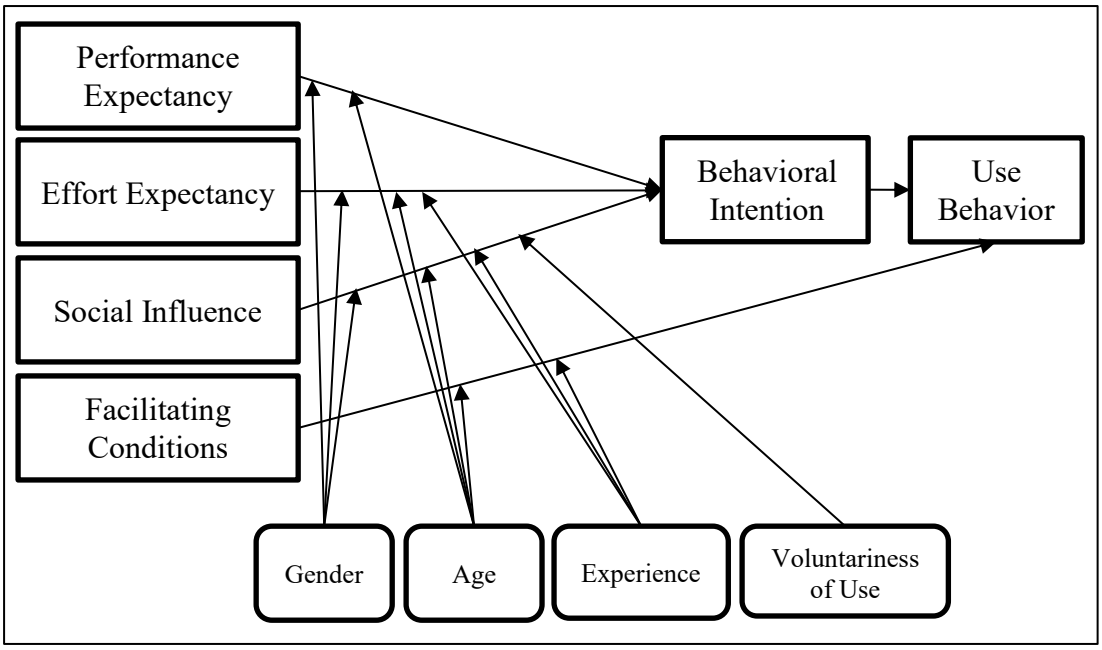


Figure 2.9. Unified Theory of Acceptance and Use of Technology (UTAUT). Adopted from Venkatesh et al. (2003).

Almost ten years after the introduction of UTAUT, the UTAUT 2 was introduced to study the acceptance and use of technology in the consumer context (Venkatesh et al., 2012). The UTAUT 2 extended the previous version of UTAUT by adding three more independent variables namely Hedonic Motivation, Price Value and Habit while at the same time drop out the moderating effect of voluntariness. Also, Venkatesh et al. (2012) argued that Facilitation Condition will influence both Intention to Use and Use (see Figure 2.10). Despite the popularity of UTAUT and UTAUT 2, these theories are only applicable for measuring Intention to Use and Use, which are simply a portion of IS Success Dimensions (DeLone & McLean, 2003). Therefore, UTAUT and UTAUT 2 would not be fully useful for the study. However, the moderating effects of Age, Gender and Experience between Performance Expectancy, Effort Expectancy and Facilitating Condition to Behavioral Intention in UTAUT and UTAUT 2 are hypothesized to be significant for the study and will be justified in the upcoming section.

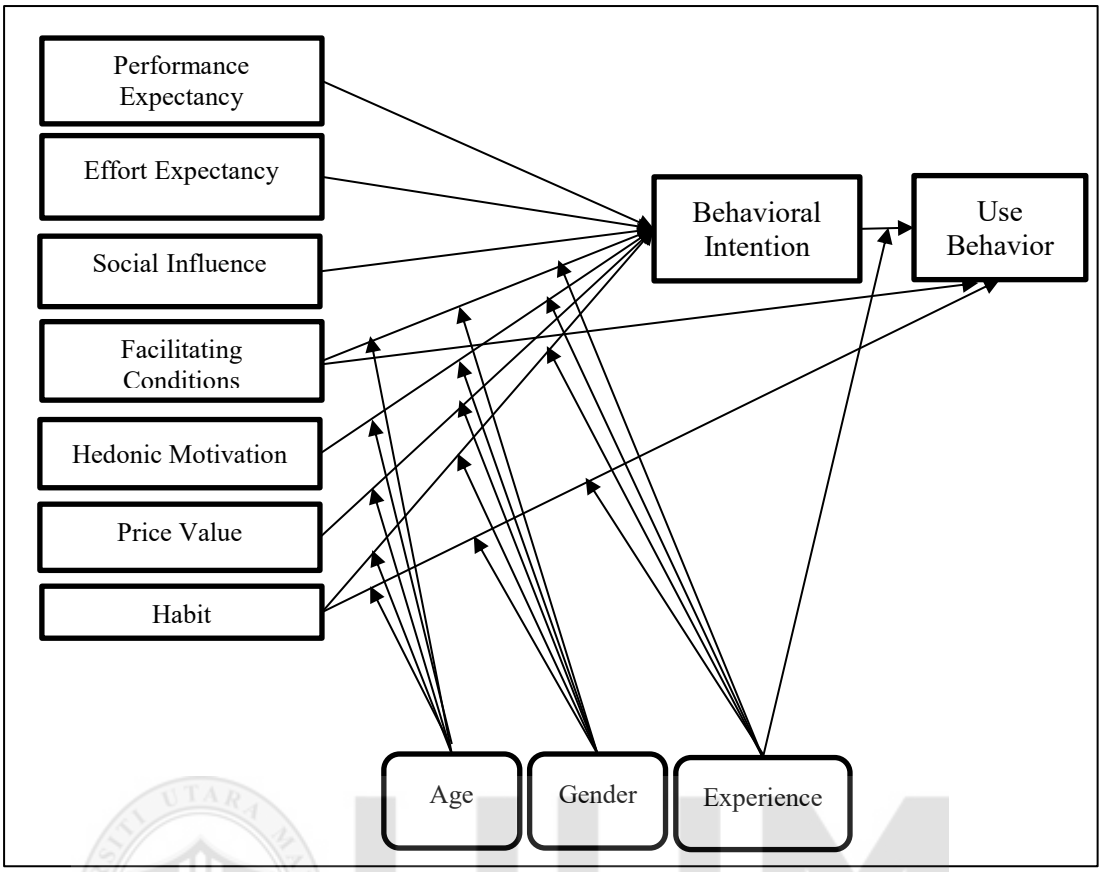


Figure 2.10. UTAUT 2. Adopted from Venkatesh et al. (2012).

2.7.6 Information Systems Success Model

Evaluation of IS success has become the most arguable and controversial issue in IS research discipline. The inconsistency of IS success dependent variables, caused by the variations in selecting IS success aspects by previous researchers had complicated the process of comparing outcomes of those studies (DeLone & McLean, 1992). In light of this, DeLone and McLean (1992) believed that there is an urgent need to find a single dependent variable that would thoroughly covers all aspects of IS success. As a result, the DeLone and McLean IS Success Model (D&M) was presented in 1992 as a comprehensive framework and well-established guidelines by which to conduct further research into IS success (DeLone & McLean, 1992). Over ten years later, this model has been updated in response to several critics, including by Seddon (1997), Rai, Lang,

and Welker (2002) and Seddon, Staples, Patnayakuni, and Bowtell (1999). The updated D&M includes new variables and modify several relationships to fit with the rapidly changed IS roles and measurements, as will be discussed in the next section. Although both the original and the updated D&M were presented without empirical validation, they have quickly gained a reputation as the most dominant models in IS evaluation studies.

2.7.6.1 The Original DeLone and McLean IS Success Model

Over 20 years ago, DeLone and McLean (1992) formulate their major historic model of IS success based on the analysis of 180 articles published in the period between 1981 and 1987. As a proposed solution for the issue of variability and inconsistency in examining IS success, this model provides a more comprehensive and rigorous view of IS success. Furthermore, DeLone and McLean (1992) argued that the assessment of multiple independent variables are insufficient without the similar degree of dependent variable's accuracy, which is referred to 'IS success' or 'effectiveness'.

The D&M was developed based on the Mathematical Theory of Communication (Shannon & Weaver, 1949) and its follow-up work by Mason (1978). According to this theory, the measurement of IS can be done at various different levels, which are technical, semantic and effectiveness level. Building on this, DeLone and McLean (1992) suggested three categories of IS success; System Quality at the technical level, Information Quality at the semantic level and Use, User Satisfaction, Individual Impact as well as Organization Impact at the effectiveness level (see Figure 2.11).

Based on the definition and suggestion of measurements by DeLone and McLean (1992), System Quality refers to the assessment of information processing system itself, which can be measured based on accessibility, reliability, ease of use and so on. Second, Information Quality is referred to IS output, which can be measured based on accuracy, format, sufficiency and so forth. Third, Use refers to the user's consumption of IS output which is measured based on the frequency of access, regularity of use and others. Fourth, User Satisfaction represents the user's response to the utilization of IS output and can be measured based on enjoyment, decision satisfaction, overall satisfaction and others. Fifth, Individual Impact is defined as the effect of IS toward the user's behavior. It can be measured based on several criteria such as personal valuation, increment of work volume and service effectiveness. Finally, Organization Impact refers to the effect of IS on the organization's performance which can be measured based on increment of market share, sales, profits and so on.

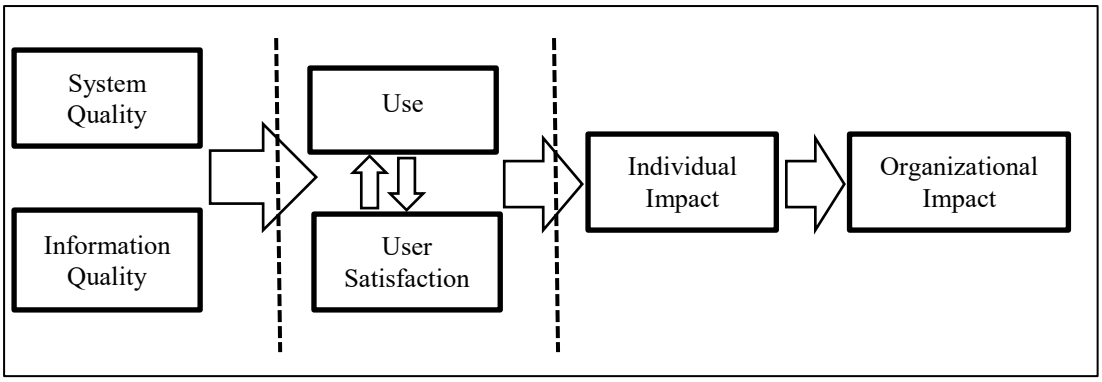


Figure 2.11. The Original DeLone & McLean IS Success Model. Adopted from DeLone and McLean (1992).

2.7.6.2 The Updated DeLone and McLean IS Success Model

DeLone and McLean (2003) believed that a popularity gained by the original D&M (DeLone & McLean, 1992) indicates the need for a more comprehensive and rigorous framework in order to integrate all IS success research findings at that time. Due to the changes of IS practices in modern society and to answer the criticisms by other researchers, DeLone and McLean (2003) proposed the updated D&M after reviewed over hundreds of articles related to IS success from 1993 until 2002. As a result, several modifications to the original version were made, as shown in Figure 2.12.

Firstly, Pitt, Watson, and Kavan (1995, p. 173) suggested that there is a risk of imprecise measurement of IS effectiveness if the researchers continuously focusing on the products and neglecting the measure of service quality. This stance was further supported by other prominent IS researchers (Kettinger & Lee, 1994; Li, 1997), and thus, DeLone and McLean (2003) have included Service Quality into their model. Service Quality refers to overall support offered by service provider to the end users of IS (DeLone & McLean, 2004). Secondly, the updated D&M also combines Individual

Impacts and Organizational Impacts into a single dimension to represent the broader perspective of benefits, known as Net Benefits. The justification behind this is to synchronize the continuously increased entities of impact measurements suggested by previous researchers. Finally, the updated D&M also proposed the construct of Intention to Use as an substitute measure for the Use to deal with the issue of IS voluntariness of usage. According to them, the Intention to Use is a better measurement for mandatory type of IS.

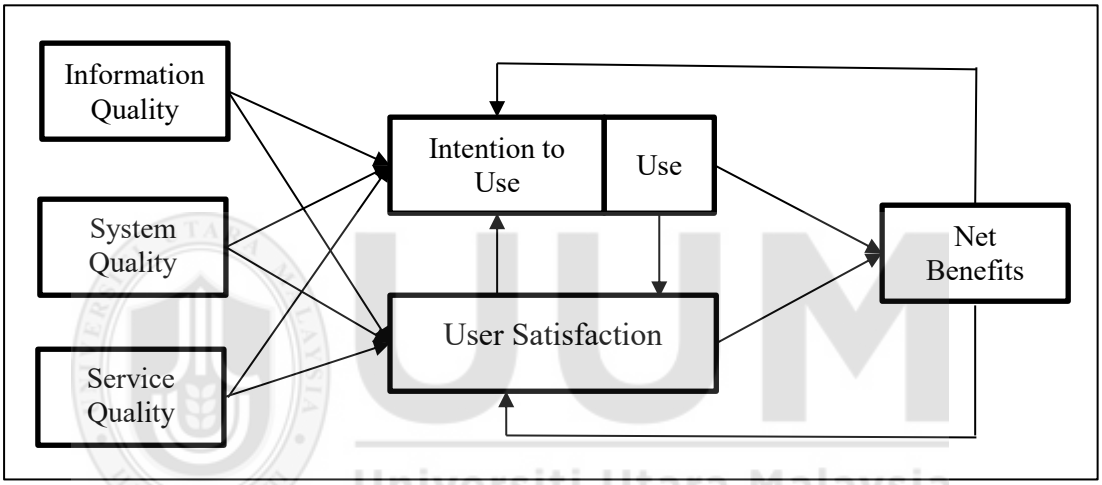


Figure 2.12. The Updated DeLone & McLean IS Success Model. Adopted from DeLone and McLean (2003).

Although the updated D&M is proven to be applicable across multiple IS domains, it was purposely developed for the evaluation of e-commerce system. Therefore, the measurements proposed by DeLone and McLean (2003) in their article were particularly for e-commerce (see Table 2.8). Nonetheless, DeLone and McLean (2003) also suggested that the selection of measurement for every construct in this model should consider objectives and context of the studies, if it is about to be applied in other domains.

Table 2.8

E-Commerce Success Metrics

Construct	Measurement (e-commerce)
Information Quality	Completeness, Ease of understanding, Personalization, Relevance & Security.
System Quality	Adaptability, Availability, Reliability, Response time & Usability.
Service Quality	Assurance, Empathy & Responsiveness.
Use	Nature of use, Navigation patterns, Number of site visits & Number of transactions executed.
User Satisfaction	Repeat purchases, Repeat visits & User surveys.
Net Benefits	Cost savings, Expanded markets, Incremental additional sales, Reduced search costs & Time savings.

Note. Adapted from (DeLone & McLean, 2003)

2.7.6.3 Previous Works on DeLone and McLean IS Success Model

The D&M model is a source of debate, and has attracted a high amount of attention among scholars in social science and IS research since the past decade (Ainin et al., 2012; Iivari, 2005; Trkman & Trkman, 2009; Zhou, 2013). Accordingly, numerous previous researchers in IS domain have attempted to measure different aspects of IS success. For instance, some studies have employed the user satisfaction as a success measure (H. H. Chang et al., 2009; Cheok & Wong, 2014; Dai et al., 2011), while some others prefer to measure usage (Alawadhi & Morris, 2008; Jurisch, Kautz, Wolf, & Krcmar, 2015; Park, 2009). However, the decision to choose a single specific aspect of

IS success dimension (e.g., use or user satisfaction) is contradicted to the main idea of IS success proposed by DeLone and McLean (2003) to provide a comprehensive framework which will enable the integration and comparison of IS success research findings. In other words, the selection of a specific dependent variable of IS success will probably increase the complexity of the existing body of knowledge in IS studies. Moreover, IS success is a multidimensional construct, and thus, DeLone and McLean (2003) have repeatedly and consistently called for further enhancement and validation of the proposed model, instead of trying to find any new dependent variable of IS success.

The D&M is recognized as the most popular evaluation model among IS researchers, and it has been widely applied in various IS disciplines (see Appendix E_2). Notwithstanding, in the domain of EIS, a limited number of empirical studies were found, especially in Malaysia. For instance, Mohd Faizal et al. (2014) have conducted a study of EMIS success in Malaysian schools. The result has shown that only three variables (Problem Facing, User Involvement, and User Satisfaction) are positively related to IS success, which is measured based on the benefits that EMIS provided to the users. On the other hand, the relationships between Information Quality, System Quality and Service Quality to EMIS success were not supported. In conceptual research paper by Cheok and Wong (2014), several major modifications to the D&M were proposed. First, they proposed to include a number of external independent variables (Perceived Usefulness, Perceived Ease of Use, Flexibility, Interaction, Attitude, Anxiety, Self-Efficacy, Training, Management Support and Technical Support) which are grouped into three main categories; User Quality, LMS Quality,

and Organization Quality. Second, a major modification was made to the relationships, where only the relationships between the three quality dimensions to the Usage and Satisfaction were retained.

At the international level, both studies by Eom (2012) and Eom et al. (2012) have attempted to investigate Learning Management Systems (LMS) success in university. Eom (2012) has included two independent variables, namely Self-Efficacy and Self-Managed Learning, while at the same time excluded the Service Quality. In addition, the final dependent variable is measured based on system effectiveness. Meanwhile, Eom et al. (2012) have applied the original D&M (DeLone & McLean, 1992) as their theoretical basis. In this particular study, all the variables were retained, except Organizational Impact, because they only focused on Individual Impact, which was measured based on e-learning outcome and overall performance. In both above-mentioned studies, Information Quality is measured based on accuracy, relevance, sufficiency, format and timeliness; System Quality is measured assessed on the basis of availability, usability, and accessibility; Use is measured based on frequency of use and dependency to the LMS, and finally, User Satisfaction is measured based on overall satisfaction.

Next, the universities' digital library has become the subject of study by Cheng (2014) and Lwoga (2013). Cheng (2014) studied the continuance intention to use the digital library by hybridizing three predominant IS models, namely Expectation-Confirmation Model (ECM), TAM and the updated D&M. In the study, the quality factors were divided into five variables, namely Information Relevance, System Accessibility,

Technical Support, Interface Design, and Navigation. Besides that, User Satisfaction was measured based on enjoyment, while Continuance Intention was measured based on the intention to continue using the digital library. Comparatively, the Continuance Intention is similar to Intention to Use in the current study. In another study by Lwoga (2013) that investigated the Library 2.0 success in the African context, a minor modification to the model has been made by replacing the Use/Intention to Use with Behavioral Intention to Reuse, and Net Benefits with the Perceived Net Benefits. Lwoga (2013) measured Information Quality based on completeness, timeliness, relevance, and accuracy; System Quality is assessed based on usability, availability, and reliability; Service Quality is measured based on responsiveness, empathy, reliability, and assurance; and Satisfaction was measured based on repeated visits and overall satisfaction. On the other hand, Behavioral Intention to Reuse is similar to Intention to Use in D&M and was measured based on intention to continuously use Library 2.0 in the future. In addition, Perceived Net Benefits is relatively similar to Net Benefits, which were measured based on time-saving, improved productivity and personal valuation.

In view of all that has been mentioned so far, it is apparent that further studies are necessary in order to strengthen and validate the D&M in other IS environments such as VLE. As has been noted, research on the D&M has been mostly restricted to limited subjects and constructs. For example, both of preceding local studies (Cheok & Wong, 2014; Mohd Faizal et al., 2014) are considered as incongruent to the original objective of D&M, and just focused on a portion of IS success dimensions, particularly the usage and teachers' satisfaction. Moreover, Mohd Faizal et al. (2014) examined User

Satisfaction and Net Benefits without describing how the quality dimensions influence these factors. EMIS is a type of EIS that is compulsory to be used by certain designated teachers. Although DeLone and McLean (2003) suggested that User Satisfaction is a suitable measurement for mandatory IS, they also mentioned that the User Satisfaction should be measured together with its antecedents, which are Information Quality, System Quality and Service Quality. This is mainly because these quality dimensions are the main force that determine User Satisfaction.

On the other hand, all the reviewed studies by international researchers (Cheng, 2014; Eom, 2012; Eom et al., 2012; Lwoga, 2013) were focusing on university students as a subject, and the studies that examine e-learning success at the school level, especially among teachers are scarce. In terms of research model, most of the studies (Cheng, 2014; Eom, 2012; Lwoga, 2013) have excluded the original recursive relationships in D&M. A possible explanation for this might be to avoid complexity in analyzing the data. Only a study by Eom et al. (2012) has tested the recursive relationship between Use and User Satisfaction. Hence, they had divided their research model into two SEM structural models for analysis. Consequently, this analysis has produced two values of R^2 and Q^2 that is inaccurate to describe the model. Therefore, this study aims to address the limitations of the previous studies by holistically examines VLE success among Malaysian teachers. To ensure the consistency with the original objective of D&M, the entire constructs of IS success (DeLone & McLean, 2003); including recursive relationships are retained. Nevertheless, to overcome the drawback of dividing research model into two structural models, this study seeks to investigate the possible solution for this issue based on the empirical analysis.

2.8 Gap Analysis

Appertaining to the review of past research's pattern and trends, the current study has identified several theoretical and practical gaps that require further exploration as follows:

i. Majority of the existing studies on EIS (including VLE), particularly in Malaysia mainly focused on adoptions, yet minimal attentions has been paid to success evaluation. Even though both adoption and evaluation share the same interest in the aspect of IS usage, evaluation studies have a broader focus to measure IS success and effectiveness including user satisfaction and net benefits. Refer to Appendix D_2 and Appendix E_1.

ii. Most of the past studies on VLE in Malaysia were conducted from the perspective of pedagogy, which focuses more on how VLE could improve the teaching and learning process. However, less attention has been paid to measuring the actual usage and the evaluation of VLE, which is a more critical aspect to ensure the survival of its implementation (Refer to Appendix E_1).

iii. Previous studies on the relationship between ICT and workload are uncommon. There are a few studies that focused on how ICT can reduce the workload of teachers and how the ineffective implementation of ICT can lead to increased workload for teachers (Selwood & Pilkington, 2005; Vinluan, 2011). However, the studies failed to describe how excessive workload (such as administration jobs, replacement class, and paper marking) among teachers influence the use of VLE.

iv. Prior studies that applied the D&M showed inconsistencies in measuring IS success, especially regarding the final endogenous construct. Some studies

applied Net Benefits (Freeze, Alshare, Lane, & Joseph Wen, 2010; K. Kim, Trimi, & Park, 2012), User Satisfaction (Fang, Chiu, & Wang, 2011), Usage (Zheng, Zhao, & Stylianou, 2013), while some retained recursive relationships (Al-Debei et al., 2013). However, there are dearth of studies that examine the best endogenous construct to be the indicator for VLE success.

2.9 Summary

In this chapter, various topics related to the study have been covered by relevant literature. Even though not meticulous, extent studies have demonstrated that empirical evidence abound for the D&M in the context of VLE, especially among Malaysian teachers. This model suggested that the IS success dimensions are interdependent to each other. Thus far, the data gathered from several sources, including from the government official reports have demonstrated the low usage of VLE among the teachers. Moreover, some previous studies also suggested that the teachers refused to use the system for some reasons, although the benefits of using it are known. As such, a need arises to empirically examine and develop an evaluation model of VLE success among Malaysian teachers.

CHAPTER THREE
CONCEPTUAL MODEL

3.1 Introduction

This chapter provides the framework for the study based on the discussions in the previous chapter. The study mainly aims to model and validate the contributing factors of VLE success among Malaysian teachers. This chapter proposes a conceptual model and formulates hypotheses underpinned by the related theories as deliberated in the Literature Review.

3.2 Theoretical Background

Various theories and models pertaining to IS usage have been proposed including TRA, TPB, TAM and UTAUT, as discussed in Chapter Two. Nevertheless, the usage does not represent the overall IS success, but it is one of the dimensions of IS success (DeLone & McLean, 1992, 2003). DeLone and McLean (2003) suggests that IS success is made up of interrelated dimensions; therefore, it should not be assessed based on one particular dimension. The implication is that research which only concentrate on certain dimensions in measuring IS success such as IS usage (Alawadhi & Morris, 2008; Jurisch et al., 2015; Park, 2009) or user satisfaction (H. H. Chang et al., 2009; Cheok & Wong, 2014; Dai et al., 2011) are insufficient from the perspective of IS success research discipline.

Furthermore, the constant utilization during the phase of post-implementation is more noteworthy in the determination of the IS success in relation to the initial utilization

during the pre-implementation (Bhattacherjee, 2001). In the context of this study, the continuous usage that is associated with the user resistance has been considered as a serious constraint, as depicted by the low usage of VLE (Johari & Siti Norazlina, 2010; Kementerian Kewangan Malaysia, 2014; Md Nor & Rashita, 2011). Although, most of the teachers possess prior experience, the present finding reveals their refusal towards the continuous utilization of VLE (Nor Azlah & Fariza, 2014; Ummu Salma & Fariza, 2014), which reflected that the system is not at the verge of succeeding. From the reviewed studies, this present study has observed the possibility to examine this issue with the aid of D&M. It has been proven by previous studies that this model matches all the measurements for IS success evaluation. (Al-Debei et al., 2013; Mohammadi, 2015; Zhu et al., 2013). In addition, it has been suggested by DeLone and McLean (2003) that the application of D&M should have a contextual consideration of IS that is being investigated. They further encourage the enhancement and refinement of the model by future researchers in order to soothe the existing variations of IS research fields. Consequently, the present study utilizes the D&M as the theoretical foundation, with the involvement of Workload (WL) and Personal Characteristics as the external moderating variables to measure the VLE success among teachers.

3.2.1 The Updated DeLone and McLean IS Success Model

Although the updated D&M was set up as means for measuring e-commerce, its applicability in other IS streams has been demonstrated by multiple research (refer to Appendix E_2). This model was introduced in 2003 to answer the critiques against the original version IS Success Model by DeLone and McLean (1992), which measures IS success based on Information Quality, System Quality, Use, User Satisfaction,

Individual Impact and Organizational Impact. As an enhanced model, a few alterations were made such as the addition of Service Quality. Individual Impact and Organizational Impact were also merged into a single dimension known as Net Benefits. The updated D&M also aims to produce a thorough cognizance 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), as shown previously in Figure 2.12.

As stressed earlier, DeLone and McLean (2003) suggested that to increase the validity and reliability of their updated model, constant tests and challenges under various situations should be applied to it. Subsequently, previous researchers have applied multiple changes and refinements to the model. The updated D&M model however continues to be the basis of their studies. For example, to investigate the influence factors of e-learning outcomes, Mohammadi (2015) had included a number of external variables into D&M such as Educational Quality, Perceived Ease of Use, Perceived Usefulness, and Learning Assistance. Zoubib and Jali (2014) meanwhile, adjusted the relationships in the D&M model by including Relative Advantage, Compatibility, and Complexity to gauge the usage of e-learning by adult workers. Some studies also combined the D&M with different models or theories such as TAM (Cheok & Wong, 2014; Hosnavi & Ramezan, 2010) and VLE Effectiveness Model (Eom et al., 2012). In spite of the various adaptations of the D&M model in order to match research purposes and situations, academicians still believe that most of the constructs in the model are suitable for measuring the success of IS in different contexts and should be retained

(Alshibly, 2014; J. V. Chen, Jubilado, Capistrano, & Yen, 2015; Teo, Srivastava, & Jiang, 2009; Wixom & Todd, 2005).

The conclusion of this research, using the above discussions as a basis, is that all the constructs in D&M are pertinent to model the VLE success among the Malaysian teachers. More importantly, keeping and using all the IS success dimensions is compatible with DeLone and McLean (2003) who suggested that the provision of a thorough comprehension of IS success while at the same time retaining the nature of interdependency between these dimensions. However, to examine the issue of VLE continuous usage, the current study uses both ITU and U dimensions, with the addition of a new relationship from U to ITU. Even though the ITU was introduced by DeLone and McLean (2003) as an alternative measurement for U, separating these two dimensions will improve the explanatory power of D&M (Agarwal & Prasad, 1997; Mardiana, Tjakraatmadja, & Aprianingsih, 2015). In addition, the current study also incorporates the WL construct since it has been pinpointed as an important factor that affects the ICT integration into education including VLE (Cheok & Wong, 2016; Raman & Yamat, 2014; D. Wu et al., 2010; Zawiyah & Mariah, 2008). Finally, three moderators namely age, gender and VLE experience were added to the D&M as these personal characteristics are predicted to affect the relationship between the Quality Dimensions (IQ, SyQ and SeQ) and ITU (Alba & Hutchinson, 1987; Cheok & Wong, 2016; Raman & Yamat, 2014; Venkatesh et al., 2012).

3.3 Conceptual Model

The Conceptual Model of the study, as shown in Figure 3.1, is developed based on the updated D&M (DeLone & McLean, 2003). Comprising of eight interdependent determinants of success, this model theorizes that the Quality Dimensions (IQ, SyQ, and SeQ) will significantly influence the ITU and US. Furthermore, the Personal Characteristics (Age, Gender and VLE Experience) may moderate the relationship between the Quality Dimensions and ITU. At the second level, the increasing ITU should lead to more usage (U) of VLE. Similarly, 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 a rise of ITU (moderated by WL) and US. At the same time, the WL is also predicted to moderate the relationship between ITU and U of VLE.

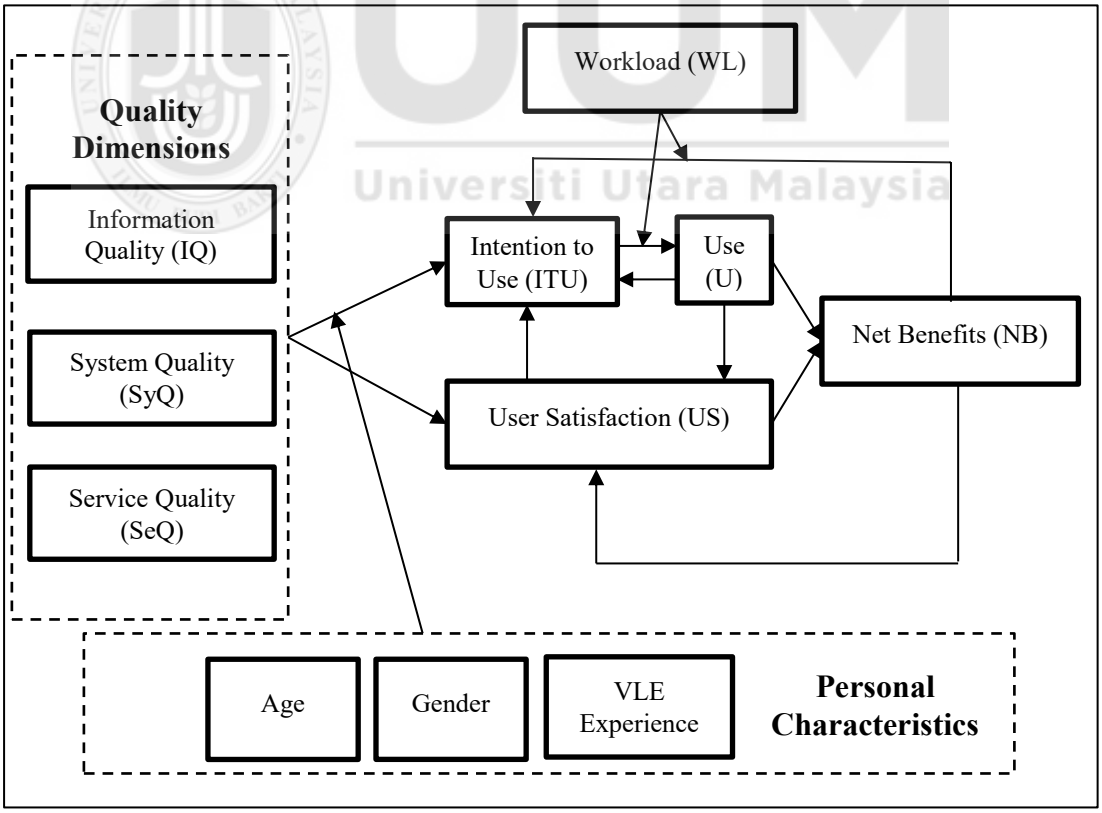


Figure 3.1. The Conceptual Model of the Study

3.3.1 Justification for using 'Intention to Use' and 'Use'

A view of the research trends (conducted to date) that applied the D&M, majority have only adopted selected parts of the model for measurement and assessment (Urbach & Müller, 2012). Responding to this issue, Urbach and Müller (2012) recommended the application of the entire D&M as an attempt to present a holistic approach and to extend its overall validity. Therefore, the current study responded to this proposition by retaining all the original constructs and the relationships between these IS success dimensions. In addition, the study also believed that U and ITU should exist together, especially when investigating initial usage and intention for future use, as suggested by Agarwal and Prasad (1997) and Mardiana et al. (2015).

The ITU was introduced in the updated D&M as a substitute for U to capture the issue of voluntary versus mandatory of IS usage. ITU was suggested as an alternative measurement for the mandatory IS (DeLone & McLean, 2002, 2003). Nevertheless, they also recommended that U is a better option as no IS is totally mandatory to be used. In addition, they stressed that ITU (attitude) and their link to U (behavior) are not easy to measure. Hence, many researchers choose to keep using U in measuring the IS usage (Baraka et al., 2013; Bossen, Jensen, & Udsen, 2013; Chong, Cates, & Rauniar, 2010; Davarpanah & Mohamed, 2013; Eom, 2012).

However, Agarwal and Prasad (1997) argued that the current use and the future intention to use are two different dimensions that are interrelated to each other. Likewise, they suggested that the current use would markedly affect future intention to use. Considering this, DeLone and McLean (2003) added that the positive initial

(current) use will lead to greater user satisfaction and thus lead to intention to use. Under those circumstances, the usage is also predicted to rise. Building on these arguments, the current study proposes the separation of these two dimensions. By doing so, the current study is expected to answer the question of "*Why the teachers refuse to continue using the VLE?*"

3.4 Operational Definitions of Constructs

The operational definition of construct provides useful terms for describing the relationship between constructs used in the current study. The study proposed eight constructs to model the determinants of VLE success among the teachers in Malaysia namely; IQ, SyQ, SeQ, WL, ITU, U, US, and NB. The operational definitions of these constructs are shown in Table 3.1.

Table 3.1

Operational Definition of Constructs

Construct	Operational Definition	Sources
Information Quality	The extent of output quality produced by VLE from the perspective of the teachers. The Information Quality is measured based on accuracy, relevance, sufficiency, format, currency, timeliness and reliability.	(C.-W. D. Chen & Cheng, 2009; J. V. Chen et al., 2015; DeLone & McLean, 1992, 2003; Eom, 2012; Eom et al., 2012; Teo et al., 2009; Wixom & Todd, 2005)
System Quality	The extent of VLE technical performance from the perspective of the teachers. The System Quality is measured based on availability, usability, accessibility and reliability.	(Al-Debei et al., 2013; Alshibly, 2014; C.-W. D. Chen & Cheng, 2009; J. V. Chen et al., 2015; DeLone & McLean, 1992, 2003; Eom, 2012; Eom et al., 2012; Lwoga, 2013; Y. Wang, Wang, & Shee, 2007; Zhou, 2013)

Table 3.1 Continued

Service Quality	The extent of services, supports and encouraging environments provided by VLE system and service provider for the teachers. The helpdesk is referred to the services provided by PKG, principals/headmasters, Frog Administrator and online helpdesk services. The Service Quality is measured based on responsiveness, assurance, empathy and tangibility.	(Al-Debei et al., 2013; Alshibly, 2014; H. H. Chang et al., 2009; C.-W. D. Chen & Cheng, 2009; J. V. Chen et al., 2015; DeLone & McLean, 2003; Gay, 2016; Kettinger & Lee, 1994; Pitt et al., 1995; Teo et al., 2009; Y. Wang et al., 2007)
Intention to Use	The extent of intention for future use, after the initial use of VLE among the teachers.	(Agarwal & Prasad, 1997; Alharbi & Drew, 2014; C.-W. D. Chen & Cheng, 2009; DeLone & McLean, 2003; Park, 2009; Teo et al., 2009)

Table 3.1 Continued

Use	The utilization of VLE among the teachers in terms of frequency of access, regularity of use and nature of use.	(Abdulwahab & Zulkhairi, 2011; Al-Debei et al., 2013; DeLone & McLean, 1992, 2003; Eom, 2012; Eom et al., 2012)
User Satisfaction	The perception of pleasure or displeasure caused by the teachers' level of belief that the VLE has fulfilled their needs or expectations.	(DeLone & McLean, 1992, 2003; Eom, 2012; Eom et al., 2012; Gay, 2016; Y. Wang et al., 2007; Zhou, 2013)
Workload	The excessive amount of works and the rapid phase of job requirements in teachers' career.	(Boyle, Borg, Falzon, & Baglioni, 1995; Denton, Zeytinoglu, Davies, & Lian, 2002; Sanchez & Aleman, 2011; Selwood, 2005)

Table 3.1 Continued

Net Benefits	The expected and the actual impacts or benefits at the individual level, attributed to the use of VLE among the teachers. The Net Benefits is measured by timesaving, improved productivity and personal valuation.	(J. V. Chen et al., 2015; DeLone & McLean, 1992, 2003; Gay, 2016; Petter, DeLone, & McLean, 2013; Y. Wang et al., 2007)

Note. The sources are included both the measurements and the items.

3.5 Exogenous Variables

Exogenous Variables are generally accepted as the variables that will influence other variables (Fraenkel & Wallen, 2009). Usually, these variables are the focus of the issues being investigated. There are three exogenous variables involved in this study that will be discussed in the upcoming sections. DeLone and McLean (2003) advocate that the selection of measurements should be parallel to the objectives and context of empirical research. Therefore, the current study has adopted the appropriate measurements that fit the context of VLE.

3.5.1 Information Quality (IQ)

Information Quality generally addresses the measurement to investigate the quality of an IS output (DeLone & McLean, 1992), particularly issues related to the content of IS (DeLone & McLean, 2004). Previous studies in IS evaluation have demonstrated that IQ is one of the key influences of IS success, as shown in Appendix F_1. In the updated D&M, the IQ is proposed as having the direct relationships with U/ITU and US. The relationship between IQ and ITU was supported by many past studies (Al-Debei et al., 2013; C.-W. D. Chen & Cheng, 2009; Iivari, 2005). Similarly, the relationship between IQ and US was also empirically supported (Ainin et al., 2012; Al-Debei et al., 2013; Bossen et al., 2013; Davarpanah & Mohamed, 2013).

As suggested by DeLone and McLean (2003), the choice of measurement for each IS success dimension should consider the context of studies, thus various measures for IQ can be used by researchers (see Appendix F_1). For VLE evaluation, measures such as relevance, accuracy, format, sufficiency, and timeliness have been used (Eom,

2012; Eom et al., 2012). Based on the preceding discussion, the current study postulated that IQ would also has a significant effect on VLE success. This implies that desired information quality should positively affect the intention to continue using VLE while at the same time cause satisfaction among the teachers. Therefore, the current study proposed the IQ as one of the important evaluation components for VLE success.

The IQ measurements usually focus on the information quality that the IS produces and its usefulness for users (Urbach & Müller, 2012). In the current study, the IQ was measured in terms of format, sufficiency, accuracy, timeliness, relevance, currency, and reliability (see Table 3.2). The items of these measurements were adapted from a number of previous studies (C.-W. D. Chen & Cheng, 2009; J. V. Chen et al., 2015; Eom, 2012; Eom et al., 2012; Teo et al., 2009; Wixom & Todd, 2005).

Table 3.2

The Sources of Measurements for Information Quality and the Operational Definition for Each Measurement

Measurement	**Operational Definition**
Accuracy (DeLone & McLean, 1992)	The quality of information produced by VLE that meet the teacher's need.
Relevance (DeLone & McLean, 2003)	The information produced by VLE that is relevant to educational activities.
Sufficiency (DeLone & McLean, 1992)	The information provided by VLE that is adequate to perform certain educational tasks.

Table 3.2 Continued

Format (DeLone & McLean, 1992)	The format of information produced by VLE that is useful, clear and easy to comprehend.
Currency (DeLone & McLean, 1992)	The current information provided by VLE.
Timeliness (DeLone & McLean, 1992)	The ability to obtain desired information from VLE in time.
Reliability (DeLone & McLean, 1992)	The extent the teacher believes that information produced by VLE is reliable.

3.5.2 System Quality (SyQ)

According to DeLone and McLean (1992), SyQ refers to the quality of the IS itself. SyQ represents the good characteristics of the system as desired by its end users (Petter, DeLone, & McLean, 2008). There is a large volume of published studies describing the role of SyQ in IS success, as shown in Appendix F_2. For the updated D&M (DeLone & McLean, 2003), the SyQ has relationships with U/ITU (the current study uses ITU) and US. These relationships have been proved as significant by a number of previous works; SyQ to ITU (Al-Debei et al., 2013; Ramayah et al., 2010; Teo et al., 2009), SyQ to US (Aggelidis & Chatzoglou, 2012; Ainin et al., 2012; Al-Debei et al., 2013; B. Armstrong, Fogarty, Dingsday, & Dimbleby, 2005; Bossen et al., 2013; Cheok & Wong, 2014; Urbach & Müller, 2012).

Equally important, the body of literature has also demonstrated the variability of SyQ measures applied by different researchers. For example, in the context of EIS, Lee-

Post (2009) measures SyQ based on ease of use, stability, security, timeliness and responsiveness. Meanwhile, Eom (2012) used only three measurements to measure SyQ of LMS which are availability, usability, and accessibility. Appendix F_2 summarized all the measurement of SyQ applied by previous studies.

Based on the positive evidence provided by the past researchers, the current study presumed that SyQ would also play an important part in evaluating the VLE success. With this in mind, the current study proposed that the good quality of VLE as desired by the teachers is expected to increase intention for future use and should satisfy them. Therefore, this study predicted the SyQ as one of the key components for the evaluation of VLE success.

In this study, the SyQ of VLE is measured using four measurement scales; availability, usability, accessibility and reliability (see Table 3.3). The items for these measurements were adapted from several sources (Al-Debei et al., 2013; Alshibly, 2014; C.-W. D. Chen & Cheng, 2009; J. V. Chen et al., 2015; Eom, 2012; Eom et al., 2012; Lwoga, 2013; Y. Wang et al., 2007; Zhou, 2013).

Table 3.3

The Sources of Measurement for System Quality and the Operational Definition for Each Measurement

Measurement	Operational Definition
Availability (DeLone & McLean, 2003)	The accessibility of VLE by teachers at all times.

Table 3.3 Continued

Usability (DeLone & McLean, 2003)	The level of teacher's perception on ease of use and learnability of VLE.
Accessibility (DeLone & McLean, 2003)	The extent of teacher's perception on convenience of accessing VLE.
Reliability (DeLone & McLean, 1992)	The degree of teacher's belief on the accuracy of VLE functions.

3.5.3 Service Quality (SeQ)

As previously mentioned, the SeQ has been included into the D&M as a response to the changes in nature and roles of IS and IS provider (DeLone & McLean, 2003), probably attributed to the expanding utilization of IS in the modern society. According to DeLone and McLean (2004) and Petter et al. (2008), SeQ concerns with the quality of overall support provided by the IS department, IT supports, IS provider, or sometimes outsourced to an external support provider. In the updated D&M, the SeQ is predicted to influence both the U/ITU and US. The relationship between SeQ and ITU was mix-supported by previous studies, as demonstrated by Choe (1996) – not supported, Halawi, McCarthy, and Aronson (2008) – weakly supported, and Al-Debei et al. (2013) – supported. Correspondently, the previous studies on the relationship between SeQ and US also presented similar pattern of mix-supported relationship (Petter et al., 2008). In terms of SeQ measurement, the IS researchers in EIS and e-learning have used several criteria such as promptness, responsiveness, assurance and availability (Lee-Post, 2009; Yengin et al., 2011). Appendix F_3 summarizes previous studies related to SeQ.

From the perspective of VLE implementation in Malaysia, the qualitative study by Cheok and Wong (2016) has stressed that SeQ is one of the major controversies among teachers, as a number of interviewees raised the issue of inadequate support provided by the management. Hence, the current study predicted that SeQ as one of the important determinants of VLE success among the teachers. Every researcher has distinctive measurements for SeQ, depending on their research aims and context (refer to Appendix F_3). As for the current study, responsiveness, assurance, empathy and tangibility were applied, as shown in Table 3.4. The items for these measurements were taken from several previous research (Al-Debei et al., 2013; Alshibly, 2014; H. H. Chang et al., 2009; C.-W. D. Chen & Cheng, 2009; J. V. Chen et al., 2015; Gay, 2016; Kettinger & Lee, 1994; Pitt et al., 1995).

Table 3.4

The Sources of Measurement for Service Quality and the Operational Definition for Each Measurement

Measurement	Operational Definition
Responsiveness (DeLone & McLean, 2003)	The willingness of VLE service provider to assist and supply quick service to teachers.
Assurance (DeLone & McLean, 2003)	Knowledgeable and courteous VLE helpdesk that inspires trust and confidence in teachers.
Empathy (DeLone & McLean, 2003)	The extent of individualized attention given by VLE and service provider to teachers.
Tangibility (Kettinger & Lee, 1994)	The VLE physical appearance, in terms of equipment and facilities.

3.6 Endogenous Variables

There are four endogenous variables involved in the current study, namely ITU, U, US and NB. The further details of relationships between exogenous and endogenous variables will be discussed thoroughly in the hypotheses section.

3.6.1 Intention to Use (ITU)

In this study, Intention to Use refers to the intention of future use, after using VLE (Agarwal & Prasad, 1997; DeLone & McLean, 2003). The ITU is usually related to two types of IS users; namely potential (never had an experience using the system, but intend to use it in the future) and continuous users (already use the system and intend to reuse it the future). However, the term 'intention to use' is more appropriate for continuous users, while 'intention to adopt' is for potential users (Karahanna, Straub, & Chervany, 1999). Consequently, the body of literature has shown that majority of researchers tend to measure the intention for continuous use, especially in investigating the relationship between ITU and U (see Appendix F_4).

For IS success studies, the ITU should be accredited to continuous users because if the respondents have yet to use the system, it is insignificant for them to rate the quality dimensions, usage and other success dimensions. As in case of Malaysian Frog VLE implementation, all teachers are required to create VLE account, and they were provided with the personal IDs by 1BestariNet, through the VLE administrator in schools (1BestariNet, 2012), which is supported by the findings of preliminary study. Therefore, this study assumed that every teacher has the experience of VLE initial usage. In light of this, it is postulated that the intention of future use or ITU is crucial

in determining the VLE success among teachers, as demonstrated by a few previous works in various IS contexts (Al-Debei et al., 2013; Lwoga, 2013; Teo et al., 2009). The measurement for ITU was taken from multiple sources (Alharbi & Drew, 2014; C.-W. D. Chen & Cheng, 2009; Park, 2009; Teo et al., 2009). Appendix F_4 summarizes the previous studies related to ITU and its measurement scales.

3.6.2 Use (U)

DeLone and McLean (1992) define system usage as the consumption of IS output or information by end users. U is usually associated with the utilization degree of IS capabilities by the end users (Petter et al., 2008), including information retrieval as well as the visits and navigations to the IS site (DeLone & McLean, 2004). In the updated D&M, U and ITU are alternately used to measure IS utilization. DeLone and McLean (2003) suggested that U is the appropriate measurement for voluntary IS while ITU is for the mandatory type of IS. In addition, the D&M also suggested that U should be associated with IQ, SyQ, SeQ, US, and NB. However, there are several researchers who argued that U and ITU as the different dimensions and sometimes can be correlated to each other (Al-Debei et al., 2013; C.-W. D. Chen & Cheng, 2009; Mardiana et al., 2015). Hence, these researchers claimed that U and ITU should exist together.

Previous studies also supported the following relationships affiliated to U, which are ITU to U (Al-Debei et al., 2013; C.-W. D. Chen & Cheng, 2009; Mohammadi, 2015), U to US (Al-Debei et al., 2013; Chiu, Chiu, & Chang, 2007) and U to NB (Alshibly, 2014; H. J. Chen, 2010; J. V. Chen et al., 2015). To measure the U dimension,

researchers in EIS and e-learning evaluation applied a number of measurements such as frequency of use, dependency and nature of use (see Appendix F_5). Therefore, concerning the outcomes and suggestions by the previous researchers, the current study posited that U is an influential factor in VLE success among teachers.

Examining the use of a system is prevalent in IS success studies, and various measurements for IS usage have been suggested (see Appendix F_5). In this study, the use of VLE was assessed by three aspects namely the frequency of access, regularity of use and the nature of use as indicated in Table 3.5. In addition, the measurement items for U were adapted from several sources (Abdulwahab & Zulkhairi, 2011; Al-Debei et al., 2013; Eom, 2012; Eom et al., 2012).

Table 3.5

The Sources of Measurement for Use of VLE and the Operational Definition for Each Measurement

Measurement	**Operational Definition**
Frequency of Access (DeLone & McLean, 1992)	The number of visits to VLE site by the teachers.
Regularity of Use (DeLone & McLean, 1992)	The amount of VLE usage by the teachers.
Nature of Use (DeLone & McLean, 2003)	The characteristics and the purpose of VLE usage by the teachers.

3.6.3 User Satisfaction (US)

User Satisfaction is usually regarded as the level of satisfaction or the users' responses to the output and the entire experience in using IS (DeLone & McLean, 1992, 2004; Petter et al., 2008). The existing literature on US is extensive and focuses particularly on its relationships with other IS success dimensions such as IQ, SyQ, SeQ, ITU, and NB. The positive relationships of US and other success dimensions have been confirmed by the previous studies, for example; US to ITU (Al-Debei et al., 2013; Halawi et al., 2008; Wixom & Todd, 2005) and US to NB (Halawi et al., 2008; Iivari, 2005). Meanwhile, the relationships between IQ to US, SyQ to US, and SeQ to US were discussed in the earlier sections.

Different researchers may use different measures for US, contingent on the objectives and research context (DeLone & McLean, 2002, 2003), as shown in Appendix F_6. Among the US measurements used by the EIS and e-learning researchers are overall satisfaction, enjoyable experience and recommended to others (Eom et al., 2012; Yengin et al., 2011). Based on the related evidence, this study predicted that US would also has a significant influence on the VLE success whereby those teachers who are satisfied with the information and overall experience of using VLE would have the intention of continuous usage as the system is believed to be beneficial. According to DeLone and McLean (2003), the US is a useful measure in the evaluation of mandatory IS. As for the VLE implementation in Malaysia, there is KPI for its usage, even though it is not mandatory. Consequently, the teachers are compelled to use it up to a certain extent based on the respective KPIs. Hence, the current study proposed US as one of the key components for VLE evaluation.

Despite the variations in measuring US by previous studies, this study measured it based on user surveys, enjoyment and overall satisfaction as suggested by DeLone and McLean (1992, 2003). The items for these measurements were adapted from several sources (Eom, 2012; Eom et al., 2012; Gay, 2016; Y. Wang et al., 2007; Zhou, 2013). Table 3.6 lists the operational definition for each measurement of US.

Table 3.6

The Sources of Measurement for User Satisfaction and Operational Definition for Each Measurement

Measurement	Operational Definition
User Surveys (DeLone & McLean, 2003)	The general view regarding the other teachers' perception of VLE by the teachers.
Enjoyment (DeLone & McLean, 1992)	The state of being pleasure after using the VLE by the teachers.
Overall Satisfaction (DeLone & McLean, 1992)	The overall feeling of satisfaction toward the VLE, from the perspective of the teachers.

3.6.4 Net Benefits (NB)

Net Benefits, defined as the category of overall impacts or benefits of using particular IS (DeLone & McLean, 2003), is considered as the most vital success measure that records the balance between positive and negative impacts, which contributes to the success of IS at the individual or organizational level (DeLone & McLean, 2004). The updated D&M suggests that NB could have a number of mutual relationships with U/ITU and US. For example, U to NB (Alshibly, 2014; H. J. Chen, 2010; J. V. Chen

et al., 2015), US to NB (Halawi et al., 2008; Iivari, 2005), NB to ITU (Al-Debei et al., 2013; Fang et al., 2011; Zheng et al., 2013) and NB to US (Petter et al., 2008).

Improved productivity, personal valuation, time savings and overall success are the examples of NB measures that have been used in previous EIS and e-learning evaluations (Eom, 2012; Halonen et al., 2010; Yengin et al., 2011) as summarized in Appendix F_7. In this study, the NB is considered as a major evaluation criterion for the VLE success among teachers. In other words, the positive impacts provided by the VLE are expected to increase teachers' satisfaction and continuous usage intention, which eventually lead to the overall success of the VLE.

Depending on the context of studies, previous researchers have developed different scales to measure NB (Appendix F_7). As such, the measurement of NB should acknowledge three considerations, which are the type of IS under examination, the purpose of the study and the level of analysis (Urbach & Müller, 2012). In this study, the NB was measured based on time-saving, improved productivity and personal valuation, as suggested by DeLone and McLean (1992, 2003). The items of these measurements were adapted from a number of previous empirical studies (J. V. Chen et al., 2015; Gay, 2016; Y. Wang et al., 2007). Table 3.7 lists the operational definition for each measurement of NB.

Table 3.7

The Sources of Measurement for Net Benefits and Operational Definition for Each Measurement

Measurement	Operational Definition
Time-Saving (DeLone & McLean, 2003)	The extent of belief by the teachers that using VLE will reduce the amount of time needed to perform a certain task (e.g., teaching, conducting the test, and lesson preparation).
Improved Productivity (DeLone & McLean, 2003)	The extent of belief by the teachers that using VLE will improve their productivity.
Personal Valuation (DeLone & McLean, 1992)	The extent of belief by the teachers that using VLE will improve their personal value and professional development.

3.7 The Role of Workload (WL) as the Moderator

The use of ICT was proved by a number of empirical studies as an effective solution in combating the excessive teachers' workloads (Condie & Munro, 2007; Selwood, 2005; Selwood & Pilkington, 2005; Vinluan, 2011). Although this may be true, some other studies have argued that the use of ICT could also become source of teacher's workload (Anuar & Mohd Nordin, 2015; Zawiyah & Mariah, 2008). In addition, a number of researchers have raised the issues of excessive workload carried by teachers and its possible negative consequences to EIS and VLE usage (Johari & Siti Norazlina, 2010; M. S. H. Khan et al., 2012; Letsoalo et al., 2014; Norazilawati et al., 2013; D. Wu et al., 2010). Unfortunately, the empirical evidence is still limited to support their assumptions (refer to Appendix F_9).

Under the Malaysian education environment, Raman and Yamat (2014) have interviewed twelve English teachers to understand the barriers that they faced in integrating the ICT for teaching and learning activities. The finding was similar to the study by Cheok and Wong (2016), which revealed the factor of workload have negatively affected teachers' use of ICT in education. Meanwhile, a qualitative study on the workload of the technical secondary school teachers by Sharifah et al. (2014) has affirmed that EIS is a part of their excessive workload. A few other IS researchers have expressed the same concerns over the matter of the heavy workload in Malaysia (Anuar & Mohd Nordin, 2015; Johari & Siti Norazlina, 2010; Norazilawati et al., 2013; Rahman et al., 2013). However, the existing ICT in education studies related to teacher's workload thus are limited to either (i) qualitative with non-generalizable findings, (ii) descriptive and (iii) literature reviews. Moreover, the empirical quantitative studies that modeled the role of workload in ICT adoption are surprisingly scarce. Therefore, this indicates the requirement for further explanations and more empirical evidence (refer to Appendix F_9).

The current study believed that workload is one of the important factors that influence the continuous utilization of VLE. Likewise, Inan and Lowther (2009) in their study of factors affecting ICT integration into the classroom also call for further investigation on teachers' workload as they believed that it is the potential threat for ICT usage in schools. Therefore, considering the issues highlighted by the prior studies, it is believed that the workload would also influence the VLE usage among teachers in Malaysia and empirical evidence in this matter is critically needed. In the current study, workload was measured based on volume of works, job pace,

multiplicity of tasks, and ICT as an extra workload (see Table 3.8) that were adapted from multiple sources (Boyle et al., 1995; Denton et al., 2002; Sanchez & Aleman, 2011; Selwood, 2005). Appendix F_8 summarizes previous studies related to workload and its measurement scales.

Table 3.8

The Sources of Measurement for Workload and the Operational Definition for Each Measurement

Measurement	Operational Definition
Job Pace (Denton et al., 2002)	The rate of job growth that could possibly affect the teachers' VLE usage.
Volume of Works (Boyle et al., 1995)	The excessive amount of works that could possibly affect the teachers' VLE usage.
Multiplicity of Tasks (Denton et al., 2002)	The extent that the teacher's belief that they have to perform a number of tasks simultaneously that infringes on their VLE usage.
ICT as Extra Workload (Sanchez & Aleman, 2011)	The extent of belief by the teachers that VLE usage will become another workload for them.

3.8 Hypotheses

Sekaran (2003) defines the hypothesis as the testable statement of the logical relationship between one or more variables. Fourteen hypotheses were tested in the study as illustrated in Figure 3.2. These hypotheses are divided into three categories; main (direct relationships), mediating relationships and moderating relationships. The IQ, SyQ and SeQ are grouped together in a single construct known as Quality

Dimensions and are represented by three sub-hypotheses. In addition, Age, Gender and VLE Experience are also compiled together as a moderating construct of Personal Characteristics.

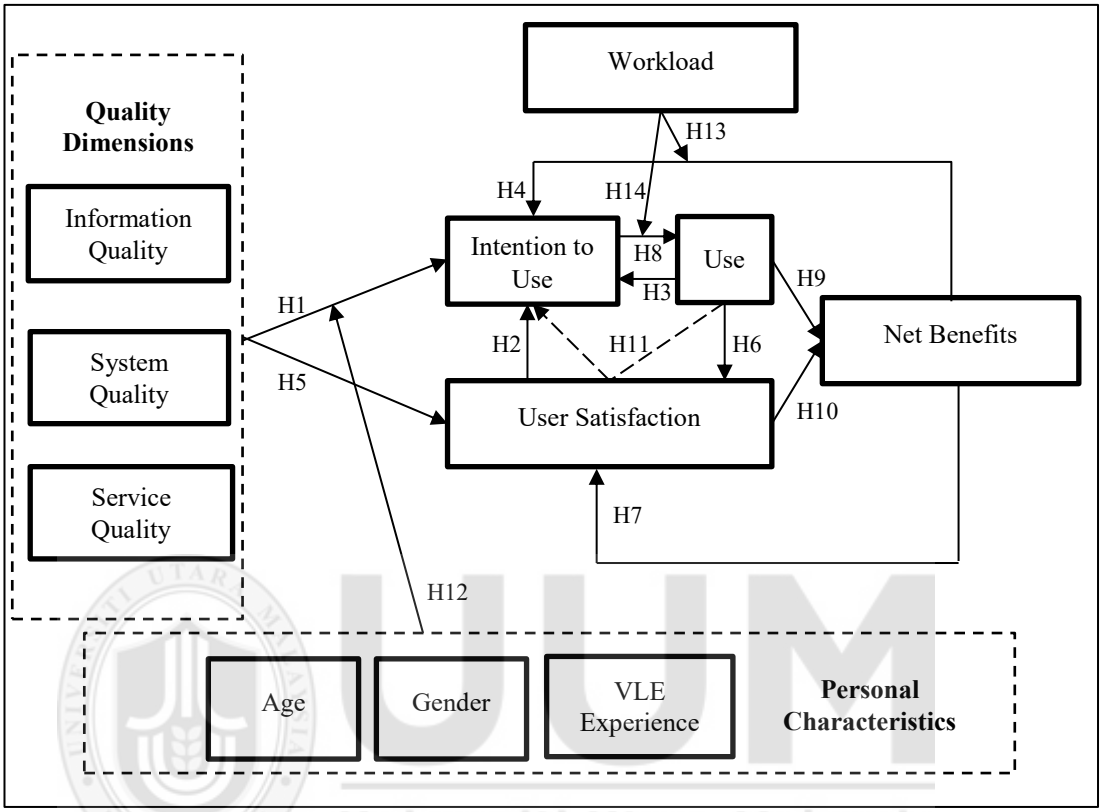


Figure 3.2. The Overall Hypotheses of the Study

3.9 Main Hypotheses

Ten main hypotheses were tested in the study, as shown in Table 3.9. Thorough discussion of these hypotheses is provided in the upcoming sections.

Table 3.9

Hypotheses between Exogenous and Endogenous Variables

	Description	Exo.	End.
H_1	*Quality Dimensions have significant influence on Intention to Use of VLE among teachers.*		
	H_{1a} Information Quality has a significant influence on Intention to Use of VLE among teachers.	IQ	ITU
	H_{1b} System Quality has a significant influence on Intention to Use of VLE among teachers.	SyQ	ITU
	H_{1c} Service Quality has a significant influence on Intention to Use of VLE among teachers.	SeQ	ITU
H_2	User Satisfaction has a significant influence on Intention to Use of VLE among teachers.	US	ITU
H_3	Use has a significant influence on Intention to Use of VLE among teachers.	U	ITU
H_4	Net Benefits have a significant influence on Intention to Use of VLE among teachers.	NB	ITU
H_5	*Quality Dimensions have significant influence on User Satisfaction of VLE among teachers.*		
	H_{5a} Information Quality has a significant influence on User Satisfaction of VLE among teachers.	IQ	US
	H_{5b} System Quality has a significant influence on User Satisfaction of VLE among teachers.	SyQ	US

Table 3.9 Continued

	H_{5c} Service Quality has a significant influence on User Satisfaction of VLE among teachers.	SeQ	US
H_6	Use has a significant influence on User Satisfaction of VLE among teachers.	U	US
H_7	Net Benefits has a significant influence on User Satisfaction of VLE among teachers.	NB	US
H_8	Intention to Use has a significant influence on Use of VLE among teachers.	ITU	U
H_9	Use has a significant influence on Net Benefits of VLE among teachers.	U	NB
H_{10}	User Satisfaction has a significant influence on Net Benefits of VLE among teachers.	US	NB

Exo. = Exogenous Variable, Endo. = Endogenous Variable

3.9.1 The Quality Dimensions and Intention to Use (ITU)

The current study postulated that Quality Dimensions would positively influence Intention to Use of VLE among Malaysian teachers. Previous research that demonstrated the significant relationships between IQ, SyQ and SeQ to the ITU appear to corroborate this postulation (Al-Debei et al., 2013; Ramayah et al., 2010). Hence, the upcoming main hypothesis is suggested, and detailed deliberations of the sub-hypotheses are provided in the next paragraphs.

H_1: *Quality Dimensions* *have significant influence on* ***Intention to Use*** *of VLE among teachers.*

The quality of information supplied by VLE as a variety of IS is one of the key measures of success to ensure its sustained use (Al-Debei et al., 2013). Several research focused on the connection between IQ and ITU had results that indicate both significant (Al-Debei et al., 2013; C.-W. D. Chen & Cheng, 2009; Iivari, 2005) and insignificant relationships (Halawi et al., 2008). The inconsistencies in the previous findings signal the requirement for further investigations and hence, the current study proposed the following sub-hypothesis:

H_{1a}: Information Quality has a significant influence on **Intention to Use** of VLE among teachers.

Many published works have described the correlation between SyQ and ITU. Within the IS literature, a diverse level of support for this relationship was found at the individual level of analysis. A few research concluded that SyQ is not connected to ITU (Agarwal & Prasad, 1997; Klein, 2007), but others found a positive relationship between these two IS success dimensions (Al-Debei et al., 2013; Ramayah et al., 2010; Teo et al., 2009). Meanwhile, Teo et al. (2009) further added that ITU should have been directly impacted by SyQ although there may be various levels of density in the relationship across disparate IS atmosphere. From these findings, it is presupposed that the characteristics of the VLE, which are readily available, easy to use and convenient to access, would lead to higher intention to use. Therefore, the study proposed the following sub-hypothesis:

H_{1b}: System Quality has a significant influence on **Intention to Use** of VLE among teachers.

While most of the IS success studies that adopted D&M focused on the relationship of SeQ and U, only few associated the relationship between SeQ and ITU (Al-Debei et al., 2013). Even though some researchers claimed that ITU is part of the U measurement, there are others who disagreed and recommended the separation of these two dimensions (Agarwal & Prasad, 1997; Mardiana et al., 2015). However, the body of research to this day still lack of empirical evidence regarding the relationship between SeQ and ITU, and thus requires further explorations.

Two decades ago, Choe (1996) has studied this relationship based on Accounting Information System (AIS) implementation in the Korean firms and revealed that the number of years of IS personnel's experience (assurance – a measurement in SeQ) was weakly related to the willingness of use (ITU). In another major study on Knowledge Management Systems (KMS), Halawi et al. (2008) discovered that the SeQ did not predict ITU. Notwithstanding, a more recent study by Al-Debei et al. (2013) who evaluate the success of a web portal found that SeQ positively influenced ITU. Previous arguments and the differences in research results have led this study to believe that a more in-depth investigation of this relationship is urgently needed. A good support infrastructure by the VLE service provider would also make daily usage a practical proposition. This will then give the teachers reason to keep on using the system. Hence, the following sub-hypothesis is proposed:

H_{1c}: Service Quality has a significant influence on **Intention to Use** of VLE among teachers.

3.9.2 User Satisfaction (US) and Intention to Use (ITU)

According to the updated D&M, users who are satisfied with the initial use should trigger their intention for future usage of the particular system in a casual sense. Hence, the current study postulates that teachers who are pleased with the VLE in terms of the initial use, information quality, system quality and service quality, would be motivated to keep using it. Al-Debei et al. (2013) supported a similar assumption and suggested that satisfaction with the technology will lead someone to carry on using it due to the positive experience and they will be positively reinforced in attitude towards the system. The connection between US and ITU has also been positively demonstrated by several empirical studies (Al-Debei et al., 2013; Halawi et al., 2008; Wixom & Todd, 2005). Consequently, the current study puts forward the following hypothesis:

H_2: User Satisfaction has a significant influence on **Intention to Use** of VLE among teachers.

3.9.3 Use (U) and Intention to Use (ITU)

The initial use and the intention to use in the future may differ under dissimilar conditions (DeLone & McLean, 2003). The updated D&M described that user satisfaction is a result of a good experience in the initial use. Thus, there will be a higher intention to use the system again. This assumption was made based on two major studies. Firstly, Agarwal and Prasad (1997) carried out an empirical investigation regarding an individual's perceptions on the attributes of the World Wide Web (WWW) service, as explanatory and predictive variables for acceptance

behavior. The finding shows that the different factors affect initial use versus the future use of the WWW.

Secondly, Karahanna et al. (1999) in their important study related to the pre- and post-adoption of Windows technology found that there are different factors affecting potential and continuous users. Potential users' ITU is solely determined by normative pressure while continuous users' ITU is determined by attitude, which is attributable to the initial use of the system. Comparatively, the current study (post-adoption) makes the assumption that all teachers are continuous users based on the discussion in the earlier section. A positive initial use of VLE is therefore a prediction of a higher intention to keep on using it. The preceding discussion is therefore the basis for the current study's proposal of the subsequent hypothesis:

H_3: Use has a significant influence on **Intention to Use** of VLE among teachers.

3.9.4 Net Benefits (NB) and Intention to Use (ITU)

In accordance with D&M, the positive NB will lead to future ITU (DeLone & McLean, 2003). In other words, if the users believed that the IS is beneficial for them, they would intend to use it again in the future. The NB in the current study is measured based on time-saving, improved productivity and personal valuation. Accordingly, the assumption of the current study is that the teachers would intend to continue using VLE if these aspects are positive to them. Several empirical studies have also shown support for a connection between NB and ITU (Al-Debei et al., 2013; Fang et al., 2011; Zheng et al., 2013). Therefore, based on this argument, the current study puts forward the following hypothesis:

H_4: Net Benefits has a significant influence on **Intention to Use** of VLE among teachers.

3.9.5 The Quality Dimensions and User Satisfaction (US)

The current study postulated that the Quality Dimensions would positively influence the US of VLE among Malaysian teachers. This presumption was grounded on many preceding research that demonstrated the significant correlations between IQ, SyQ and SeQ to the US (Al-Debei et al., 2013; Hsieh, Rai, Petter, & Zhang, 2012). Consequently, the current study proposes the following main hypothesis. The succeeding paragraphs will discuss in detail all the sub-hypotheses.

H_5: ***Quality Dimensions*** *have significant influence on* ***User Satisfaction*** *of VLE among teachers.*

According to the D&M, IQ will positively influence US, whereby user will be satisfied if the information produced by the IS are accurate, up to date, pertinent, and suitable (DeLone & McLean, 1992, 2003). A significant number of researchers have previously studied the relationship these two IS success dimensions. (Ainin et al., 2012; Al-Debei et al., 2013; Bossen et al., 2013; Davarpanah & Mohamed, 2013). Furthermore, in their prominent qualitative literature review study, Petter et al. (2008) highlighted that IQ was found to be strongly and positively correlated with the US by many preceding research. The context of the current study therefore should find that a VLE system that produces good quality information would raise teachers' satisfaction. This study proposes the following sub-hypothesis based on the earlier discussion:

H_{5a}: Information Quality has a significant influence on **User satisfaction** of VLE among teachers.

Over the past decade, most research in IS have emphasized the influence of SyQ toward US (Aggelidis & Chatzoglou, 2012; Ainin et al., 2012; Al-Debei et al., 2013; B. Armstrong et al., 2005; Bossen et al., 2013; Cheok & Wong, 2014; Urbach & Müller, 2012). Several research have also discovered SyQ to be positively related to US (Urbach & Müller, 2012). This notion is supported by the qualitative literature review study by Petter et al. (2008) that found the strong support of this relationship at the individual unit of analysis (all 21 papers reviewed produced significant relationship). Empirical research carried out by Al-Debei et al. (2013) that measured Web portal success and by Aggelidis and Chatzoglou (2012) that measured end user's computing satisfaction of Hospital Information Systems are samples of studies that found a strong relationship between SyQ and US. Only a few numbers of studies discovered weak or no relationship between these two variables, such as by Ainin et al. (2012) and Premkumar, Ramamurthy, and Nilakanta (1994). Hence, the current study's assumption that a VLE that is always reliably and conveniently accessible, easy to use and learn would result in a positive satisfaction for teachers. This study proposes the following sub-hypothesis based on the earlier discussion:

H_{5b}: System Quality has a significant influence on **User satisfaction** of VLE among teachers.

According to DeLone and McLean (2003), a higher service quality is expected to lead to higher user satisfaction. Thus, the current study postulated that if VLE and the

service provider (e.g. 1BestariNet), supplied a good service then the teachers would likely be contented and carry on using the system. However, empirical investigations conducted by several preceding research demonstrated only a mixed confidence in the ability of SeQ to describe US (Urbach & Müller, 2012). Similarly, Petter et al. (2008) analyzed the findings from 12 studies related to SeQ and US at the individual level of analysis. The result revealed that the relationship was only supported in six studies, while it was either half supported or not supported in six others. For example, the relationship of SeQ and US was supported in the studies by H. H. Chang et al. (2009), Chong et al. (2010) and Hsieh, Rai, Petter, and Zhang (2012). On the other hand, studies by J. V. Chen et al. (2015) and Chiu et al. (2007) found no association between these two IS success dimensions. Nevertheless, existing research in the field of EIS evaluation especially in the context of Malaysia have not revealed any attempt to empirically test this relationship. Therefore, the current study intends to fill the gap by proposing the following sub-hypothesis:

H_{5c}: Service Quality has a significant influence on **User Satisfaction** of VLE among teachers.

3.9.6 Use (U) and User Satisfaction (US)

The updated D&M suggests that the positive experience with initial U of IS will lead to a greater US. Based on the same argument, teachers who have experienced a positive use of VLE are presumed to be contented. Empirical literature has demonstrated a moderately supported relationship between U and US (Urbach & Müller, 2012). Regardless of that, there are also several studies that strongly support

this relationship (Al-Debei et al., 2013; Chiu et al., 2007). This study therefore proposes the following sub-hypothesis based on the earlier discussion:

H_6: Use has a significant influence on **User Satisfaction** of VLE among teachers.

3.9.7 Net Benefits (NB) and User Satisfaction (US)

DeLone and McLean (2003) suggest the correlation between NB and US where a higher NB will result in a higher US and vice versa. Indeed, the reversed back effect from NB to US was shown to be very robust (Urbach & Müller, 2012). For instance, Petter et al. (2008) reviewed 11 prominent research related to the relationship between NB and US. The result has unveiled that this relationship was supported in all those studies. Furthermore, ten years after DeLone and McLean (2003) produced their updated D&M, Al-Debei et al. (2013) have empirically tested the relationship between NB and US under the context of web portal and found that it was positively supported. In another empirical study of online shopping and re-purchase intention by Fang et al. (2011), the relationship between NB and US was strongly supported. Finally, this relationship was also supported in a recent study by Zheng et al. (2013) that investigated the continuance intention in information-exchange of virtual communities. Preceding data and arguments lead the current study to postulate that positive benefits conferred by VLE would increase the teachers' satisfaction toward the system itself. Therefore, the following hypothesis is proposed:

H_7: Net Benefits has a significant influence on **User satisfaction** of VLE among teachers.

3.9.8 Intention to Use (ITU) and Use (U)

The ITU calculates the probability of someone using an application (Al-Debei et al., 2013). Even though the ITU is suggested as an alternative construct for U (DeLone & McLean, 2003), some researchers disagreed and argued that these two constructs should exist together (Agarwal & Prasad, 1997; Mardiana et al., 2015). The concept of people's intention to use certain technology was introduced in TAM (F. D. Davis, 1989). The 'Behavioral Intention to Use' construct is used in TAM as a precursor for predicting the actual usage of the particular technology. Furthermore, Venkatesh et al. (2012) have highlighted that the 'Behavioral Intention' is correspondingly referred to continuous users, as in the case of consumer acceptance of the technology. This stance is also consistent to DeLone and McLean (2003) who suggested the looped relationship between U, US and ITU. According to them, the satisfaction of the initial use leads to greater intention to use and thus trigger the positive use. Positive use will result in satisfaction and intention for future use. These premises led Mardiana et al. (2015) to also suggest that the ITU should be the predictor of U in the D&M. In addition, several empirical research have also suggested this relationship between ITU and U (Al-Debei et al., 2013; C.-W. D. Chen & Cheng, 2009; Mohammadi, 2015). The hypothesis that can be formulated from the preceding discussion is that the teachers' future intention to use VLE would be a contributing factor in its actual usage. Therefore, the following hypothesis is proposed:

H_8: Intention to Use has a significant influence on **Use** of VLE among teachers.

3.9.9 Use (U) and Net Benefits (NB)

DeLone and McLean (2003) suggested that certain net benefits would occur when a user operated a particular IS. They further added that these net benefits could be positive or negative. Hence, the current study hypothesized that teachers would accrue some benefits in terms of the time saved, productivity gains and personal enhancement via VLE usage. Empirically, there is moderate support in the correlation between these two IS success dimensions (Petter et al., 2008). To illustrate, a number of studies have rejected the hypothesis of the relationship between U and NB (Chong et al., 2010; Khayun & Ractham, 2011). Nonetheless, some other recent studies have positively supported this relationship (Alshibly, 2014; H. J. Chen, 2010; J. V. Chen et al., 2015). Based on the variability of the previous research results, the current study believed that an in-depth examination is warranted. The following hypothesis is thus put forward:

H_9: Use has a significant influence on **Net Benefits** of VLE among teachers.

3.9.10 User Satisfaction (US) and Net Benefits (NB)

According to DeLone and McLean (2003), U and US will result in some NB. In practice, the users who have experienced gratification when using the system should perceive that the particular system is beneficial to them. In the context of this study, the teachers who were satisfied with the VLE should believe that they would gain extra time, better productivity or enhance their personal worth by using it. A review of the present state of D&M research has shown previous empirical studies vigorously accepted the relationship between US and NB (Urbach & Müller, 2012). This is also supported by the qualitative literature review by Petter et al. (2008) that analyzed 14

prominent studies related to US and NB. The result shows that all of these studies have positively supported the relationship, including those conducted by prominent researchers like Iivari (2005) and Halawi et al. (2008). Considering these findings, the current study also expected similar outcomes, and hence proposed the following hypothesis:

H_{10}: User Satisfaction has a significant influence on **Net Benefits** of VLE among teachers.

3.10 Hypothesis for Mediating Variable (MeV)

As discussed in the 'Conceptual Model' section, the initial U of VLE should result in a positive US, and raise the ITU (DeLone & McLean, 2003). Therefore, the relationship between U and ITU should only exist with the mediating effect of US. This means that teachers (who have already been through the initial use) presumably intend to keep on using VLE, provided they were satisfied with it when they first used it. Therefore, the current study proposed the following hypothesis:

H_{11}: **User Satisfaction** mediates the relationship between **Use** and **Intention to Use** of VLE among teachers.

3.11 Hypotheses for Moderating Variables (MoV)

Two hypotheses for moderating variables were tested in the study, which consists of Workload (WL) and Personal Characteristics, as shown in Table 3.10.

Table 3.10

Hypotheses for Moderating Variables

Code	Description	Exo.	MoV	Endo.
H_{12}	***Personal Characteristics*** *moderates the relationships between* ***Quality Dimensions*** *and* ***Intention to Use*** *of VLE among teachers*			
	H_{12a}: Age moderates the relationship between **Information Quality** and **Intention to Use** of VLE among teachers.	IQ	Age	ITU
	H_{12b}: Age moderates the relationship between **System Quality** and **Intention to Use** of VLE among teachers.	SyQ	Age	ITU
	H_{12c}: Age moderates the relationship between **Service Quality** and **Intention to Use** of VLE among teachers.	SeQ	Age	ITU
	H_{12d}: Gender moderates the relationship between **Information Quality** and **Intention to Use** of VLE among teachers.	IQ	Gender	ITU

Table 3.10 Continued

	H_{12e}: Gender moderates the relationship between **System Quality** and **Intention to Use** of VLE among teachers.	SyQ	Gender	ITU
	H_{12f}: Gender moderates the relationship between **Service Quality** and **Intention to Use** of VLE among teachers.	SeQ	Gender	ITU
	H_{12g}: VLE Experience moderates the relationship between **Information Quality** and **Intention to Use** of VLE among teachers.	IQ	VLE Exp.	ITU
	H_{12h}: VLE Experience moderates the relationship between **System Quality** and **Intention to Use** of VLE among teachers.	SyQ	VLE Exp.	ITU
	H_{12i}: VLE Experience moderates the relationship between **Service Quality** and **Intention to Use** of VLE among teachers.	SeQ	VLE Exp.	ITU
H_{13}	**Workload** moderates the relationship between **Net Benefits** and **Intention to Use** of VLE among teachers.	NB	WL	ITU

Table 3.10 Continued

H14	**Workload** moderates the relationship between **Intention to Use** and **Use** of VLE among teachers.	ITU	WL	U

Exo. = Exogenous Variable, Endo. = Endogenous Variable, MoV = Moderating Variable

3.11.1 Personal Characteristics as the Categorical Moderators

This research submits that Personal Characteristics; Age, Gender and VLE Experience play moderating roles in the relationships between the Quality Dimensions (IQ, SyQ and SeQ) and ITU. Therefore, the following main hypothesis is proposed. The precursors of this main hypothesis will be expounded in detail in the succeeding paragraphs.

H12: ***Personal Characteristics*** *moderate the relationships between* ***Quality Dimensions*** *and* ***Intention to Use*** *of VLE among teachers.*

A lot more data has become available in the past half century to explain the effects of age on IS adoption, particularly concerning intention to use the technology (Lin, Lu, & Liu, 2013; R. N. Taylor, 1995; Venkatesh et al., 2003). There is a suggestion by some researchers that age is a reflection of the different human capabilities to process the input of information which further interferes in their response toward the IS (Venkatesh et al., 2012). The older generation are discovered to rely more on automatic memory processing in comparison to the younger ones (Jennings & Jacoby, 1993). This is mainly due to the experience of doing the same things repeatedly that

creates the habits. Consequently, the habits of the aged people prevent them from defusing a new technology (Venkatesh et al., 2003) and caused them to rely on better quality of information to perform certain tasks. Processing complicated information and staying focused on the job is made harder by advancements in age, even though both abilities are required when using IS (Venkatesh et al., 2003). Hence, veteran teachers are predicted to have less enthusiasm for VLE usage if they found that the information and system quality to be low.

Moreover, in IS adoption, preceding research have demonstrated that the elderly workers tend to need extra more assistance and help in carrying out the work. The aging process is a factor due to the reduction in physical and cognitive abilities (Venkatesh et al., 2003). In these situations, older IS users are impaired in their ability to learn recent technologies due to greater hindrances in processing new and complex information. (Morris, Venkatesh, & Ackerman, 2005). As a result, they are prone to be ICT illiterate and will have to be more reliant on the finer support and service quality in carrying out certain tasks (Venkatesh et al., 2012). Therefore, the current study posited that older teachers would require better information, system and service quality from VLE before they can use it in their teaching activities. This assumption has the backing of several empirical research which showed the impact of teachers' ages on ICT usage in schools (Hindman, 2000; Johari & Siti Norazlina, 2010; Raman & Yamat, 2014). Similarly, Cheok and Wong (2016) interviewed twelve teachers to explore the influence of teachers' age in the context of VLE implementation. The result has proven that the younger teachers are more comfortable to use VLE compared to their older colleagues. The previous deliberation is the basis for the current study's

postulation that the older teachers would demand greater information, system and service quality by VLE and service provider (e.g. 1BestariNet). The following sub-hypotheses are subsequently presented:

H_{12a}: Age moderates the relationship between **Information Quality** and **Intention to Use** of VLE among teachers.

H_{12b}: Age moderates the relationship between **System Quality** and **Intention to Use** of VLE among teachers.

H_{12c}: Age moderates the relationship between **Service Quality** and **Intention to Use** of VLE among teachers.

It is noteworthy that empirical data demonstrated perceived usefulness (one of the measurements for information quality) to be more important for men compared to women (Venkatesh & Morris, 2000; Venkatesh et al., 2003). The desired quality of information is more important for men to carry out certain tasks such as teaching because they are usually task-oriented (Venkatesh et al., 2003). Women are instead discovered to be more sensitive and detail-oriented especially in making decisions (Meyers-Levy & Tybout, 1989). Women usually digest information in an organized way, the opposite of men who usually discard pertinent details in order to process the information from a broader perspective (Meyers-Levy & Maheswaran, 1991). Venkatesh et al. (2012) took note of this and put forth the theory that women would be quicker to respond to variations in the environment that will further influence their intention. A few empirical IS studies that uncovered the greater impact of perceived ease of use (one of the measurements for system quality) among women have reinforced this suggestion (Venkatesh & Morris, 2000; Venkatesh et al., 2003). This

evidence indicates that women anticipates a good system quality that is easy to use (Venkatesh et al., 2003) and consequently if they perceive that the specific system is convoluted in nature, they will most likely demand improved service quality.

Levy (1988) suggested that age and gender are elements that are intricately related and therefore should be investigated at the same time. Gender differences and the dependence on service quality are also expected to be more noticeable with an increase in age (Morris et al., 2005). Differences in gender roles get more cogent as age increases and women normally tend to be more reliant on better external support or service quality (Venkatesh et al., 2012). To sum up, the preceding discourse on gender roles has shown that the intention to use VLE among the teachers tend to be affected by gender dissimilarities. Male teachers want improved information quality, while female teachers tend to consider the system and service quality. Therefore, the current study considered the preceding arguments and proposed the following sub-hypotheses:

H_{12d}: Gender moderates the relationship between **Information Quality** and **Intention to Use** of VLE among teachers.

H_{12e}: Gender moderates the relationship between **System Quality** and **Intention to Use** of VLE among teachers.

H_{12f}: Gender moderates the relationship between **Service Quality** and **Intention to Use** of VLE among teachers.

Experience as suggested in UTAUT and UTAUT 2 refers to "an opportunity to use a target technology and is typically operationalized as the passage of time from the initial use of a technology by an individual" (Venkatesh et al., 2012, p. 161).

Therefore, this study refers to experience as the teachers' experience with the VLE. VLE experience should moderate the relationship between SeQ and ITU, as suggested by Venkatesh et al. (2012). By referring to the ground-breaking research conducted by Alba and Hutchinson (1987), Venkatesh et al. (2012) also explained that greater experience is expected to lead to a higher familiarity with a particular system and thus the dependence on external support is lessened.

Although age and gender have been found to be influential factors in preceding research, their impact were also predicted to reduce as experience increases (Venkatesh et al., 2003). Gender dissimilarities when first using new technologies will normally rise in concert with age (Venkatesh et al., 2012) as the aging process will result in a declining ability to process information. Men tend to process information based on their previous experience, whilst older women are more likely to process the information in a more thorough and considered way (Venkatesh et al., 2012). Thus, older women are predicted to be less affected by their heuristic experience. Perceived usefulness is more distinct as experience expands in which the IS user will psychologically believe that the information supplied by the particular IS is beneficial to them as they get more familiar with the system (S. Taylor & Todd, 1995a). The role of earlier experience is therefore implied to be pivotal in the context of IS usage, particularly in measuring the strength of the relationship between information quality and intention to use.

Similarly, the perceived complexity should diminish as the ease of use becomes higher when experience grows (F. D. Davis, 1989; Szajna, 1996; Thompson, Higgins, & Howell, 1994). Dependence on outside support is usually more pronounced for users

with lesser experience (Thompson et al., 1994). This suggests that experience can also be a moderator between service quality and intention to use because increased familiarity of IS usage will enhance user's knowledge structure, which will help in the learning process and reduce the reliance on external support or services (Alba & Hutchinson, 1987; Venkatesh et al., 2012).

The dependence on service quality is also more pronounced in older women at the early stages of technology usage (less experience) since they usually dedicate more effort to learning the new technology (Venkatesh et al., 2012). In the context of this study, the effects of information, system and service quality are predicted to be moderated by the VLE experience. This explains that the effect of personal characteristics will eventually become lower as the teachers are getting more familiar with the system. The higher experience in using the VLE should positively increase the familiarity and finally should lead to decreased dependence on external support. For example, the teachers will be less dependent on the 1BestariNet helpdesk services as in the case of Frog VLE. Therefore, the following sub-hypotheses are put forward:

H_{12g}: VLE Experience moderates the relationship between **Information Quality** and **Intention to Use** of VLE among teachers.

H_{12h}: VLE Experience moderates the relationship between **System Quality** and **Intention to Use** of VLE among teachers.

H_{12i}: VLE Experience moderates the relationship between **Service Quality** and **Intention to Use** of VLE among teachers.

3.11.2 Workload (WL) as a Continuous Moderator

The Association of School and College Leaders (2014) issued a report that elucidated Workload (WL) as: "Work done for perceived and/or unnecessary compliance processes, which take teachers away from the complex process of teaching and learning." The definition also relates to the teachers' professional functions and obligations such as teaching, community services, professional development and interaction with students (Yuker, 1984). In the context of VLE implementation, workload is considered as one of the possible influencing factors in the utilization of the system. The problem of heavy teachers' workload has been acknowledged by many previous studies, specifically in the field of ICT in education (Cheok & Wong, 2016; Johari & Siti Norazlina, 2010; M. S. H. Khan et al., 2012; D. Wu et al., 2010). Unfortunately, the empirical evidence regarding the issue is scarce in the Malaysian context.

In their study, Cheok and Wong (2016) pointed out that majority of teachers blamed heavy workload as their main excuse of not using the VLE. On the other hand, Zawiyah and Mariah (2008) indicated that heavy and extra workload including the requirements of using ICT applications affects their teaching quality. In another study by Selwood (2005), the use of ICT by teachers for administration and management helped to reduce their workload. Nevertheless, Selwood (2005) also argued that the poor quality of hardware and software will most probably add to teacher's workload, which supports the finding of Zawiyah and Mariah (2008). These studies have described that the body of literature on the workload and ICT/EIS/VLE (the relationship between WL and U) thus far are categorized as following:

i. The excessive workload that deters the user from using the system or time barriers (Anuar & Mohd Nordin, 2015; Cheok & Wong, 2016; Johari & Siti Norazlina, 2010; M. S. H. Khan et al., 2012; Norazilawati et al., 2013; D. Wu et al., 2010).
ii. IS as another workload (Sanchez & Aleman, 2011; Zawiyah & Mariah, 2008).
iii. IS as a solution for the excessive workload (Selwood, 2005; Selwood & Pilkington, 2005; Vinluan, 2011).

Regarding the first category, Hu, Clark, and Ma (2003) mentioned that workload can seriously obstruct teachers from using new technology. Since the last century, teachers' tasks have rapidly risen in number and the problem of heavy workload have turned into a common-place occurrence among them (Ballet & Kelchtermans, 2009). The types of excessive workload carried by teachers are usually in form of non-teaching tasks, MARRA (monitoring, assessment, recording, reporting and accountability), substituting absent colleagues, government schools' initiatives and inferior school planning (Butt & Lance, 2005). Hence, Inan and Lowther (2009) suggested that any upcoming research on ICT integration in education should include the factor of workload, as they believed that it will extend the explanations from the existing literature.

Furthermore, several studies have attempted to explore how WL plays a role in technology adoption. For instance, in a case study by Raman and Yamat (2014) that investigate ICT integration in English education, they found that WL is one of the major barriers that prevent teachers from incorporating the use of ICT in their teaching

practices. In the context of VLE, majority of researchers agreed on the benefits provided to the teachers (Cheok & Wong, 2016; Hiong & Umbit, 2015; Kaur & Hussein, 2015; Norazilawati et al., 2013). However, Cheok and Wong (2016) found that WL is one of the impactful influences that interfere in their predetermination to the use of VLE, although the benefits are obvious to them. On the contrary, there are also other studies that suggested ICT as a medium to deal with heavy WL (Selwood & Pilkington, 2005; Vinluan, 2011). Therefore, it is not clear on the manner WL could affect the VLE implementation.

In terms of measurement, the existing literature in the IS studies have not provide adequate scales to measure how the WL would influence the use of ICT/EIS/VLE. Therefore, the current study adapted certain measurements from other research fields, as shown in Appendix F_8. Based on the presented findings and arguments, the current study hypothesized that WL would play the moderating role in the VLE success among the teachers, in either positive or negative ways. Therefore, the following hypothesis is proposed:

H_{13}: Workload moderates the relationship between **Net Benefits** and **Intention to Use** of VLE among teachers.

H_{14}: Workload moderates the relationship between **Intention to Use** and **Use** of VLE among teachers.

3.12 Summary

This chapter discussed the need for using updated D&M model as a theoretical framework in the current study by further elaborating on the reasons for including Workload and Personal Characteristics in the conceptual research model. This chapter also explained the justification of using both constructs of Intention to Use and Use. The discussions of the relationships among exogenous variables, endogenous variables, mediating variable, and moderating variables are also presented. This is continued by presenting the research hypotheses, which have been proposed for the current study. In the next chapter, the adapted research methodology is described.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1 Introduction

The methodology used in this research is elaborated on in this chapter. It is divided into six major sections and starts with the description of research approach, which also includes the discussion of research design and process. The following section details out the data collection procedure. Finally, the last section describes the employed data analysis procedures.

4.2 Research Approach

Research approach is a procedure that involves several steps from determining hypotheses to conducting data collection and analysis (Creswell, 2014). Two types of basic research approaches are quantitative and qualitative (Kothari, 2004). However, for a more rigorous study, researchers choose mixed methods approach (Creswell, 2014). Based on the problem statement and the objectives stated in Chapter One, the mixed methods approach based on explanatory sequential design was applied in this study. This design uses qualitative approach to validate or explain the quantitative results (see Figure 4.1). As for this case, the quantitative phase is the core of the study, where the hypotheses testing were done. In addition, the qualitative approach was applied during the model validation using the 'VLE Implementation Strategy for Malaysian Schools' that was developed based on the final revised model. Therefore, the following paragraphs will describe the quantitative phase, and the qualitative analysis will be provided in the Data Analysis chapter.

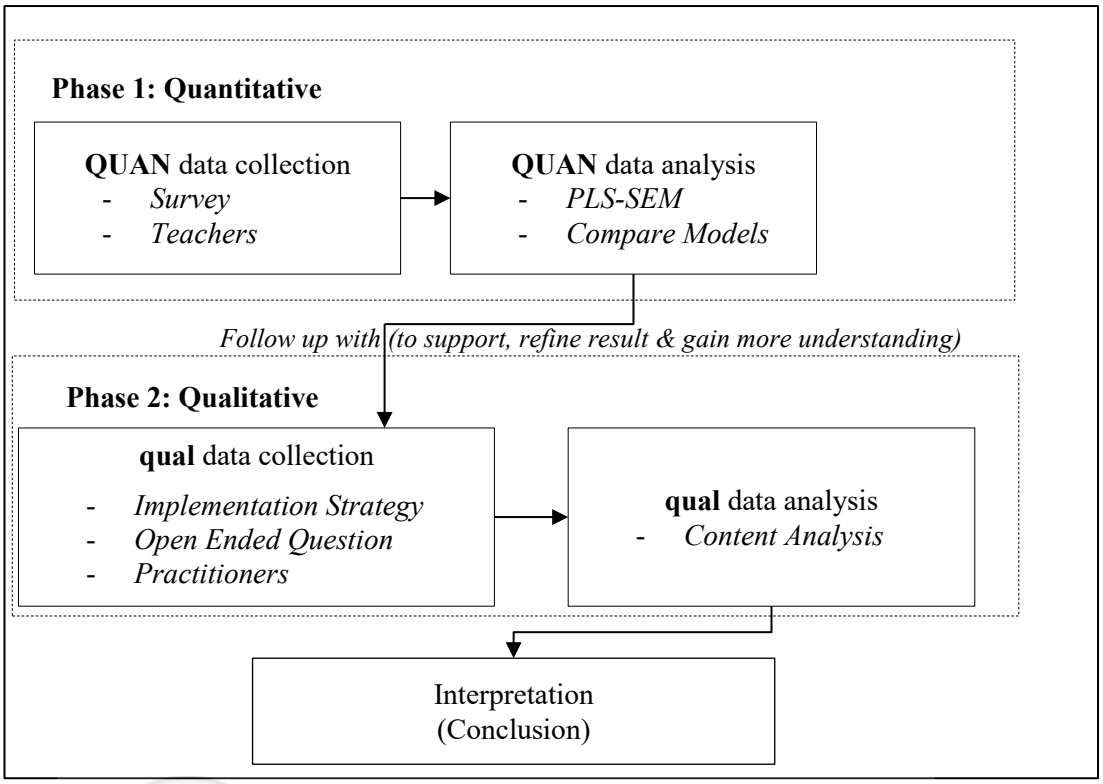


Figure 4.1. Explanatory Sequential Design

This study has proposed fourteen main hypotheses, which include mediator and moderators to examine the relationship between the variables in the model and to develop the evaluation model for measuring the VLE success among the Malaysian teachers. Thus, the use of such approach is appropriate since quantitative studies normally investigate the relationships between variables and occasionally explain the causes of those relationships (Fraenkel & Wallen, 2009).

Research design is a type of inquiry in qualitative, quantitative and mixed methods approaches that accords the specific direction for inquiry procedures (Creswell, 2014; Sekaran & Bougie, 2013). The main purpose of the design is to provide clear answers to the proposed research questions using the obtained evidence (de Vaus, 2001). According to Creswell (2014), there are two categories of research designs:

experimental (true experimental and quasi-experimental) and non-experimental. As for the quantitative research approach, Creswell (2012) suggested three research designs that are usually used in educational research, namely experimental, correlational and survey designs.

A cross-sectional survey field study was deployed in the current study, as the data has been collected at a single point in time. Field study refers to the non-experimental scientific inquiries designed to uncover the relationship between variables (Sekaran & Bougie, 2009). The application of a survey field study provides several advantages. First, this research design could maximize the representative sampling of population units and therefore, will improve the ability to generalize the findings (Scandura & Williams, 2000). Secondly, it is usually high in accuracy, due to the instrument that is designed specifically to address the research questions (Slater, 1995).

A survey is considered as the most appropriate method because of its accuracy in gathering information as well as enabling researchers to generalize findings, from a sample to a population (Creswell, 2014). A survey is also appropriate for studies with large sample sizes, as it is expedient, cost-effective and administratively efficient (Sekaran, 2003). Finally, a survey is also relevant when querying respondents about their perceptions, opinions, and feelings (Shaughnessy, Zechmeister, & Zechmeister, 2012).

Despite the above-mentioned advantages of the survey, the method is still being criticized due to its dependency on self-report data. Among its drawbacks are self-selection and lack of control over the timeliness, depending on the type of survey (Rea

& Parker, 2014). Considering these issues, this study made use of three strategies to minimize the drawbacks of applying the survey method. The first strategy was to use only the previously tested, reliable and valid scales to ensure the reliability and validity of the instrument. The second strategy was to translate the constructed questionnaire from English to Bahasa Melayu (also provided in both languages) to establish better understanding of the questions among the teachers and thus mitigate any response bias. Finally, QR code is included at the front page of the questionnaire to increase the response rate and speed up the data collections process.

4.2.1 Research Process

Research process represents the procedure for answering research questions (Field, 2009). In this study, the research process involved three major phases as depicted in Figure 4.2.

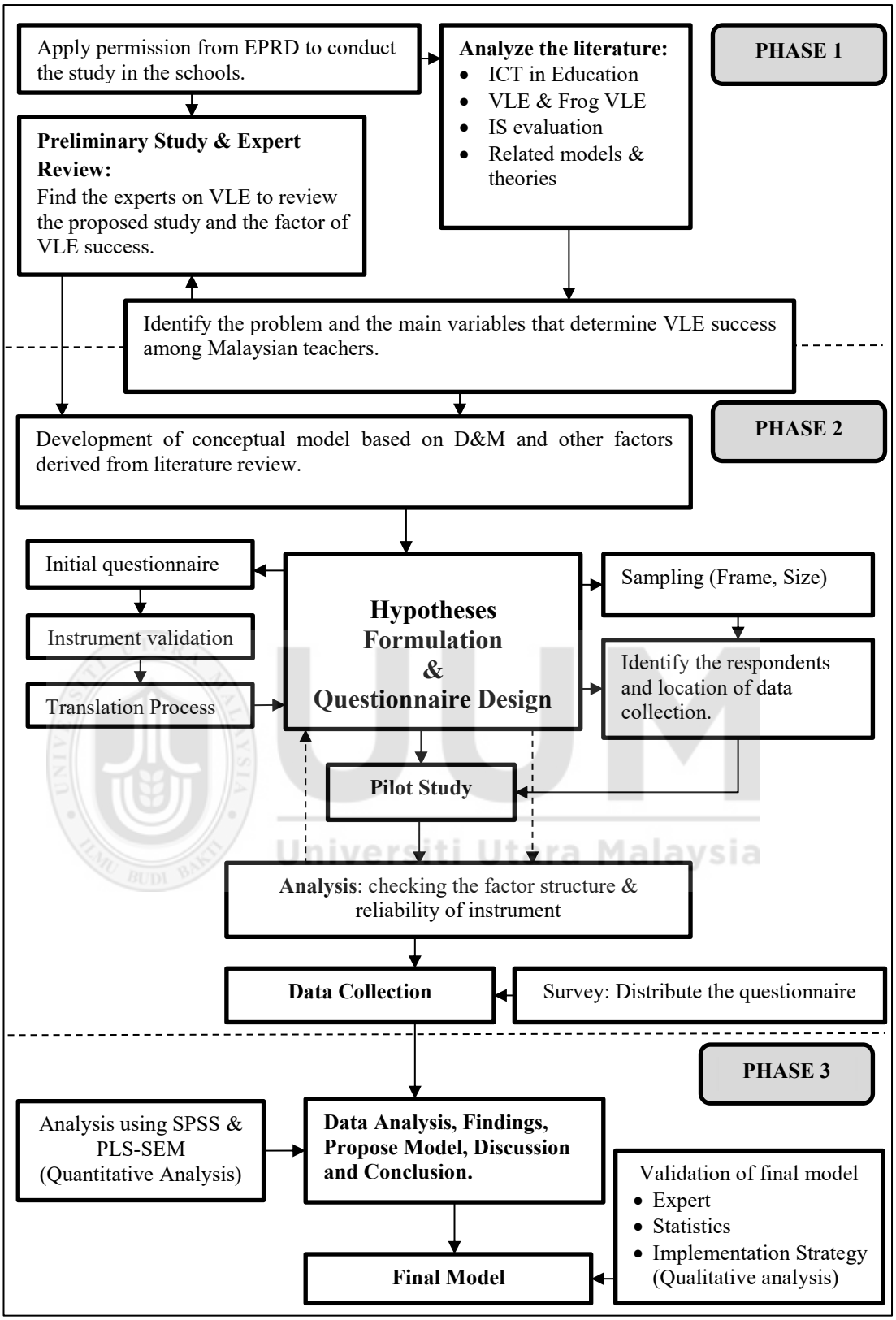


Figure 4.2. Research Process

Activities in phase one were literature review, preliminary study and expert review for factor selections. The research activity began by applying permission from the Educational Planning and Research Division (EPRD), MOE, the authority in-charged for all education premises in Malaysia. The approval from the authority is important before conducting the study in all government primary and secondary schools across the Northern Region of Malaysia. The preliminary study was performed to determine the main issue that possibly hinders the VLE success (data from several sources including the government audit report). Once the factors related to the issue were identified and reviewed by experts, the initial broad problem area was narrowed down to a more specific problem statement. Finally, the research questions and objectives was developed at this stage.

In phase two, the conceptual model was developed based on the updated D&M with the inclusion of other external moderating variables; Workload, Age, Gender and VLE Experience, which were derived from the literature. Each success dimension was then operationalized. In addition, 14 hypotheses were developed. The design and validation of the survey instrument by academic experts were also done in this phase. The questionnaire was then sent to a qualified translator from the Language Center, Universiti Utara Malaysia (UUM) for translating the English version to Bahasa Melayu. The reliability test and factor analysis for the constructs were performed using pilot data. The data collection started once the pilot study was completed and instrument was revised.

Data analysis was carried out in the third phase, which was completed by analyzing data from respondents, testing the hypotheses, discussing and interpreting the findings, and presenting the final research model. Upon the completion, the data analysis procedure and the revised model were validated based on expert, statistical and practitioner's validations.

4.2.2 Factor Selection

The findings from the preliminary study show the consensus among field experts on the need for evaluating the current implementation of VLE in the schools, due to the low utilization among teachers. Thus, in order to comprehend the potential significant factors for evaluating the VLE success, two methods of acquiring and validation were applied. Initially, the literature review was conducted to search for the relevant factors related to the IS success. These selected factors were then given to the field experts to confirm the appropriateness and suitability. To ensure the validity of this procedure, the experts were chosen based on two criteria; years of teaching and experience with e-learning system.

The minimum requirement to be appointed as expert is seven years of teaching experience for teachers (Berliner, 2004). This criterion is important for this study as the selected experts' reviews help in determining the significance of the proposed factors in the perspective of the teachers. The experts in e-learning system should have at least three years of experience (Guasch, Alvarez, & Espasa, 2010). The e-learning criterion will ensure that the experts are familiar with the VLE, especially in terms of the system, information and service quality. Therefore, the experts were selected based

on their experience as teachers (over seven years) and experience in dealing with VLE (over three years). The findings of the expert review are shown in Table 4.1. In addition, the possible influence of the personal characteristics to the usage was also considered in this study since all the experts had acknowledged it.

Table 4.1

Factor Selections of the Current Study

Factor	Suggested by	Expert Review
Information Quality	(DeLone & McLean, 1992, 2003)	All the experts rate this factor as very significant.
System Quality	(DeLone & McLean, 1992, 2003)	All the experts rate this factor as very significant.
Service Quality	(DeLone & McLean, 2003)	All the experts rate this factor as very significant.
Workload	(Cheok & Wong, 2016; M. S. H. Khan et al., 2012; Letsoalo et al., 2014; Norazilawati et al., 2013; D. Wu et al., 2010)	All the experts rate this factor as very significant.
Intention to Use	(Agarwal & Prasad, 1997; DeLone & McLean, 2003)	All the experts rate this factor as very significant.
Use	(DeLone & McLean, 1992, 2003)	All the experts rate this factor as very significant.

Table 4.1 Continued

User Satisfaction	(DeLone & McLean, 1992, 2003)	All the experts rate this factor as very significant.
Net Benefits	(DeLone & McLean, 2003)	All the experts rate this factor as very significant.

4.3 Instrument Development

Previous researchers have highlighted that the design of a research instrument requires a good comprehension of basic assumption to formulate good questions (Müller, 2012). The instrument for survey research is usually in the form of a self-administered questionnaire, which will be completed by respondents (Sekaran & Bougie, 2013; Zikmund, Babin, Carr, & Griffin, 2010). Thus, a structured questionnaire, which consists of a set of statements that were adapted and reformulated to suit the perspective of the current study, was employed.

This study also structurally built up the questionnaire that meets the research objectives based on the proposed conceptual model and hypotheses. The questionnaire is comprised of four sections; A, B, C and D. Apart from gathering the demographic data of the respondents, the last question in Section A represents a filtering question to determine whether the respondent has any experience in using the VLE system. Those with no experience will proceed to Section D, which consists of two questions related to the VLE system (reason for not using, comments and suggestions). The others will continue with Section B and C, which include questions regarding the

factors that affect the successful implementation of the VLE system among Malaysian teachers.

Section B is formulated to measure the eight VLE success dimensions, namely Information Quality (IQ), System Quality (SyQ), Service Quality (SeQ), Intention to Use (ITU), Use (U), User Satisfaction (US), Workload (WL), and Net Benefits (NB). In this section, respondents are required to circle appropriate response. The statement of each item has been revised and validated by the selected experts before conducting the pilot study. The related constructs and items of the VLE success, as well as their sources, are shown in Table 4.2.

The measurement scale for every construct is a seven-point Likert Scale, which ranges from 1 to 7 [‘1’ extremely disagree to ‘7’ extremely agree]. The study applied the seven-point Likert Scale because it provides a wide spread scale and prevent respondents from selecting the neutral value. Thus, the chances of biasness will be decreased (Dwivedi, Papazafeiropoulou, Brinkman, & Lal, 2010). Moreover, the seven-point Likert Scale has been applied by many prominent IS researchers (Agarwal & Prasad, 1997; D. J. Armstrong, Brooks, & Riemenschneider, 2015; Bhattacherjee, 2001; Seddon & Kiew, 1996; Venkatesh et al., 2012).

4.3.1 Construct Measurement

The survey measures eight continuous variables, which are IQ, SyQ, SeQ, ITU, U, US, WL, and NB. All the items related to these variables were adapted from previous studies (e.g., Denton et al., 2002; Eom et al., 2012; Kettinger & Lee, 1994; Zhou, 2013). Table 4.2 summarizes the draft measurements used for all constructs, which were later gone through other instrumentation procedures.

Table 4.2

Draft Measurement of VLE Success

Measurement	Item(s)	Original Item(s)	Source(s) of Item(s)
Information Quality (IQ)			
Accuracy (DeLone & McLean, 1992)	1. The Frog VLE provides information that is exactly what I need.	The system provides information that is exactly what you need.	(Eom, 2012; Eom et al., 2012)
Relevance (DeLone & McLean, 2003)	2. The Frog VLE provides information that is relevant to teaching.	The system provides information that is relevant to learning.	(Eom, 2012; Eom et al., 2012)
Sufficiency (DeLone & McLean, 1992)	3. The Frog VLE provides sufficient information.	The system provides sufficient information.	(Eom, 2012; Eom et al., 2012)

Table 4.2 Continued

Format (DeLone & McLean, 1992)	4.	The Frog VLE provides information that is easy to understand.	The system provides information that is easy to understand.	(Eom, 2012; Eom et al., 2012)
	5.	The information provided by Frog VLE is clearly presented on the screen.	The information provided by _____ is clearly presented on the screen.	(Wixom & Todd, 2005)
	6.	Information provided by Frog VLE is in a useful format.	Information provided by this Web site is in a useful format.	(Teo et al., 2009)
Currency (DeLone & McLean, 1992)	7.	The Frog VLE provides up-to-date information.	The system provides up-to-date information	(Eom, 2012; Eom et al., 2012)

Table 4.2 Continued

Timeliness (DeLone & McLean, 1992)	8.	Through Frog VLE, I get the information I need in time.	Through this Web site, I get the information I need in time.	(Teo et al., 2009)
Reliability (DeLone & McLean, 1992)	9.	Information provided by Frog VLE is reliable.	Information provided by this Web site is reliable.	(Teo et al., 2009)
	10.	Overall, the Frog VLE provides me with high-quality information.	In general, the shopping website provides me with high-quality information.	(C.-W. D. Chen & Cheng, 2009)

Table 4.2 Continued

System Quality (SyQ)			
Availability (DeLone & McLean, 2003)	1. The Frog VLE is always available so I can use it whenever I want.	- The system is always available. - Library Web 2.0 service is always available so I can use it whenever I want. - The e-learning system provides high availability.	(Eom, 2012; Lwoga, 2013; Y. Wang et al., 2007)
Usability (DeLone & McLean, 2003)	2. The Frog VLE is user-friendly.	The system is user-friendly.	(Eom, 2012; Eom et al., 2012)
	3. The Frog VLE has attractive features that appeal to users.	The system has attractive features that appeal to the user.	(Eom, 2012; Eom et al., 2012)

Table 4.2 Continued

	4. It is easy for me to share the content on Frog VLE.	It is easy for me to share the content and post comments on library Web 2.0.	(Lwoga, 2013)
	5. It is easy for me to post comments on Frog VLE.	It is easy for me to share the content and post comments on library Web 2.0.	(Lwoga, 2013)
	6. It is easy to find the information I need from the Frog VLE.	It is easy to find the information I need from the library Web 2.0 tools.	(Lwoga, 2013)
	7. The Frog VLE provides interactive features between users and system.	- The e-learning system provides interactive features between users and system. - The e-HRM system provides interactive features between users and system.	(Alshibly, 2014; Y. Wang et al., 2007)

Table 4.2 Continued

	8. The Frog VLE enables me to accomplish task quicker.	Online tax filing system enables me to accomplish task quicker.	(J. V. Chen et al., 2015)
	9. The Frog VLE provides a personalized information presentation.	The e-learning system provides a personalized information presentation.	(Y. Wang et al., 2007)
	10. The Frog VLE is easy to use.	The e-HRM system is easy to use.	(Alshibly, 2014)
	11. The Frog VLE is easy to navigate.	Mobile payment is easy to navigate.	(Zhou, 2013)
Accessibility (DeLone & McLean, 1992)	12. The Frog VLE provides high-speed information access.	- The system provides high-speed information access. - The e-learning system provides high-speed information access.	(Eom, 2012; Y. Wang et al., 2007)

Table 4.2 Continued

	13. The Frog VLE enables me to get on to it quickly.	The shopping website enables me to get on to it quickly.	(C.-W. D. Chen & Cheng, 2009)
	14. The Frog VLE quickly loads all the text and graphics.	Mobile payment quickly loads all the text and graphics.	(Zhou, 2013)
	15. The Frog VLE is accessed easily from different locations (inside and outside the school).	Our portal is accessed easily from different locations (inside and outside the company).	(Al-Debei et al., 2013)
Reliability (DeLone & McLean, 2003)	16. The Frog VLE is available most of the time.	Our portal is reliable; that is available and functions accurately most of the time.	(Al-Debei et al., 2013)

Table 4.2 Continued

	17. The Frog VLE functions accurately most of the time.	Our portal is reliable; that is available and functions accurately most of the time.	(Al-Debei et al., 2013)
	18. Overall, in terms of system quality, I would rate the Frog VLE highly.	In terms of system quality, I would rate the shopping website highly.	(C.-W. D. Chen & Cheng, 2009)
Service Quality (SeQ)			
Responsiveness (DeLone & McLean, 2003)	1. The Frog VLE offers diversiform contact channels (FAQ, email, toll-free number, etc.)	This website offers diversiform contact channels (FAQ, email, toll-free number, etc.)	(H. H. Chang et al., 2009)
	2. The Frog VLE provides a proper level of online assistance and explanation	The e-learning system provides a proper level of online assistance and explanation.	(Gay, 2016; Y. Wang et al., 2007)
	3. The Frog VLE helpdesk are prompt in responding to my queries.	The shopping website is prompt in responding to my queries.	(C.-W. D. Chen & Cheng, 2009)

Table 4.2 Continued

	4. The Frog VLE helpdesk respond in a cooperative manner.	The e-learning support specialists respond in a cooperative manner.	(Gay, 2016)
	5. The Frog VLE helpdesk provide high availability for consultation.	The IS department staff provides high availability for consultation.	(Y. Wang et al., 2007)
	6. The Frog VLE helpdesk are available in case I have a technical problem.	The e-learning support specialists are available in case I have a technical problem.	(Gay, 2016)
	7. The Frog VLE helpdesk are willing to help whenever I need support.	IT staff are willing to help whenever I need support.	(Al-Debei et al., 2013)
	8. The Frog VLE helpdesk give users individual attention.	The e-HRM gives users individual attention.	(Alshibly, 2014)

Table 4.2 Continued

Assurance (DeLone & McLean, 2003)	9.	The Frog VLE helpdesk are highly knowledgeable that they can confidently answer my technical questions and queries.	IT staff are highly knowledgeable that they can confidently answer my technical questions and queries.	(Al-Debei et al., 2013)
	10.	The behavior of Frog VLE helpdesk instills confidence in the teachers.	The behavior of employees will instill confidence in users.	(Pitt et al., 1995)
Empathy (DeLone & McLean, 2003)	11.	The Frog VLE is designed with teachers' best interests at heart.	This Web site is designed with citizen's best interests at heart.	(Teo et al., 2009)
	12.	The Frog VLE is designed to satisfy the needs of the teachers.	This Web site is designed to satisfy the needs of citizens.	(Teo et al., 2009)
	13.	Service provided by Frog VLE understands my needs.	Service provided by online tax filing system understands my needs.	(J. V. Chen et al., 2015)

Table 4.2 Continued

	14.	The Frog VLE helpdesk dedicate enough time to resolve my specific technical needs and concerns.	IT staff dedicate enough time to resolve my specific technical needs and concerns.	(Al-Debei et al., 2013)
	15.	The helpdesk shows a sincere interest in solving and troubleshooting technical problems related to Frog VLE.	IT staff show a sincere interest in solving and troubleshooting technical problems related to our web portal.	(Al-Debei et al., 2013)
Tangibility (Kettinger & Lee, 1994)	16.	The Frog VLE has up-to-date equipment.	Excellent college computing services will have up-to-date equipment.	(Kettinger & Lee, 1994)
	17.	The Frog VLE's physical facilities are visually appealing.	The physical facilities at excellent college computing services will be visually appealing.	(Kettinger & Lee, 1994)

Table 4.2 Continued

	18.	Overall, in terms of service quality, I would rate the Frog VLE highly.	In terms of system quality, I would rate the shopping website highly.	(C.-W. D. Chen & Cheng, 2009)
Intention to Use (ITU)				
Future Intention to Use/Reuse (Agarwal & Prasad, 1997; DeLone & McLean, 2003)	1.	I intend to continue using the Frog VLE rather than discontinue its use.	I intend to continue using the shopping website rather than discontinue its use.	(C.-W. D. Chen & Cheng, 2009)
	2.	I will regularly use the Frog VLE in the future.	I will regularly use the shopping website in the future	(C.-W. D. Chen & Cheng, 2009)
	3.	I will continue using the Frog VLE in the future.	I will continue using the shopping website in the future	(C.-W. D. Chen & Cheng, 2009)

Table 4.2 Continued

	4. My intention is to continue using the Frog VLE rather than use any alternative means (e.g., traditional classroom teaching).	My intention is to continue using this Web site rather than use any alternative means (e.g., offline interaction with the government agency).	(Teo et al., 2009)
	5. Assuming that I have access to the Frog VLE, I intend to use it.	Assuming that I have access to an LMS, I intend to use it.	(Alharbi & Drew, 2014)
	6. I intend to be a heavy user of Frog VLE.	I intend to be a heavy user of e-learning system.	(Park, 2009)

Table 4.2 Continued

Use (U)				
Regularity of Use (DeLone & McLean, 1992)	1.	I frequently use the Frog VLE.	I frequently use the system	(Eom, 2012)
	2.	I use the Frog VLE a lot.	I use the WWW a lot to do my work.	(Agarwal & Prasad, 1997)
	3.	I use the Frog VLE whenever possible.	I use the WWW whenever possible to do my work.	(Agarwal & Prasad, 1997)
	4.	I use the Frog VLE whenever appropriate.	I use the WWW whenever appropriate to do my work.	(Agarwal & Prasad, 1997)
Nature of Use (DeLone & McLean, 2003)	5.	I depend upon the Frog VLE.	I depend upon the system.	(Eom, 2012; Eom et al., 2012)
	6.	I use Frog VLE voluntarily.	I use our web portal voluntarily.	(Al-Debei et al., 2013)

Table 4.2 Continued

	7. I use Frog VLE for teaching.	I use our web portal to perform the following tasks.	(Al-Debei et al., 2013)
	8. I use Frog VLE to conduct quizzes.	I use our web portal to perform the following tasks.	(Al-Debei et al., 2013)
	9. I use Frog VLE to communicate with students.	I use our web portal to perform the following tasks.	(Al-Debei et al., 2013)
	10. I use Frog VLE for collaboration with other teachers.	I use our web portal to perform the following tasks.	(Al-Debei et al., 2013)
	11. I use Frog VLE to retrieve educational information.	I use our web portal to perform the following tasks.	(Al-Debei et al., 2013)
	12. I use Frog VLE to retrieve teaching resources.	I use our web portal to perform the following tasks.	(Al-Debei et al., 2013)

Table 4.2 Continued

User Satisfaction (US)				
User Surveys (DeLone & McLean, 2003)	1.	Most of the teachers bring a positive attitude towards the Frog VLE function.	Most of the users bring a positive attitude or evaluation towards the e-learning system function.	(Y. Wang et al., 2007)
	2.	Most of the teachers bring a positive evaluation towards the Frog VLE function.	Most of the users bring a positive attitude or evaluation towards the e-learning system function.	(Y. Wang et al., 2007)
Enjoyment (DeLone & McLean, 1992)	3.	I feel contented with using Frog VLE.	I feel contented with using mobile payment.	(Zhou, 2013)
	4.	I feel pleased with using Frog VLE.	I feel pleased with using mobile payment.	(Zhou, 2013)

Table 4.2 Continued

Overall Satisfaction (DeLone & McLean, 1992)	5.	I think the Frog VLE is very helpful.	I think the system is very helpful.	(Eom, 2012; Eom et al., 2012)
	6.	I think the Frog VLE is successful.	I think the ELS is successful.	(Gay, 2016)
	7.	Overall, I am satisfied with the Frog VLE.	Overall, I am satisfied with the system.	(Eom, 2012; Eom et al., 2012)
Workload (WL)				
Job Pace (Denton et al., 2002)	1.	The pace in my job is too fast.	The pace in your job is too fast.	(Denton et al., 2002)
	2.	My job is too demanding.	Your job is too demanding.	(Denton et al., 2002)
	3.	My job is very hectic.	Your job is very hectic.	(Denton et al., 2002)
Volume of Works (Boyle et al., 1995; Denton et al., 2002)	4.	I have too much work to do on the job.	- Too much work to do (e.g. lesson preparation and marking). - You have too much to do on the job.	(Boyle et al., 1995; Denton et al., 2002)

Table 4.2 Continued

Multiplicity of Tasks (Denton et al., 2002)	5.	I am expected to do too many different tasks at the same time.	You are expected to do too many different tasks at the same time.	(Denton et al., 2002)
ICT as Extra Workload (Sanchez & Aleman, 2011)	6.	I will have to learn new teaching strategies in order to use Frog VLE.	Teachers will have to learn new teaching strategies in order to use ICT tools.	(Sanchez & Aleman, 2011)
	7.	The use of Frog VLE will increase my workload.	The use of ICT tools will represent more workload and extra effort for teachers.	(Sanchez & Aleman, 2011)
	8.	The use of Frog VLE requires extra effort from me.	The use of ICT tools will represent more workload and extra effort for teachers.	(Sanchez & Aleman, 2011)
Net Benefits (NB)				
Time Saving (DeLone & McLean, 2003)	1.	The Frog VLE is time-saving.	Online tax filing system is time-saving.	(J. V. Chen et al., 2015)

Table 4.2 Continued

Improved Productivity (Petter et al., 2013)	2.	The Frog VLE enhanced my teaching skills.	The e-learning environment enhanced my teaching skills.	(Gay, 2016)
	3.	The Frog VLE helps me improve my job performance.	The e-learning system helps you improve your job performance.	(Y. Wang et al., 2007)
Personal Valuation (DeLone & McLean, 1992)	4.	The Frog VLE empowered me.	The e-learning environment empowered me.	(Gay, 2016)
	5.	The Frog VLE contributed to my career success.	The e-learning environment contributed to my academic success.	(Gay, 2016)
	6.	Overall, Frog VLE is more beneficial to use.	Overall, online tax filing system is more beneficial to use.	(J. V. Chen et al., 2015)

4.3.2 Translation of the Questionnaire

The items of the instrument were adapted from various sources and translated from English to Bahasa Melayu by a qualified translator from the UUM Language Center. Nevertheless, the original English version is also been provided in a smaller font size to enable respondents to crosscheck certain terms that might be confusing if only provided in Bahasa Melayu.

4.3.3 Face Validity

In this study, the face validation procedure was conducted in two phases; by academic experts and respondents (Devon et al., 2007). During the first phase, the pool of items for each variable was created, which were retrieved from the literature. Then, these items were presented to a language expert to check the grammar and language structure, three experts in IS and e-learning examined the accuracy of the items (double-barreled, ambiguity, leading questions, etc.) and two statisticians ascertained the scale development and sampling procedures.

In the second phase, the instrument was pre-tested to 16 participants using focus group procedure in two sessions, each for rural and urban teachers. The sampling procedure for the instrument pre-testing was systematically designed to ensure the representation of all the characteristics of real respondents, as depicted in Figure 4.3.

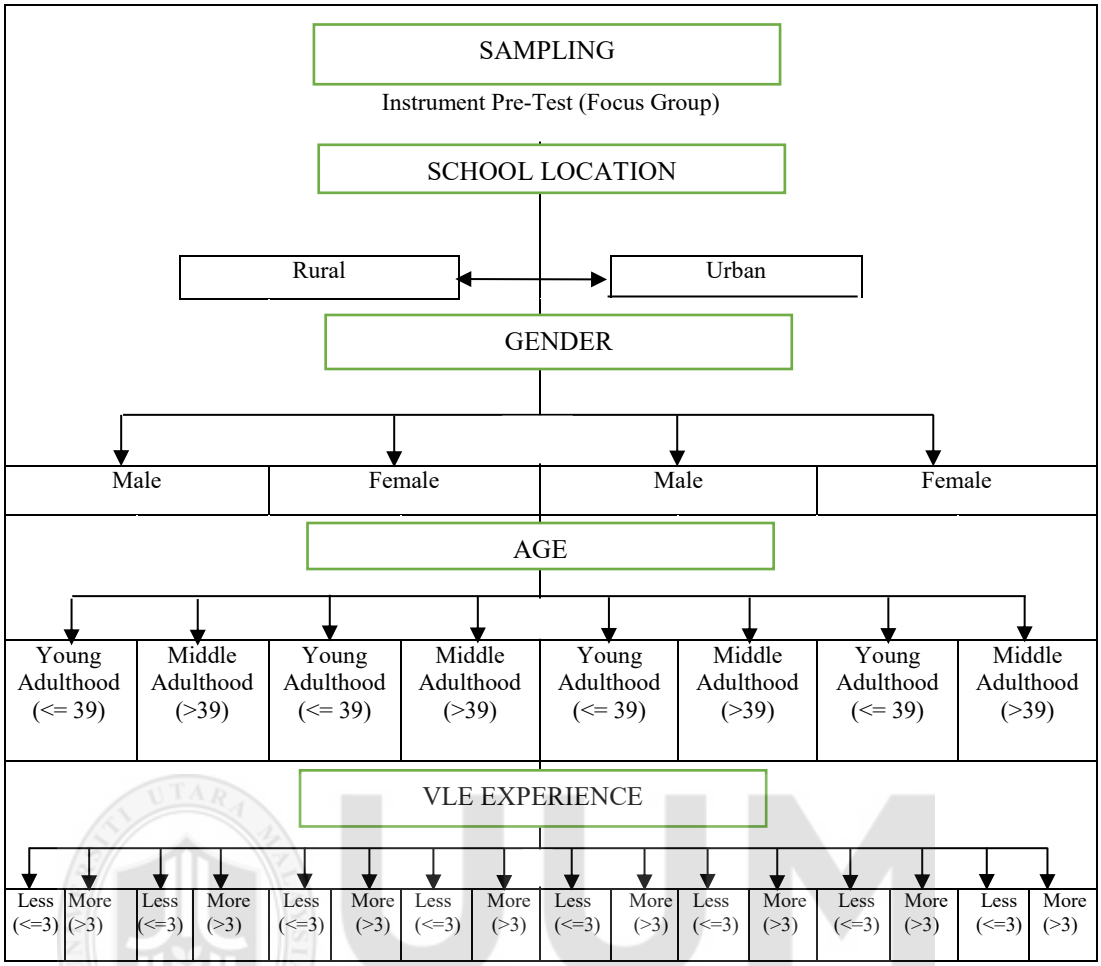


Figure 4.3. Sampling Procedure for Instrument Pre-Test

The time for answering the questionnaire was recorded for every participant with the average of 19.75 minutes, which is considered as a suitable duration; less than 20 minutes (Henning, 2013). A focus group discussion session was then conducted to get consensus among the participants. From this session, a number of issues and suggestions were captured, as shown in Table 4.3.

Table 4.3

Issues and Suggestions from the Focus Group Sessions

Issues	Suggestions
Bi-languages items make the questionnaire look messy.	Change the font size. Font size for Bahasa Melayu should be bigger. The English version should be smaller because it is just for crosschecking to make sure the respondent really understand the meaning. Only Section B should be provided in bi-languages.
Too many items.	Reduce the number of items.
Scale confusion.	Put the scale on every page.
Confusing sentence structure in several items.	Re-sentence.
Questionnaire design.	Use bigger font size.

4.3.4 Content Validity

Content validity refers to the degree of the items in the instrument that represent the overall possible questions to measure what they are designed to measure (Creswell, 2012). Sekaran and Bougie (2013, p. 226) stressed that content validity guarantees that the measurement contains relevant representative items to capture the concept. They further mentioned that content validity of the instrument could be done via a panel of judges consisting of experts in the field of research.

The content validation procedure for this study began by creating the large pool of items, which were adapted from various sources (Netemeyer, Bearden, & Sharma, 2003). Later on, the number of items in the pool was reduced based on the analysis of

content validity. To determine the consensus among the experts, the analysis of content validity was done using Content Validity Index (CVI). The CVI is the measurement of the item's appropriateness to represent certain construct under investigation (Polit, Beck, & Owen, 2007). Lynn (1986) suggested that three to ten experts should validate the content of the instrument. Nevertheless, a minimum of six experts is required to control the disagreement among them (Lynn, 1986).

Therefore, the items of this study were validated by seven experts in IS, e-learning and ICT in education; from UUM, Universiti Tun Hussein Onn Malaysia (UTHM), Institut Pendidikan Guru Malaysia - Darul Aman Campus (IPGM DA) and Institut Pendidikan Guru Malaysia - Tengku Bainun Campus (IPGM TB), see Appendix G. Each of the experts was provided with sufficient information on the objectives, research questions, research model, hypothesis and the instructions for CVI rating. All the experts have rated the instrument items based on four scales (1 = Not Relevant, 2 = Somewhat Relevant, 3 = Quite Relevant, 4 = Highly Relevant) (L. L. Davis, 1992).

The CVI value was calculated based on each item (i-CVI) and the overall scale (s-CVI) (Polit et al., 2007). The acceptable cut-off point for i-CVI using seven experts is 0.78 (Lynn, 1986). On the other hand, s-CVI can be calculated using s-CVI/UA (Universal Agreement method) and s-CVI/Ave (Averaging method). For this study, the s-CVI/Ave was chosen with the cut-off value of 0.80 (L. L. Davis, 1992). Table 4.4 summarizes the CVI analysis of the current study. The following formulas were used to calculate the i-CVI and s-CVI/Ave:

$$\mathrm{i-CVI} = \left(\frac{nx}{ny}\right), \mathrm{s-CVI/Ave} = \frac{\sum(i-CVI)}{nz}$$

Where; *nx* refers to the total agreement among experts, *ny* refers to a total number of experts involved in content validation, and *nz* refers to a total number of items in each construct.

Table 4.4

Analysis of Content Validity Index

Construct	Initial Items	Removed Items	Retained Items	s-CVI/Ave
IQ	10	3 [IQ5, IQ6, IQ10]	7	0.86
SyQ	19	12 [SyQ4, SyQ5, SyQ6, SyQ7, SyQ9, SyQ10, SyQ13, SyQ14, SyQ15, SyQ16, SyQ17, SyQ19]	7	0.81
SeQ	18	9 [SeQ1, SeQ2, SeQ4, SeQ5, SeQ10, SeQ11, SeQ12, SeQ13, SeQ18]	9	0.81
ITU	6	2 [ITU3, ITU4]	4	0.81
U	12	3 [U2, U3, U5]	9	0.88
US	7	3 [US1, US2, US7]	4	0.82
NB	6	1 [NB6]	5	0.93
WL	8	2 [WL5, WL8]	6	0.86

4.4 Pilot Study

A pilot study is a small-scale replication of real study that aims to check whether the selected procedure (in this case, questionnaire) will actually function according to the

plan (Zikmund et al., 2010). It is also a procedure of altering the questionnaire based on the response from a small group of respondents (Creswell, 2012). The current study was piloted in several schools in Pahang, as a prerequisite for the real study of the VLE success among teachers. The sample size for a pilot study must be at least 30 respondents (Hunt, Sparkman, & Wilcox, 1982). However, the 'rule of 100' stressed that the sample should be at least 100 to conduct factor analysis (Gorsuch, 1974; MacCallum, Widaman, Zhang, & Hong, 1999). On the other hand, the sample for pilot study should not consist of a part of the real study population but represent the same characteristics of them to avoid the 'contamination of pilot study' (Chua, 2014). Therefore, 150 questionnaires were distributed to the primary and secondary teachers in Pahang, which represent the homogenous characters of the real study population. Out of this number, only 119 are usable after the data cleaning, generating 79% of response rate. The characteristics of respondents for the pilot study are shown in Table 4.5.

Table 4.5

The Demographic of Respondent for Pilot Study

Characteristic/Value/Percentage		
Age	Min: 20, Max: 57, Mean: 34.76	
Gender	Male: 42.9%	Female: 57.1%
School Location	Urban: 49.6 %	Rural: 50.4 %
School Level	Primary: 53.8%	Secondary: 46.2%

4.4.1 Normality of the Pilot Data

The current study uses the Skewness and Kurtosis values to examine the distribution normality for each variable. The values of Skewness and Kurtosis for the entire variables in this study fall between -2 and 2 (see Table 4.6) which are considered to be approximately normally distributed (Garson, 2012). The test for normality assumption in the pilot data is vital, especially to minimize the error during reliability analysis based on internal consistency (Sheng & Sheng, 2012).

Table 4.6

Skewness and Kurtosis Values for Pilot Data

Variable	Skewness	Kurtosis
IQ	-0.026	-0.710
SyQ	0.132	-0.478
SeQ	0.269	-0.180
ITU	0.07	-0.220
U	0.119	-0.641
US	-0.018	-0.666
NB	-0.131	-0.414
WL	0.182	-0.767

4.4.2 Factor Analysis

The factor analysis is conducted to examine the relationships between large numbers of items that enable the researcher to class them into smaller groups or factors (Hooper, 2012). Usually, the Exploratory Factor Analysis (EFA) is conducted during the pilot study as the basis for construct development, particularly to identify the underlying

construct behind a set of measured variables (Suhr, 2006). Therefore, EFA is crucial to be conducted using pilot data as a foundation for Confirmatory Factor Analysis (CFA) in the real study.

EFA allows the researchers to confirm the consistency of the extracted factors from the real data and the theoretical perspective (Hair, Black, Babin, & Anderson, 2010). Therefore, instead of running the EFA procedure to all 51 items at once, this study runs it based on each construct. This is mainly because the items were adapted from the previous studies that measured the intended construct. In this sense, the goal of the study is to prove the structure of these items. Hair et al. (2010) recommended the following common rules based on certain cut-off values in conducting EFA; Bartlett Test < 0.5, Kaiser-Meyer-Olkin (KMO) > 0.8, Factor Loading ≥ 0.5, Communalities ≥ 0.3, and Eigenvalue ≥ 1.0. All the items are above these values (see Table 4.7); therefore, no deletion of the item was done during this procedure.

Table 4.7

Summary of Results for EFA

VAR	**KMO**	**Eigen Value**	**Bartlett Test**	**Item**	**Factor Loading**	**Communalities**	**Deleted Item**
IQ	0.930	5.944	0.000	IQ1	0.807	0.807	Nil
				IQ2	0.905	0.905	Nil
				IQ3	0.873	0.873	Nil
				IQ4	0.847	0.847	Nil
				IQ7	0.863	0.863	Nil

Table 4.7 Continued

				IQ8	0.882	0.882	Nil
				IQ9	0.767	0.767	Nil
SyQ	0.892	5.494	0.000	SyQ1	0.847	0.718	Nil
				SyQ2	0.911	0.830	Nil
				SyQ3	0.844	0.712	Nil
				SyQ8	0.921	0.848	Nil
				SyQ11	0.883	0.779	Nil
				SyQ12	0.891	0.795	Nil
				SyQ18	0.902	0.813	Nil
SeQ	0.926	7.458	0.000	SeQ3	0.940	0.812	Nil
				SeQ6	0.932	0.866	Nil
				SeQ7	0.930	0.869	Nil
				SeQ8	0.923	0.884	Nil
				SeQ9	0.920	0.846	Nil
				SeQ14	0.901	0.763	Nil
				SeQ15	0.890	0.853	Nil
				SeQ16	0.880	0.792	Nil
				SeQ17	0.873	0.774	Nil
ITU	0.858	3.569	0.000	ITU1	0.948	0.897	Nil
				ITU2	0.947	0.898	Nil
				ITU5	0.943	0.890	Nil
				ITU6	0.940	0.884	Nil

Table 4.7 Continued

U	0.910	7.363	0.000	U1	0.911	0.830	Nil
				U4	0.784	0.615	Nil
				U6	0.881	0.776	Nil
				U7	0.937	0.878	Nil
				U8	0.932	0.868	Nil
				U9	0.920	0.847	Nil
				U10	0.933	0.870	Nil
				U11	0.916	0.839	Nil
				U12	0.917	0.840	Nil
US	0.808	3.677	0.000	US3	0.962	0.926	Nil
				US4	0.978	0.956	Nil
				US5	0.956	0.914	Nil
				US6	0.939	0.881	Nil
NB	0.869	4.527	0.000	NB1	0.925	0.855	Nil
				NB2	0.950	0.903	Nil
				NB3	0.970	0.941	Nil
				NB4	0.959	0.920	Nil
				NB5	0.952	0.907	Nil
WL	0.885	4.688	0.000	WL1	0.792	0.627	Nil
				WL2	0.952	0.905	Nil
				WL3	0.954	0.911	Nil
				WL4	0.956	0.915	Nil

Table 4.7 Continued

	WL6	0.714	0.509	Nil
	WL7	0.906	0.820	Nil

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

4.4.3 Reliability

The reliability test of the instrument was conducted at the third phase of pilot study analysis. Reliability is generally referred to the stability and consistency of the instrument (Sekaran & Bougie, 2013). It is the extent to which it is free from random error and it is usually indicated using test-retest reliability and internal consistency (Pallant, 2010). Internal consistency refers to the degree of measurement items measure the same characteristic, which can be computed using Cronbach's Alpha (α) (Field, 2009; Pallant, 2010). For the pilot study, α was widely applied to calculate the internal consistency of the data. In addition, the range of α is between 0 to 1, with the higher value indicating higher levels of reliability (Hair, Hult, Ringle, & Sarstedt, 2014; Pallant, 2010). Hair et al. (2014) suggested that the α value of 0.6 to 0.7 is acceptable while the value below than that is considered as lack of internal consistency reliability.

According to the rule of thumb for reliability analysis, the item that did not contribute to the increment of α should be deleted. Nevertheless, the result indicated that no item is below the threshold value, and thus should not be removed. Moreover, the data from

the pilot study has shown that the values of α are within 0.942 to 0.974, indicating the high level of construct reliability (see Table 4.8).

Table 4.8

Result of Reliability Analysis

Construct	Initial Items	Initial α	Final Items	Final α
IQ	7	0.970	7	0.970
SyQ	7	0.954	7	0.954
SeQ	9	0.974	9	0.974
ITU	4	0.960	4	0.960
U	9	0.971	9	0.971
US	4	0.970	4	0.970
NB	5	0.974	5	0.974
WL	6	0.942	6	0.942

4.5 Data Collection Procedure

The data collection begins right after the research problem and research plan are clearly defined and approved (Kothari, 2004). The approach of data collection does affect the quality and adequacy of the required data. Therefore, some precautions need to be taken by conducting a pilot study, systematically designing the questionnaire and planning the sampling procedure before embarking on the main data collection. The data collection procedure of the current study was done from July to October 2017. Eight hundred and fifty questionnaires were distributed to the selected schools via two methods; by mail and walk-in. To increase the response rate, the questionnaire was designed to allow the respondent to choose whether to answer on paper or online by

simply scanning the QR code provided on the front page. To avoid multiple responses in the online questionnaire, the form was set to accept only one response from each respondent. In addition, an envelope with postage stamp and the researcher's address was attached together for the questionnaires distributed by mail. This was done to motivate the respondents to return the questionnaires.

4.5.1 Sampling Procedure

Sampling refers to the process of choosing a portion from a larger group to serve as the foundation to estimate the prevalence of unknown fragment of information, scenario or findings related to those larger group (Kumar, 2011). Furthermore, Creswell (2012) defines sample as a subgroup of the target population that the researcher plans to study for the purpose of making generalizations pertaining the target population. In every research, sampling is the main criteria used to evaluate the reliability of the result. Failure of choosing proper sampling technique will lead to difficulties in collecting the required data. Consequently, the data analysis result will be inaccurate and unreliable. Rea and Parker (2014) stated that sampling methods are categorized into probability and non-probability sampling. Probability sampling method ensures an equal chance of being selected for each member of the population, while non-probability allows the researcher to choose appropriate respondents according to the nature of the problem being studied. Thus, the study used the probability sampling method to reduce the bias and increase the generalizability of the findings. Table 4.9 summarizes the sampling design of the current study.

Table 4.9

Sampling Design of the Current Study

Concept / Terminology	**The Current Study**
The Theoretical Population *(To whom the current study aimed to generalize the findings)*	All teachers in Malaysia.
The Study Population *(The population that are accessible for the current study)*	Teachers in the Northern Region of Malaysia (Perlis, Kedah, Penang and Perak).
Sampling Frame	List of the schools in the Northern Region of Malaysia.
The Sample	850 teachers.

Note. Adapted from Trochim (2006)

4.5.2 Unit of Analysis

Unit of analysis of the current study is at the individual level, which involved 97,503 teachers who currently serve in 2,347 schools across the Northern Region of Malaysia. However, this number is not definite due to the transfer process of the teachers that is beyond the control of the current study.

4.5.3 Target Population

The focus of IS studies should be on people (end user; medium of benefits) rather than technology because people is much more important in determining the success of an IS project (Haag & Cummings, 2009; Joukes, Cornet, de Bruijne, & de Keizer, 2016; Satyanarayana, 2006). This justification leads to the decision of having the teachers (the end user of VLE) as the respondents of this study.

Malaysia is divided into West Malaysia (Peninsula) and East Malaysia. East Malaysia consists of Sabah and Sarawak, while West Malaysia is divided into Northern, Eastern, Central and Southern regions (Aslam & Hassan, 2003). The states in each region are presented in Table 4.10.

Table 4.10

States Allocation Based on Region in West Malaysia

Region	**State(s)**
Northern	Perlis, Kedah, Penang & Perak
Eastern	Kelantan, Terengganu & Pahang
Central	Selangor, Negeri Sembilan & Melaka
Southern	Johore

Note. Adapted from Aslam and Hassan (2003)

The target population of this study is the school teachers in the Northern Region of Peninsular Malaysia. The selection is based on the following justifications. First, the Northern Region with the size of 32, 404 km^2 is the second largest region in the Peninsular Malaysia (Jabatan Perangkaan Malaysia, 2010). Second, this region has the largest school population with the total number of 2,349 or 32 % of overall schools in Peninsular Malaysia (Kementerian Pendidikan Malaysia, 2017), see Figure 4.4. As randomization procedure was done based on the school list as the sampling frame, the selection of the Northern Region provides a wider range of selection and would increase the generalizability of the finding. In addition, this region also has become the base for 96,748 teachers that serve in both rural and urban schools, scattered across the four states in the region (Kementerian Pendidikan Malaysia, 2017).

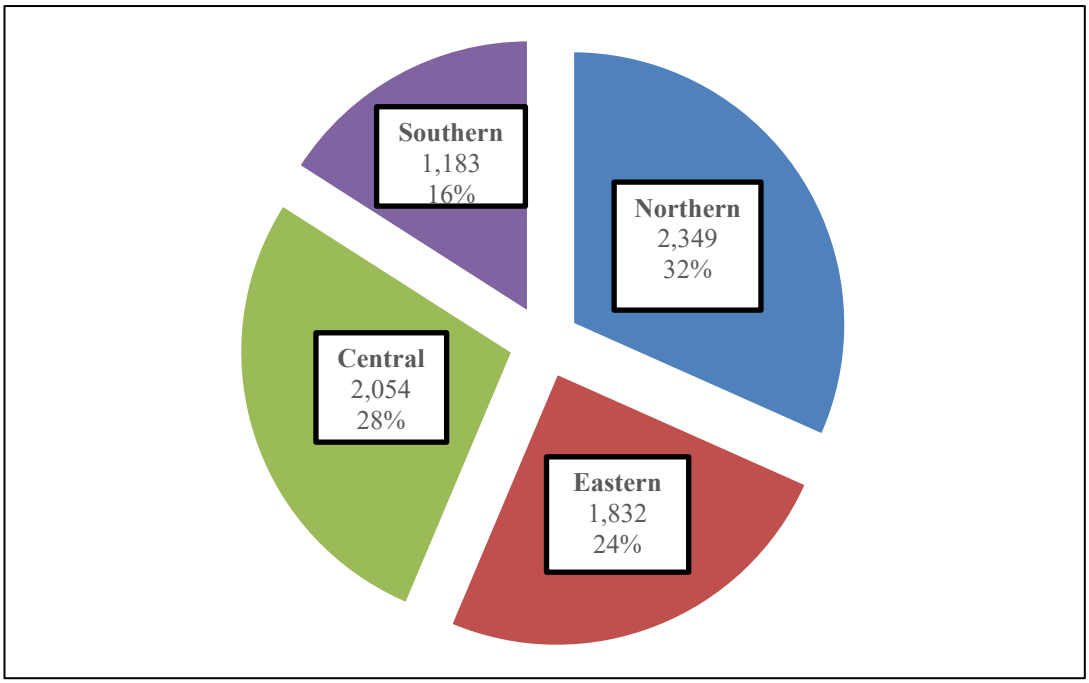


Figure 4.4. Number of Schools in Peninsular Malaysia.

Third, the states in Malaysia are divided into two categories, which are developed and developing state, according to the Development Composite Index (DCI). Hence, the Northern Region is chosen because it is the only region that consists of both developed (Penang and Perak) and developing states (Kedah and Perlis) (Norhaslinda & Dahlan, 2013). Moreover, the disparity of Internet penetration rate between these two categories of states is wide. The current statistic has illustrated that the developing states (Kedah and Perlis) only contribute 41.8% of overall Internet penetration in the Northern Region during the 3rd quarter of 2016, as shown in Figure 4.5. Therefore, the selection of both categories is important to ensure that the current study would capture all the characteristics of Malaysian socio environment. As the research has set the goal to evaluate the VLE success among Malaysian teachers across both environments, the Northern Region is assumed to fulfil the research objectives (Shareef, Kumar, Kumar, & Dwivedi, 2011).

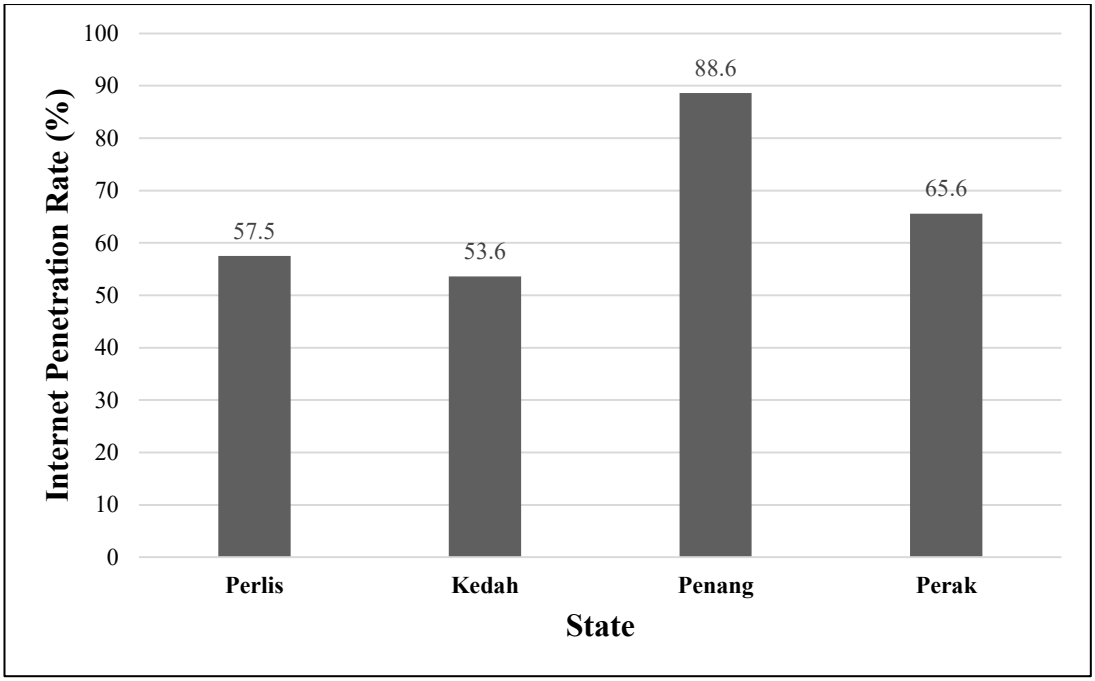


Figure 4.5. Internet Penetration Rate in the Northern Region (Suruhanjaya Komunikasi & Multimedia, 2014)

Finally, another important aspect to consider in determining the location of study is the homogeneity of the sample. All the professional teachers in Malaysia can be assumed as homogeneous in terms of qualification and training (Kementerian Pendidikan Malaysia, 2012b, 2012a). Therefore, the selection of Northern Region as a location for the study is sufficient to represent the whole population of the teachers nationwide, as suggested by Kothari (2004, p. 174).

4.5.4 Sampling Frame

The sampling frame is regarded as the parameter characteristics of the wider population, which usually consists of the list of population elements from which a sample is about to be drawn (L. Cohen, Manion, & Morrison, 2007; Kothari, 2004). In addition, these elements could be individuals or organizations (Creswell, 2012). In

the context of the current study, the teachers are the respondents of the study, as they are the most common group of users who regularly deal with the VLE system. However, the list of the teachers based on their names and identifications are unavailable. As an alternative, the sampling frame for the study is the list of the primary and secondary schools in the Northern Region of Malaysia that was obtained from *Bahagian Pengurusan Sekolah Harian* (BPSH), MOE, as the department has the latest list and details of all Malaysian schools.

4.5.5 Sample Size

As mentioned in the earlier section, there are 7,418 schools, which are operated by 96,748 teachers in the Northern Region of Malaysia (see Figure 4.4). Therefore, the minimum sample size for the current study should be 384 teachers (Krejcie & Morgan, 1970; Sekaran & Bougie, 2013). The 384 samples are reasonable based on the possible sampling size shown in Table 4.11, whereby the population is from 75,000 to 100,000; an appropriate sample size should be in the range of 382 to 384. However, to avoid any potential risks of the low response rate, incomplete responses, and case exclusion during data cleaning, the number of sample size for the study was higher to compensate those potential shortfalls.

The minimum number of 300 samples are required for the rigorous and advanced analysis such as factor analysis and multivariate analysis (Dwivedi et al., 2010). In addition, Hair, Ringle, and Sarstedt (2011) added that multivariate data analysis needs at least ten times of the largest number of structural paths directed to a particular construct (in the current study, the largest number of paths directed to a single

construct is six). With this in mind, the sample size of the current study was 850 to fulfil the suggestions of the previous researchers.

Table 4.11

Sample Size for a Given Population Size

N	S
10,000	370
15,000	375
20,000	377
30,000	379
40,000	380
50,000	381
75,000	382
1000,000	384

Note. N= population size, S= sample size. Adapted from Sekaran and Bougie (2013, p. 268) and Krejcie and Morgan (1970)

4.5.6 Sampling Method

In the current study, the simple random sampling (probability sampling) was applied. However, due to the unavailability of list of teachers, the randomizing procedure was conducted based on the list of the schools, as the sampling frame. The sampling process for the study involved three stages. At the first stage, the list of the schools in the northern region was obtained from BPSH, MOE. Based on the predetermined sample size required for the study, 85 schools were selected. From each selected

school, 10 teachers were chosen as respondents. This produced a total of 850 of sample size (85*10 = 850).

In the second stage, the random calculator retrieved from the Internet (www.mathgoodies.com/calculators/random_no_custom.html), was used to randomly select the 85 schools that will participate in the data collection process, as shown in the Appendix B. Table 4.12 summarizes the number of respondents for each state of the Northern Region.

Table 4.12

Summary of Respondents for the Current Study

State	**Total No of Teachers**	**Respondents**
Perlis	4,817	170
Kedah	31,965	260
Penang	20,395	180
Perak	40,326	240
TOTAL		**850**

During the final stage, the data collection was done using two methods, via postage and walk-in to the selected schools. For the postage method, 780 questionnaires were distributed to 78 schools. The headmasters or principals in the particular schools were provided with the proper instruction on how to distribute the questionnaires to the teachers. Another 70 questionnaires were distributed by walk-in to seven schools. By acquiring the list of teachers from the school's administration office, the selection of ten teachers was done using simple random sampling.

4.6 Data Analysis Procedure

The data analysis of this study was conducted in two phases. In the first phase, IBM SPSS Statistics (SPSS) was employed for data entry, screening, and preparation. Finally, in the second phase, the Partial Least Squares - Structural Equation Modeling (PLS-SEM) was used for hypotheses and model testing. The CFA was conducted at this stage to confirm the factor structure extracted previously during the EFA. According to Hair et al. (2011), SEM is an appropriate multivariate method to test the complete theories and concepts. It also enables the researcher to conduct systematic and comprehensive testing of the interlinked variables and their items in just a single run (Gefen, Straub, & Boudreau, 2000). However, several assumptions, including the normality of data, outliers, linearity and multicollinearity need to be considered before choosing any type of multivariate analysis (Tabachnick & Fidell, 2007). In addition, the type of study (exploratory or confirmatory) would determine the type of SEM method to be employed; Covariance-Based approach (CB-SEM) or Partial Least Squares approach (PLS-SEM).

The current study aimed to predict the moderating role of WL and Personal Characteristics, while at the same time test the new relationship between U and ITU, which is deduced as an exploratory study. Therefore, the PLS-SEM is more suitable to be applied, even though the data are normally distributed (Hair et al., 2014). In fact, the normally distributed data will provide a more accurate result, even for non-parametric analysis such as PLS-SEM (Tabachnick & Fidell, 2007). Nevertheless, the normality analysis during the data cleaning procedure has revealed that the data of this study is not normally distributed, which demands for the usage of PLS-SEM.

4.7 Model Validation

The main objective of the current study is to develop the post-implementation evaluation model for VLE success, which will be beneficial for the IS and educational researchers, stakeholders and policymakers. In addition, this model can also be a guideline for those who wish to employ VLE into their future, especially to reduce the risk of teachers' rejection toward the system. Therefore, model validation is probably the most important step in model development. As for the current study, the model validation has been done based on three methods; expert validation, statistical cross-validation and practitioners' validation. For the practitioners' validation, the open-ended questions were analyzed using qualitative approach.

4.8 Summary

This chapter presented an overview of the research methodology used to answer the research questions of the current study. This study applied mixed methods approach based on explanatory sequential design. During quantitative phase, cross-sectional survey field study was used to evaluate the VLE success among the teachers. Furthermore, the current study applied questionnaire as its quantitative data collection method and the data analysis employed SPSS and PLS-SEM procedure. Finally, the final model was validated using three methods, where the last method applied qualitative data analysis.

CHAPTER FIVE
DATA ANALYSIS

5.1 Introduction

This chapter presents the procedures and the results of quantitative data analysis. The data was collected from the primary and secondary school teachers across the Northern Region of Malaysia. To facilitate the analysis, SPSS version 21 and Smart PLS version 3.0 were used. In the first section, the analysis of survey response is presented. Next is the discussion on the data preparation, which includes the seven main steps of dealing with missing data, outliers, normality, linearity, homoscedasticity, multicollinearity and common method variance. This is followed by the analysis of measurement and structural model of the current study. Later, the analysis of model comparison to find the best VLE Success Model is presented. The final section discusses about the model validation procedures, which includes a qualitative data analysis.

5.2 Descriptive Statistic of Respondents

The questionnaires were distributed to the selected schools via two methods; by postage mail and walk-in. Out of 850 distributed questionnaires, 719 were returned or about 84.0% response rate. The percentage of the returned questionnaires is considered very high. Most of the respondents (61.0%) answered on paper, while the rest (39.0%) chose to answer online. The returned questionnaires were underwent the data preparation process to filter those with missing value and outliers. Eventually, there

were only 643 (75.6%) usable data or valid response rate. This value is far above the minimum 30.0% response as recommended by Sekaran and Bougie (2009).

From the 643 respondents, 380 are females (59.1%) and 263 are males (40.9%) with the average age of 40 years old. The proportion is acceptable since in most Malaysian schools, female teachers usually outnumber their male counterparts. Even though the female percentage is higher, the ratio is considered valid for any statistical analysis, as there is no sample size assumptions for comparing two groups (Karen, 2017). The respondents represent primary (39.5%) and secondary (60.5%) school teachers from the urban (39.5%) and rural (60.5%) areas.

Majority the teachers hold Bachelor degree (86.5%), whilst others with Master's degree (8.6%), Diploma (4.5%) and PhD (0.5%), with more than 14 years of teaching experience (47.9%). These indicate that Malaysian teachers are highly educated and competent. Even though majority of respondents are experienced teachers, they are still considered new to VLE, because this application has been introduced for less than seven years ago. As stated in Table 5.1, most of the teachers only have one year or less of experience in using the VLE (29.1%) compared to those with four years and above (23.6%).

Table 5.1

The Demographic Characteristics of Respondents

Demographic Profile	**Category**	**Frequencies (N=643)**	**Percentage (%)**
School Location	Urban	254	39.5

Table 5.1 Continued

	Rural	389	60.5
School Level	Primary	254	39.5
	Secondary	389	60.5
Gender	Male	380	59.1
	Female	263	40.9
Academic Qualification	Diploma	29	4.5
	Bachelor Degree	556	86.5
	Master's Degree	55	8.6
	Doctoral Degree	3	0.5
Teaching Experience	≤ 1 Year	2	0.3
	2-4 Years	39	6.1
	5-7 Years	74	11.5
	8-10 Years	129	20.1
	11-13 Years	91	14.2
	≥ 14 Years	308	47.9
VLE Experience	≤ 1 Year	187	29.1
	2 Years	151	23.5
	3 Years	153	23.8
	4 Years	78	12.1
	5 Years	43	6.7

Table 5.1 Continued

	≥ 6 Years	31	4.8

5.3 Data Screening and Preparation

The data screening and preparation procedures are essential pre-requisite steps for multivariate data analysis. There are six main assumptions that are usually considered during the data cleaning which are missing data, outliers, normality, linearity, homoscedasticity and multicollinearity (Tabachnick & Fidell, 2007). This study also examined the Common Method Variance (CMV) because it has been recognized as an important consideration especially for cross-sectional studies (Juneman, 2013). All of these procedures were done using the SPSS.

5.3.1 Missing Data

The most conventional method to deal with missing data is case deletion (Tabachnick & Fidell, 2007). As for the current study, 51 cases were deleted. Forty-one were eliminated from the dataset because they were identified as non-users of the VLE, while the other ten were diagnosed with incomplete responses. The incomplete responses were mainly from those who answered on paper. For those who answered online, each of the items has been set as 'compulsory field' that prevent them from skipping any question. All the cases with incomplete responses were deleted due to the achievement of a high-level response rate.

5.3.2 Outliers

All the continuous variables in the current study were tested for outliers, including age. The outliers can exist in two forms; univariate and multivariate. The current study identifies univariate outliers based on unengaged responses (Gaskin, 2017) and z-score with the threshold value of ±3.29 (Tabachnick & Fidell, 2007). As a result, two unengaged responses with the standard deviation (SD) value of 0.00 and one case that has the z-score of WL exceeding the threshold value (-3.78) were eliminated from the dataset.

On the other hand, the multivariate outliers' analysis was done using the Mahalanobis Distance method, a measure of the multivariate distance that can be evaluated for each case using the chi-square (X^2) distribution. The most common probability estimate for a case being an outlier is $p < 0.001$ for the X^2 value, is appropriate with Mahalanobis Distance (Tabachnick & Fidell, 2007). Hence, 22 deletions were made during the procedure as displayed in Table 5.2.

Table 5.2

Analysis of Multivariate Outlier using Mahalanobis Distance Method

No.	Exogenous	Endogenous	Deletion	Cases
1.	IQ, SyQ, SeQ, US, NB, U	ITU	15	89, 177, 28, 327, 451, 198, 51, 27, 634, 199, 340, 244, 61, 382, 424
2.	ITU	U	-	-

Table 5.2 Continued

3.	IQ, SyQ, SeQ, NB,U	US	6	396, 93, 560, 408, 559, 586
4.	U,US	NB	1	675

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

5.3.3 Linearity

Linearity refers to the consistent slope of change on the relationship between an exogenous and endogenous variable. In this study, the linearity test was done using two methods namely ANOVA test and Ordinary Least Square (OLS) Linear Regression. The relationship between exogenous variable and endogenous variable is considered as linear when the significance value of ANOVA test is greater than 0.05. However, if the test produce the opposite result, the OLS Linear Regression should be conducted for confirmation. Under this circumstance, the significant value that is lesser than 0.05 is accepted as sufficiently linear (Gaskin, 2017). As presented in Table 5.3, all the relationships between exogenous variables and endogenous variables in the current study have met the assumption of linearity.

Table 5.3

Linearity Analysis

Relationship		**ANOVA**	**OLS Linear Regression**	**Linear Relationship**
Exo.	**Endo.**	**Sig. (> 0.05)**	**Sig. (<0.05)**	
IQ	ITU	0.250	-	Yes

Table 5.3 Continued

SyQ	ITU	0.317	-	Yes
SeQ	ITU	0.010	0.00	Yes
US	ITU	0.033	0.00	Yes
NB	ITU	0.017	0.00	Yes
U	ITU	0.037	0.00	Yes
ITU	U	0.653	-	Yes
IQ	US	0.511	-	Yes
SyQ,	US	0.518	-	Yes
SeQ,	US	0.093	-	Yes
NB	US	0.105	-	Yes
U	US	0.416	-	Yes
U	NB	0.137	-	Yes
US	NB	0.280	-	Yes

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, Exo. = Exogenous Variable, Endo. = Endogenous Variable

5.3.4 Normality

The current study used Skewness and Kurtosis, Kolmogorov-Smirnov and Shapiro-Wilk for the distribution normality test. The initial analysis using Skewness and Kurtosis showed that data are approximately normally distributed or in the range of ±2 (Garson, 2012). However, the further analysis of Kolmogorov-Smirnov and Shapiro-Wilk showed that the significant values are below 0.05, which indicated the violation of normality assumption (Table 5.4). Hence, the non-normality of the

collected data in the study calls for the usage of PLS-SEM for the main analysis as it can handle the standard error that caused by the non-normality of the distribution (Hair et al., 2011).

Table 5.4

Normality Test

Variable	Skewness	Kurtosis	Kolmogorov-Smirnov (Sig.)	Shapiro-Wilk (Sig.)
IQ	-0.251	0.089	0.000	0.000
SyQ	-0.181	-0.219	0.001	0.003
SeQ	-0.049	-0.090	0.000	0.005
ITU	-0.058	-0.016	0.000	0.000
U	0.142	-0.319	0.001	0.007
US	0.020	-0.295	0.000	0.000
NB	0.001	-0.209	0.000	0.000
WL	0.111	-0.355	0.000	0.001

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

5.3.5 Homoscedasticity

Homoscedasticity exists when the variable's residual exhibits consistent variance across different levels of the variable (Gaskin, 2017). This analysis can be done using scatterplot, where the equal distance of residuals (standard error) along the fit line is expected to meet the assumption homoscedasticity. On the other hand, the funnel out shape of scatterplot indicated the existence of heteroscedasticity, which violates the

assumption of parametric analysis (Salkind, 2010). As revealed in Figure 5.1, the scatterplots of all exogenous variables to endogenous variables are approximately homoscedastic, which signify the good characteristic of data.

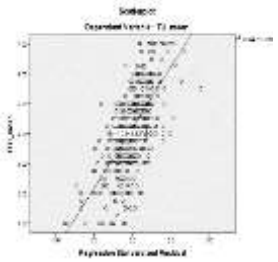
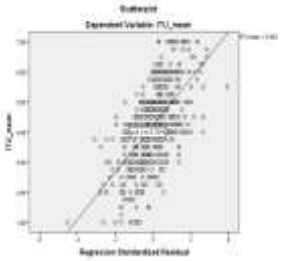
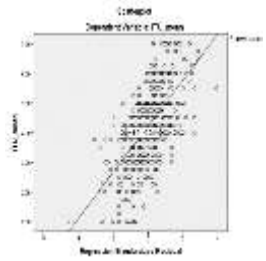
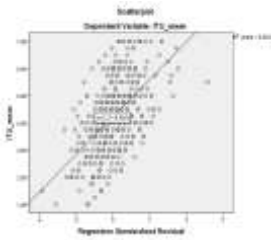
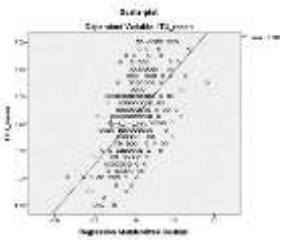
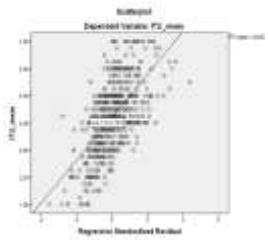
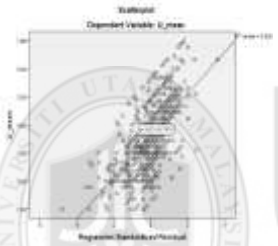
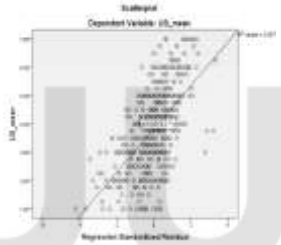
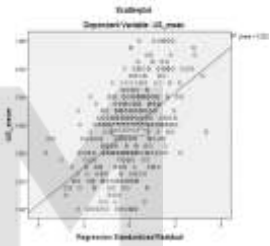
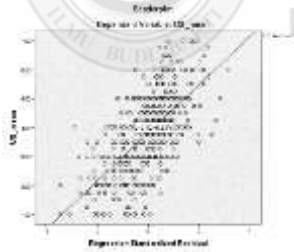
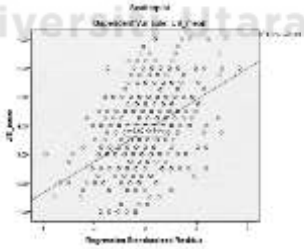
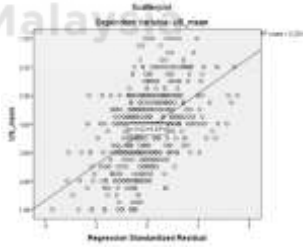
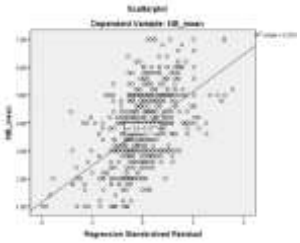
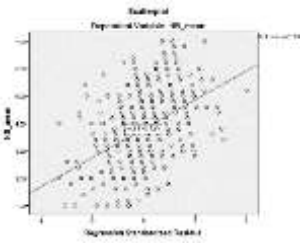
Homoscedasticity Analysis		
 IQ – ITU (Homoscedastic)	 SyQ – ITU (Homoscedastic)	 SeQ – ITU (Homoscedastic)
 US – ITU (Homoscedastic)	 NB – ITU (Homoscedastic)	 U – ITU (Homoscedastic)
 ITU – U (Homoscedastic)	 IQ – US (Homoscedastic)	 SyQ – US (Homoscedastic)
 SeQ – US (Homoscedastic)	 NB – US (Homoscedastic)	 U – US (Homoscedastic)
 U – NB (Homoscedastic)	 US – NB (Homoscedastic)	

Figure 5.1. The Analysis of Homoscedasticity

5.3.6 Multicollinearity

Multicollinearity appears when the variance of exogenous variables are overlapping with each other and thus not explaining unique variance in the endogenous variables (Gaskin, 2017). For the current study, the Tolerance and Variance Inflation Factor (VIF) values were applied as the indicators in the multicollinearity test. The value of VIF < 10 and Tolerance > 0.10 are accepted as the threshold for multicollinearity assumption (Field, 2009). As demonstrated in Table 5.5, the entire exogenous variables' VIF values were below 10, and the tolerance values were above 0.10, therefore, there is no collinearity problem in the model.

Table 5.5

Multicollinearity Analysis

Endo.	**ITU**		**U**		**US**		**NB**	
Exo.	**Tolerance**	**VIF**	**Tolerance**	**VIF**	**Tolerance**	**VIF**	**Tolerance**	**VIF**
IQ	0.236	4.230	-	-	0.238	4.197	-	-
SyQ	0.153	6.550	-	-	0.161	6.219	-	-
SeQ	0.292	3.430	-	-	0.292	3.420	-	-
ITU	-	-	-	-	-	-	-	-
U	0.210	4.772	-	-	0.247	4.054	0.233	4.293
US	0.117	8.567	-	-	-	-	0.233	4.293
NB	0.153	6.550	-	-	0.200	5.008	-	-

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, Exo. = Exogenous Variable, Endo. = Endogenous Variable

5.3.7 Common Method Variance (CMV)

Common Method Variance occurs when the respondents are presumed to have similar intention of answering the same pattern or the same answer for different variables, which caused both exogenous and endogenous to have equal variances. One of the methods of detecting CMV is through the analysis of inter-construct correlation. The CMV is expected to exist if the value of inter-construct correlation is above 0.90 (Bagozzi, Yi, & Phillips, 1991; Podsakoff, MacKenzie, & Podsakoff, 2012; Tehseen, Ramayah, & Sajilan, 2017). In the current study, only the inter-construct correlation of NB – US is approximately reaching the threshold value (0.908). Nevertheless, this value is acceptable because the conceptual framework of this study proposed the recursive relationships between these two variables. Table 5.6 presents the result of CMV analysis.

Table 5.6

Analysis of Common Method Variance

Inter-Construct Correlations								
	IQ	**SyQ**	**SeQ**	**ITU**	**U**	**US**	**NB**	**WL**
IQ	1							
SyQ	0.858	1						
SeQ	0.766	0.784	1					
ITU	0.761	0.785	0.736	1				
U	0.752	0.785	0.730	0.778	1			
US	0.808	0.859	0.767	0.835	0.876	1		
NB	0.787	0.835	0.737	0.836	0.851	0.908	1	

Table 5.6 Continued

WL	0.260	0.219	0.278	0.219	0.238	0.216	0.183	1

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

5.4 Structural Equation Modeling

Structural Equation Modeling is a statistical methodology that is designed as an alternative analytical method performing tasks similar to multiple-regression but is superior in a number of ways. Generally, there are two types of SEM which are distinguished and categorized by their differences in objectives, namely PLS-SEM and CB-SEM (Hair et al., 2011). The CB-SEM focuses on examining the strength of the theory which makes it suitable for confirmatory studies (Carmen Barroso, Carrion, & Roldan, 2010). In this study, the PLS-SEM has been applied based on three justifications, as suggested by Hair et al. (2014). Firstly, the current study is a predictive or exploratory study whereby the D&M model was modified by adding the WL and personal characteristics as the moderators, while at the same time add the ITU to the model. Secondly, the data distribution of the study is not normal, thus the need to use the non-parametric test. Finally, the conceptual model of the study is considered complex as it consists of recursive relationships, with eight variables, four moderators, and 26 connection lines between the variables. In light of this, the PLS-SEM is considered as a better choice to analyze complex model compared to the CB-SEM.

5.4.1 Assessment of Measurement Model

The analysis of the conceptual model was conducted in two phases, which involved the examination of measurement and structural model. As all the constructs in the current study are reflective, the evaluation of the measurement model was done based on the construct reliability, convergent and discriminant validities (Hair et al., 2014). The construct reliability based on internal consistency is established by using α and composite reliability (CR) values, with the threshold of 0.70 (Hair et al., 2014). On the other hand, the outer loading (indicator reliability) and the Average Variance Extracted (AVE) are considered to establish convergent validity. For this reason, the accepted cut-off value of outer loading is 0.70, while 0.50 for AVE (Hair et al., 2014). Finally, to ensure that a particular construct is distinct from other constructs, the discriminant validation was conducted by examining either cross-loadings, Fornell-Larker criterion or Heterotrait Monotrait Ratio (HTMT). To achieve discriminant validity, the indicator outer loadings on the associated construct should be greater than all of its loading on the other constructs, the square-root of AVE (√AVE) are larger than latent variable correlations (Fornell-Larker criterion) or HTMT below than 1.0 (Hair et al., 2014; Henseler, 2017).

By executing the PLS algorithm on SmartPLS 3.0, it was discovered that WL had AVE value slightly below than 0.50 (0.454), whereas the remaining constructs were passed the cut-off value. However, after the deletion of the item WL6 which holds the lowest outer loading (0.419), the AVE of WL has increased to 0.574 and exceeded the threshold value. Next, the construct reliability was examined for all the constructs. The results had shown that the lowest α and CR was 0.850 and 0.870 respectively,

indicating the high level of internal consistency. On the other hand, the validity of the construct was evaluated through convergent and discriminant validity. For each construct, the current study has demonstrated the good level of convergent validity, indicated by a good score of AVE (min: 0.570; max: 0.916) and factor loading (min: 0.730; max: 0.971). Table 5.7 summarizes the analysis of construct reliability and convergent validity of the current study.

Table 5.7

Analysis of Measurement Model

Construct	Indicator	Factor Loading	α	CR	AVE	Construct Reliability	Convergent Validity
IQ	IQ1	0.894	0.965	0.971	0.825	Achieved	Achieved
	IQ2	0.905					
	IQ3	0.924					
	IQ4	0.922					
	IQ5	0.932					
	IQ6	0.904					
	IQ7	0.876					
SyQ	SyQ1	0.867	0.959	0.966	0.804	Achieved	Achieved
	SyQ2	0.910					
	SyQ3	0.873					
	SyQ4	0.90					
	SyQ5	0.906					
	SyQ6	0.909					
	SyQ7	0.910					

Table 5.7 Continued

SeQ	SeQ1	0.913	0.976	0.979	0.839	Achieved	Achieved
	SeQ2	0.922					
	SeQ3	0.938					
	SeQ4	0.935					
	SeQ5	0.913					
	SeQ6	0.928					
	SeQ7	0.940					
	SeQ8	0.892					
	SeQ9	0.863					
ITU	ITU1	0.942	0.953	0.966	0.876	Achieved	Achieved
	ITU2	0.958					
	ITU3	0.911					
	ITU4	0.932					
US	US1	0.968	0.969	0.978	0.916	Achieved	Achieved
	US2	0.963					
	US3	0.961					
	US4	0.935					
U	U1	0.868	0.960	0.966	0.757	Achieved	Achieved
	U2	0.854					
	U3	0.863					
	U4	0.886					
	U5	0.855					

Table 5.7 Continued

	U6	0.881					
	U7	0.883					
	U8	0.865					
	U9	0.874					
NB	NB1	0.914	0.974	0.980	0.907	Achieved	Achieved
	NB2	0.959					
	NB3	0.971					
	NB4	0.969					
	NB5	0.947					
WL	WL1	0.762	0.850	0.870	0.570	Achieved	Achieved
	WL2	0.759					
	WL3	0.730					
	WL4	0.741					
	WL5	0.794					

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

As for the discriminant validity, first, the cross-loadings were examined. All the indicator's loadings in this study are greater than the entire corresponding cross-loadings (Hair et al., 2014) as shown in Table 5.8. Hence, the first criterion for discriminant validity is accomplished.

Table 5.8

Cross-Loading Analysis

	IQ	**ITU**	**NB**	**SeQ**	**SyQ**	**U**	**US**	**WL**
IQ1	**0.894**	0.699	0.707	0.691	0.763	0.686	0.728	0.386
IQ2	**0.905**	0.698	0.718	0.680	0.748	0.697	0.727	0.399
IQ3	**0.924**	0.686	0.702	0.691	0.768	0.674	0.726	0.376
IQ4	**0.922**	0.683	0.706	0.697	0.792	0.696	0.746	0.391
IQ5	**0.932**	0.701	0.728	0.711	0.794	0.687	0.735	0.370
IQ6	**0.904**	0.686	0.737	0.694	0.805	0.688	0.745	0.349
IQ7	**0.876**	0.690	0.701	0.701	0.783	0.672	0.727	0.432
ITU1	0.772	**0.942**	0.824	0.725	0.781	0.770	0.823	0.391
ITU2	0.730	**0.958**	0.815	0.713	0.764	0.756	0.807	0.403
ITU3	0.661	**0.911**	0.721	0.655	0.684	0.686	0.731	0.404
ITU4	0.683	**0.932**	0.767	0.663	0.707	0.709	0.763	0.376
NB1	0.739	0.775	**0.914**	0.705	0.790	0.788	0.849	0.357
NB2	0.740	0.794	**0.959**	0.699	0.784	0.821	0.857	0.369
NB3	0.769	0.815	**0.971**	0.710	0.813	0.825	0.884	0.382
NB4	0.749	0.805	**0.969**	0.719	0.808	0.818	0.873	0.378
NB5	0.747	0.794	**0.947**	0.683	0.784	0.808	0.857	0.373
SeQ1	0.694	0.661	0.655	**0.913**	0.743	0.672	0.690	0.407
SeQ2	0.674	0.652	0.665	**0.922**	0.754	0.678	0.693	0.400
SeQ3	0.684	0.662	0.671	**0.938**	0.750	0.685	0.703	0.419
SeQ4	0.707	0.679	0.684	**0.935**	0.758	0.671	0.705	0.414
SeQ5	0.720	0.680	0.668	**0.913**	0.751	0.659	0.693	0.396

Table 5.8 Continued

SeQ6	0.701	0.671	0.674	**0.928**	0.763	0.677	0.709	0.382
SeQ7	0.710	0.684	0.683	**0.94**	0.764	0.680	0.709	0.410
SeQ8	0.708	0.688	0.686	**0.892**	0.773	0.670	0.709	0.382
SeQ9	0.709	0.695	0.698	**0.863**	0.767	0.650	0.723	0.384
SyQ1	0.748	0.667	0.704	0.722	**0.867**	0.658	0.727	0.366
SyQ2	0.766	0.705	0.734	0.739	**0.910**	0.686	0.765	0.350
SyQ3	0.799	0.733	0.752	0.727	**0.873**	0.690	0.771	0.387
SyQ4	0.815	0.765	0.810	0.736	**0.900**	0.762	0.809	0.357
SyQ5	0.730	0.677	0.731	0.735	**0.906**	0.704	0.748	0.340
SyQ6	0.748	0.671	0.754	0.743	**0.909**	0.704	0.775	0.335
SyQ7	0.772	0.707	0.755	0.793	**0.910**	0.732	0.793	0.367
U1	0.665	0.704	0.727	0.648	0.689	**0.868**	0.775	0.385
U2	0.675	0.674	0.725	0.652	0.672	**0.854**	0.739	0.422
U3	0.688	0.759	0.775	0.680	0.726	**0.863**	0.790	0.399
U4	0.615	0.668	0.717	0.611	0.657	**0.886**	0.747	0.382
U5	0.572	0.601	0.679	0.572	0.634	**0.855**	0.711	0.327
U6	0.608	0.639	0.727	0.601	0.655	**0.881**	0.755	0.320
U7	0.656	0.669	0.767	0.638	0.696	**0.883**	0.782	0.319
U8	0.696	0.680	0.762	0.659	0.697	**0.865**	0.761	0.354
U9	0.721	0.711	0.788	0.667	0.728	**0.874**	0.800	0.374
US1	0.782	0.809	0.871	0.748	0.833	0.862	**0.968**	0.424
US2	0.767	0.807	0.864	0.733	0.818	0.854	**0.963**	0.417

Table 5.8 Continued

US3	0.789	0.809	0.878	0.738	0.834	0.846	**0.961**	0.399
US4	0.752	0.774	0.861	0.725	0.806	0.795	**0.935**	0.360
WL1	0.393	0.382	0.396	0.381	0.361	0.400	0.397	**0.762**
WL2	0.164	0.152	0.124	0.198	0.163	0.167	0.149	**0.759**
WL3	0.143	0.093	0.066	0.166	0.102	0.109	0.110	**0.730**
WL4	0.183	0.116	0.096	0.186	0.134	0.150	0.134	**0.741**
WL5	0.424	0.464	0.410	0.441	0.423	0.425	0.436	**0.794**

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

Fornell-Larcker criterion is the second test in establishing the discriminant validity. In the current study, only construct U did not achieve the Fornell-Larcker criterion with a small difference of 0.07. On the contrary, the other constructs exhibited $\sqrt{\text{AVE}}$ greater than the values of other constructs, indicating the discriminant validity (see Table 5.9).

Table 5.9

Analysis of Fornell-Larcker Criterion

	IQ	**ITU**	**NB**	**SeQ**	**SyQ**	**U**	**US**	**WL**
IQ	**0.908**							
ITU	0.762	**0.936**						
NB	0.786	0.837	**0.952**					
SeQ	0.765	0.737	0.738	**0.916**				

Table 5.9 Continued

SyQ	0.858	0.786	0.836	0.828	**0.897**			
U	0.755	0.781	0.853	0.733	0.788	***0.870***		
US	0.808	0.836	0.907	0.769	0.860	0.877	**0.957**	
WL	0.425	0.420	0.390	0.436	0.399	0.420	0.418	**0.757**

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

Although U did not achieve Fornell-Larcker criterion with a very small value, the current study has conducted the HTMT criterion to affirm the discriminant validity. As shown in Table 5.10, all HTMT values are below than 1.0, therefore, the discriminant validity is confirmed (Henseler, 2017).

Table 5.10

Analysis of Heterotrait Monotrait Ratio

	IQ	**ITU**	**NB**	**SeQ**	**SyQ**	**U**	**US**	**WL**
IQ								
ITU	0.793							
NB	0.811	0.867						
SeQ	0.789	0.763	0.757					
SyQ	0.891	0.819	0.864	0.855				
U	0.783	0.814	0.880	0.756	0.818			
US	0.835	0.868	0.934	0.790	0.891	0.908		
WL	0.368	0.343	0.306	0.384	0.334	0.353	0.344	

HTMT $_{\text{inference}}$ > 1.0

5.4.2 Assessment of Structural Model

After the CFA that was done during the measurement model analysis, the structural model was examined. Several criteria were examined including collinearity assessment, the significance and relevance of structural model's relationships, coefficient of determination (R^2), f^2 effect size, predictive relevance (Q^2) and q^2 effect size. The conceptual model of the current study consists of 14 hypotheses. The main hypotheses H_1 and H_5 are further divided into three sub-hypotheses respectively. Similarly, the moderation hypothesis H_{12} is divided into nine sub-hypotheses.

The PLS-SEM structural analysis did not allow the recursive relationships between the latent variables (Hair et al., 2014). Therefore, the structural model evaluation of this study was separated into Model A and Model B. The main hypotheses H_1, H_5, H_8, H_9, H_{10} and the moderation hypotheses H_{12} and H_{14} were tested in Model A (see Figure 5.2). In addition, the main hypotheses H_2, H_3, H_4, H_6, H_7 along with mediation hypothesis H_{11} and moderating hypothesis H_{13} were examined in Model B (see Figure 5.6).

5.4.2.1 Structural Model A

Before embarking on the key criteria of structural analysis, the collinearity issues need to be addressed. Even though the multicollinearity test has already been conducted during the data preparation, this issue was re-examined during structural model analysis by obtaining VIF values from PLS algorithm. The result supports the previous analysis, whereby all VIF values are below 10 (min: 1.059; max: 5.187), indicating that the structural model is free from multicollinearity issue (Henseler, 2017). To

examine the significance of path coefficient (*β*), the current study applied standard bootstrapping procedure with 5,000 samples and 643 cases (Hair, Hult, Ringle, & Sarstedt, 2017). Table 5.11 and Figure 5.2 show structural Model A, including a WL as a continuous moderator.

Table 5.11

Assessment of Main Hypotheses in Structural Model A

Hypothesis		*β*	T Values	p Values	95% CI	Result
H_{1a}	IQ -> ITU	0.285	4.925	0.00***	0.170, 0.398	Supported
H_{1b}	SyQ -> ITU	0.356	5.979	0.00***	0.242, 0.475	Supported
H_{1c}	SeQ -> ITU	0.224	4.765	0.00***	0.134, 0.319	Supported
H_{5a}	IQ -> US	0.236	5.071	0.00***	0.147, 0.327	Supported
H_{5b}	SyQ -> US	0.541	10.808	0.00***	0.438, 0.633	Supported
H_{5c}	SeQ -> US	0.140	3.620	0.00***	0.067, 0.221	Supported
H_{8}	ITU -> U	0.719	28.921	0.00***	0.668, 0.766	Supported
H_{9}	U -> NB	0.246	6.528	0.00***	0.172, 0.322	Supported
H_{10}	US -> NB	0.691	19.359	0.00***	0.617, 0.760	Supported

1.65 (*p < 0.10), 1.96 (**p < 0.05), 2.58 (***p< 0.01)

Hypothesis H_{1a} postulated that IQ has a significant influence towards the ITU of VLE among teachers. From the analysis, it was discovered that this relationship is significant (*β*=0.285, t=4.925, p<0.01). Therefore, this finding supports the hypothesis H_{1a}. The result also shows that SyQ has positive effect on ITU (*β*=0.356, t=5.979, p<0.01), which supported the hypothesis $H_{1b.}$ Meanwhile, hypothesis H_{1c} posited that SeQ would significantly influence the ITU. From the analysis, it is apparent that this

hypothesis is supported (β=0.224, t=4.765, p<0.01). Next, the relationship between IQ and US in hypothesis H_{5a} was examined. The result indicated that there is a positive relationship between these constructs (β=0.236, t=5.071, p<0.01), thus supporting the proposed hypothesis. On the other hand, the result also shows that SyQ has a positive relationship with the US (β=0.541, t=10.808, p<0.01). Therefore, the hypothesis H_{5b} is supported. Similarly, hypothesis H_{5c} which postulated a significant relationship between SeQ and US is also supported (β=0.41, t=3.62, p<0.01) in this study.

Furthermore, after examining hypothesis H_8, it was found that ITU has a positive effect toward the U of VLE among teachers at the 0.01 level of significance (β=0.719, t=28.921, p<0.01). Considering the result, hypothesis H_8 is supported. In the same way, hypothesis H_9 which posited the relationship between U and NB is also supported (β=0.246, t=6.528, p<0.01). The last main hypothesis investigated in Model A was H_{10}. According to this hypothesis, the US should significantly influence the NB. From the PLS path analysis, it was discovered that there is a positive relationship between these constructs at 0.01 of the significance level (β=0.691, t=19.359, p<0.01). Further discussions regarding these findings are provided in the next chapter.

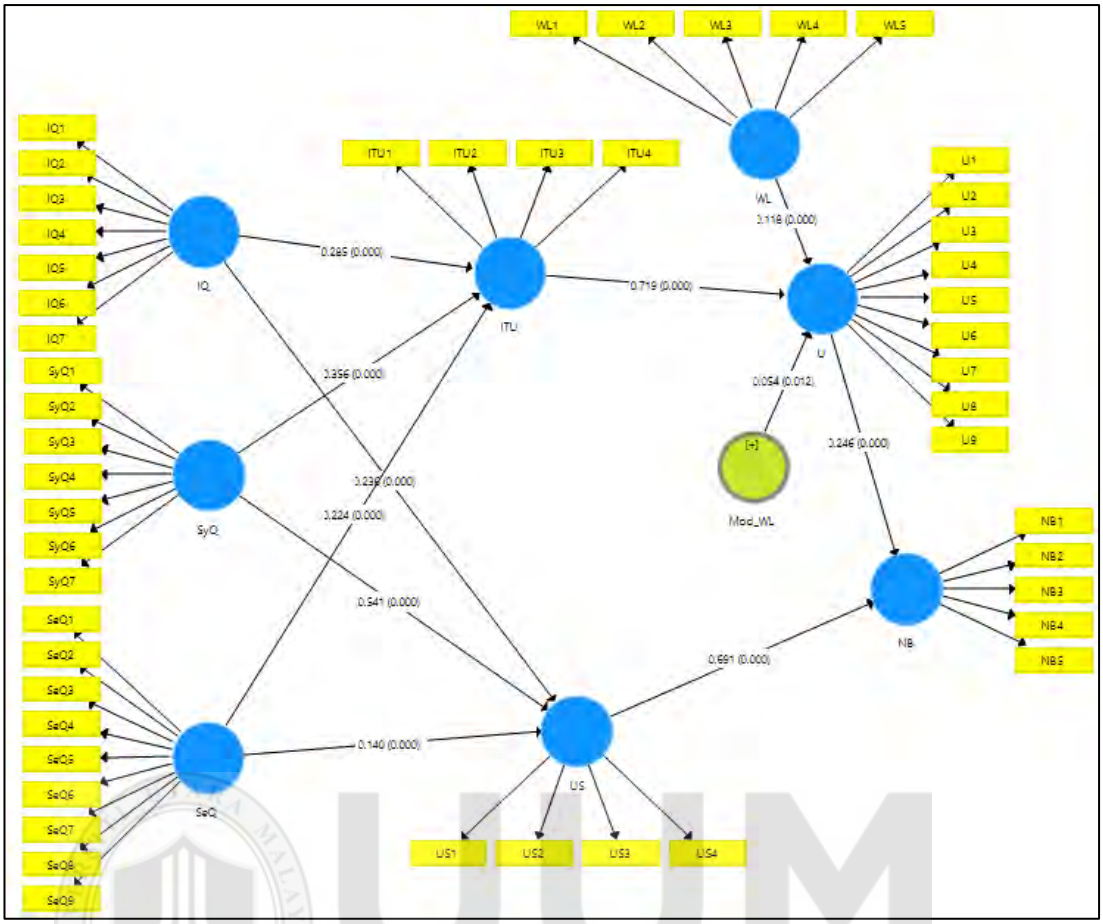


Figure 5.2. The Structural Model A

5.4.2.1.1 Assessment of Coefficient of Determination (R^2) for Model A

In the second step of structural analysis, the level of R^2 was assessed. The R^2 value is a measure of the model's predictive accuracy and is calculated as the squared correlation between actual and predictive values of a specific endogenous construct (Hair et al., 2017). There is no specific rule of thumb for R^2 value. As such, the current study follows the suggestion of Hair et al. (2017), who recommended 0.25, 0.50 and 0.75 as weak, moderate and high R^2 values respectively. As can be seen from Table 5.12, the primary endogenous variable, NB achieved the highest R^2 (0.837) compared to others. This R^2 along with US (0.763) can be considered as high. In contrast, the R^2

values of ITU and U are rather moderate, even though the values are approximately close to high.

Table 5.12

Analysis of Predictive Accuracy in Model A

Construct Type	Construct	R^2	Level of R^2
Primary Endogenous	NB	0.837	High
Secondary Endogenous	ITU	0.662	Moderate
	U	0.625	Moderate
	US	0.763	High

Note. ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

5.4.2.1.2 Assessment of Effect Size (f^2) for Model A

The f^2 effect size is an impact measurement of a specific exogenous toward an endogenous construct. In other words, it estimates the changes in R^2 when the specific predictor is excluded from the model. The f^2 can be calculated based on the following formula:

$$f^2 = \frac{R^2 Included - R^2 Excluded}{1 - R^2 Included}$$

By referring to the guidelines by J. Cohen (1988), the appropriate interpretation of f^2 effect size is 0.02 for small, 0.15 for medium and 0.35 for large effect.

For endogenous construct ITU, all the predictors (IQ, SyQ and SeQ) demonstrated small effect sizes in producing R^2 of ITU. However, the effect of SyQ (0.072) is the most prominent when omitted from the model. On the other hand, US (0.676) achieved

large effect size on the relationship to NB, while U (0.086) shows a small effect in predicting the R^2 of NB. For endogenous construct U, the f^2 value of ITU (1.072) as the predictor is large. Finally, the f^2 of exogenous SyQ (0.239) is the most noticeable in producing R^2 of US, which is medium yet close to large effect. On the contrary, both SeQ (0.025) and IQ (0.060) showed small effect sizes in producing R^2 of US. Table 5.13 simplifies the analysis of the f^2 effect sizes in the Model A.

Table 5.13

Analysis of f^2 Effect Sizes in Model A

Exogenous/Endogenous	**ITU**	**NB**	**U**	**US**
IQ	0.061			0.060
ITU			**1.072**	
NB				
SeQ	0.045			0.025
SyQ	**0.072**			**0.239**
U		0.086		
US		**0.676**		

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

5.4.2.1.3 Assessment of Predictive Relevance (Q^2) for Model A

The research model that has Stone-Geisser Q^2 value above zero is considered to have predictive relevance (Henseler, Ringle, & Sinkovics, 2009). As a relative measure of predictive relevance, the values of 0.02, 0.15 and 0.35 indicated that the particular exogenous construct has a small, medium and large predictive relevance toward the

certain endogenous construct (Hair et al., 2017). Table 5.14 shows the results of the cross-validated redundancy Q^2 of the current study.

Table 5.14

Analysis of Predictive Relevance for Model A

Endogenous Construct	SSO	SSE	Q² (=1-SSE/SSO)
ITU	2,572.00	1,174.60	**0.543**
NB	3,215.00	932.364	**0.710**
U	5,787.00	3,247.30	**0.439**
US	2,572.00	886.012	**0.656**

Note. IQ = ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

As indicated in Table 5.14, the cross-validated redundancy Q^2 for all endogenous latent variables are above zero, indicating the existence of predictive relevance. Therefore, the predictive relevance for Model A are as follows; ITU (0.54, large), NB (0.71, large), U (0.44, large) and US (0.66, large).

5.4.2.1.4 Assessment of Effect Size (q^2) for Model A

The final assessment addresses the calculation of q^2 effect size, which involved the manual calculations based the following formula:

$$q^2 = \frac{Q^2 Included - Q^2 Excluded}{1 - Q^2 Included}$$

The q^2 effect size measures the impact of a specific predecessor to the predictive relevance (Q^2) of an endogenous latent construct. In the current study, the blindfolding procedure was applied to obtain the values of $Q^2_{Included}$ and $Q^2_{Exluded}$. As a guideline for

assessing the q^2, the values of 0.35, 0.15, and 0.02 indicate that the particular exogenous latent construct has large, medium or small effect in producing Q^2 of an endogenous construct (Hair et al., 2017).

Table 5.15

Assessment of q^2 Effect Size in Model A

	ITU			NB			U			US		
	$Q^2_{incl.}$	$Q^2_{exl.}$	q^2	$Q^2_{incl.}$	$Q^2_{exl.}$	q^2	$Q^2_{incl.}$	$Q^2_{exl.}$	q^2	$Q^2_{incl.}$	$Q^2_{exl.}$	q^2
IQ	0.543	0.527	0.035							0.656	0.439	0.631
ITU							0.439	0.124	0.561			
SeQ	0.543	0.531	0.026							0.656	0.651	0.015
SyQ	0.543	0.523	0.044							0.656	0.607	0.142
U				0.710	0.698	0.041						
US				0.710	0.617	0.321						

Note. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

Comparing the q^2 values illustrated in Table 5.15, SyQ produced the highest effect in producing Q^2 of ITU. Nevertheless, this value (0.044) only represents the small effect size. On the other hand, US (0.321) contributes the higher q^2 on the NB's Q^2, which is approximately close to large effect. Whereas, U (0.041) had only small effect size in acquiring Q^2 of NB. For endogenous latent variable U, ITU (0.561) has the large q^2, as it is the only relationship exists. Finally, the 0.631 is the q^2 effect size for the predictive relevance of IQ on US. On the contrary, 0.015 and 0.142 indicate that SeQ and SyQ respectively have very small and close to medium effect in producing Q^2 for US.

5.4.2.1.5 Moderating Effects in Model A

In the structural analysis of Model A, two main hypotheses of moderated relationships were tested; H_{12} and H_{14}. The hypothesis H_{12} was divided into nine sub-hypotheses consisting age, gender and VLE experience as the attributes of the Personal Characteristics. Equally important, the Personal Characteristics in H_{12} is a categorical moderator, while WL acts as continuous moderator in H_{14}. The moderating analysis of Personal Characteristics in the relationship between Quality Dimensions and ITU was done using PLS Multi-Group Analysis (PLS-MGA) (Hair et al., 2017). The p-value for MGA should be below 0.05 or above 0.95 to be considered as significant (Henseler, 2007; Valaei & Nikhashemi, 2017).

First, the current study examined the moderating effect of age on the relationships between the Quality Dimensions (IQ, SyQ and SeQ) to the ITU. To do so, the age was grouped into two categories, namely young adulthood (≤ 39 years old; 339 cases) and middle adulthood (≥ 40 years old, 304 cases). As shown in Figure 5.3, there are differences in path coefficient values between these two groups. For the young teachers, the path coefficient between SyQ and ITU is the most noticeable, whereas the relationship between IQ and ITU has produced the largest path coefficient for middle-aged teachers.

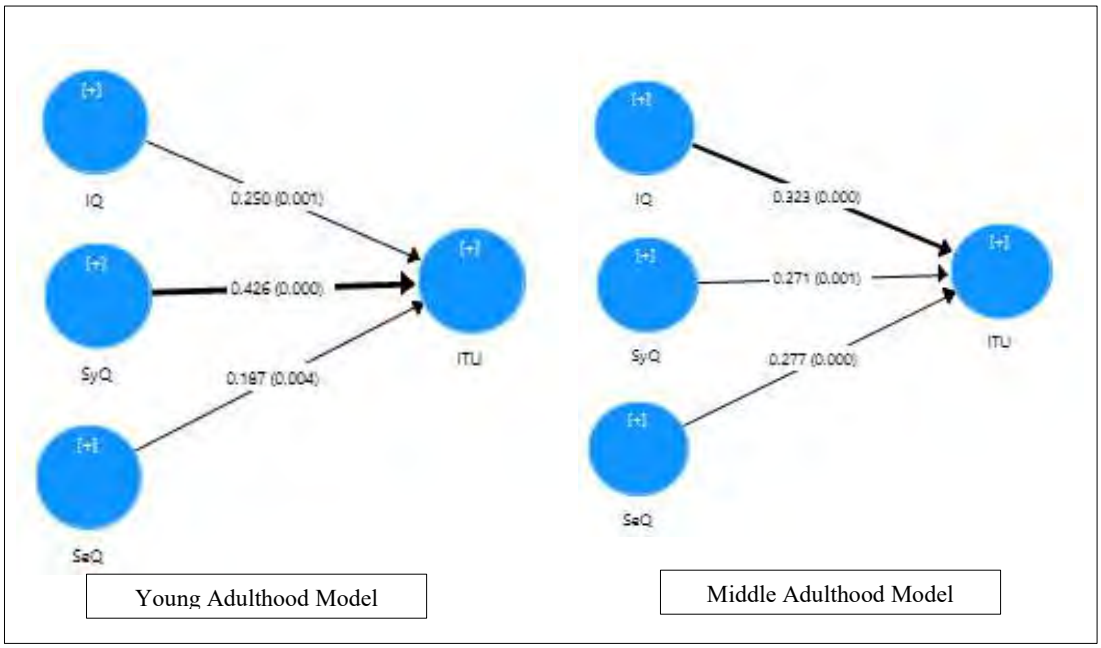


Figure 5.3. Multi-Group Analysis of Age

However, further analysis of MGA between groups of young and middle-aged teachers has revealed that all the p values are not significant. Therefore, the hypotheses H_{12a}, H_{12b} and H_{12c} were rejected (see Table 5.16).

Table 5.16

Multi-Group Analysis of Age

Hypothesis		Group 1: Young Adult		Group 2: Middle Adult		Group 1 vs. Group 2			
		$p^{(1)}$	Se $p^{(1)}$	$p^{(2)}$	Se $p^{(2)}$	$p^{(1)}$- $p^{(2)}$	t Value	Sig.	p Value
H_{12a}	IQ->ITU	0.25	0.074	0.323	0.088	0.074	0.652	NS	0.739
H_{12b}	SyQ->ITU	0.187	0.068	0.277	0.062	0.09	0.965	NS	0.837
H_{12c}	SeQ->ITU	0.426	0.079	0.271	0.088	0.155	1.322	NS	0.097

**p < 0.05, ***p< 0.01, ****p>0.95, NS=Not Significant

Next, the role of gender as the categorical moderator was examined. The gender represents females (380 cases) and males (263 cases). The entire relationships in both female and male model are found to be significant, as shown in Figure 5.4. Moreover, there are differences in the path coefficient, depicted by the path weights and *β* values.

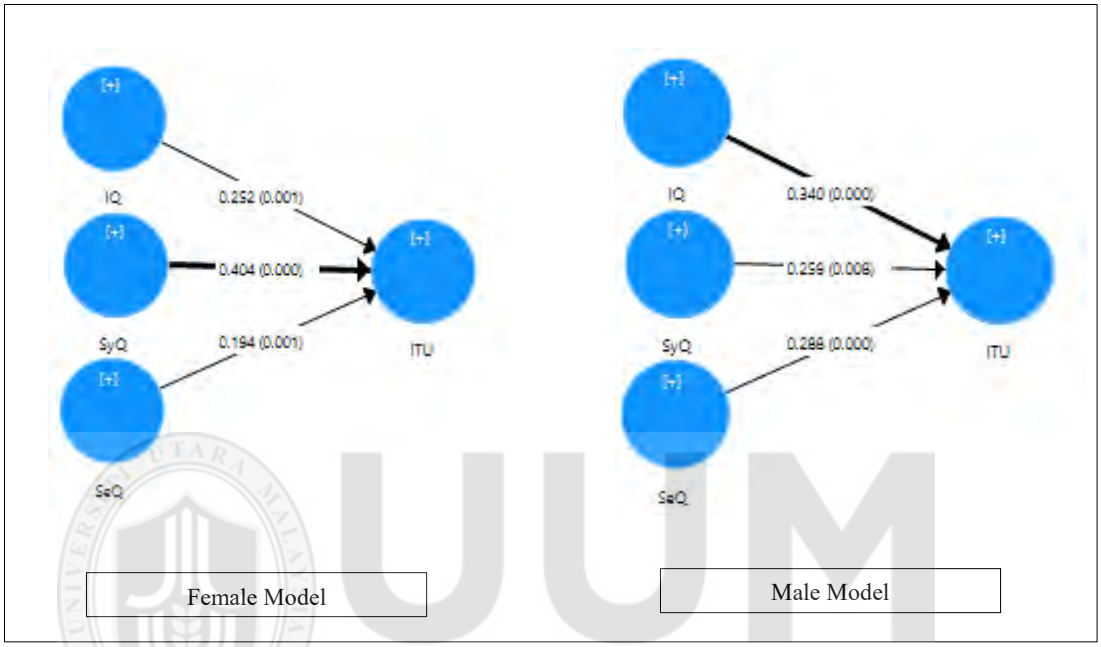


Figure 5.4. Multi-Group Analysis of Gender

Furthermore, the PLS-MGA procedure was executed to examine the significance of the differences between the female and male groups. Unfortunately, the result has uncovered that there is no significant differences in the relationship between quality dimensions and ITU between female and male groups. Considering this outcome, hypotheses H_{12d}, H_{12e} and H_{12f} were returned (see Table 5.17).

Table 5.17

Multi-Group Analysis of Gender

Hypothesis		Group 1: Female		Group 2: Male		Group 1 vs. Group 2			
		$p^{(1)}$	Se $p^{(1)}$	$p^{(2)}$	Se $p^{(2)}$	$p^{(1)}$- $p^{(2)}$	t Value	Sig.	p Value
H_{12d}	IQ->ITU	0.252	0.082	0.34	0.082	0.088	0.75	NS	0.776
H_{12e}	SyQ->ITU	0.194	0.061	0.288	0.074	0.094	1.005	NS	0.837
H_{12f}	SeQ->ITU	0.404	0.076	0.259	0.097	0.145	1.167	NS	0.115

**p < 0.05, ***p< 0.01, ****p>0.95, NS=Not Significant

The third and final categorical moderator in the current study is VLE experience, which has been divided into less (338 cases) and more experience (305 cases). As shown in Figure 5.5, the models are comparatively identical in path weights, illustrated by path widths. Nonetheless, the numerical values of the path coefficients differ somewhat, which calls for further analysis of PLS-MGA.

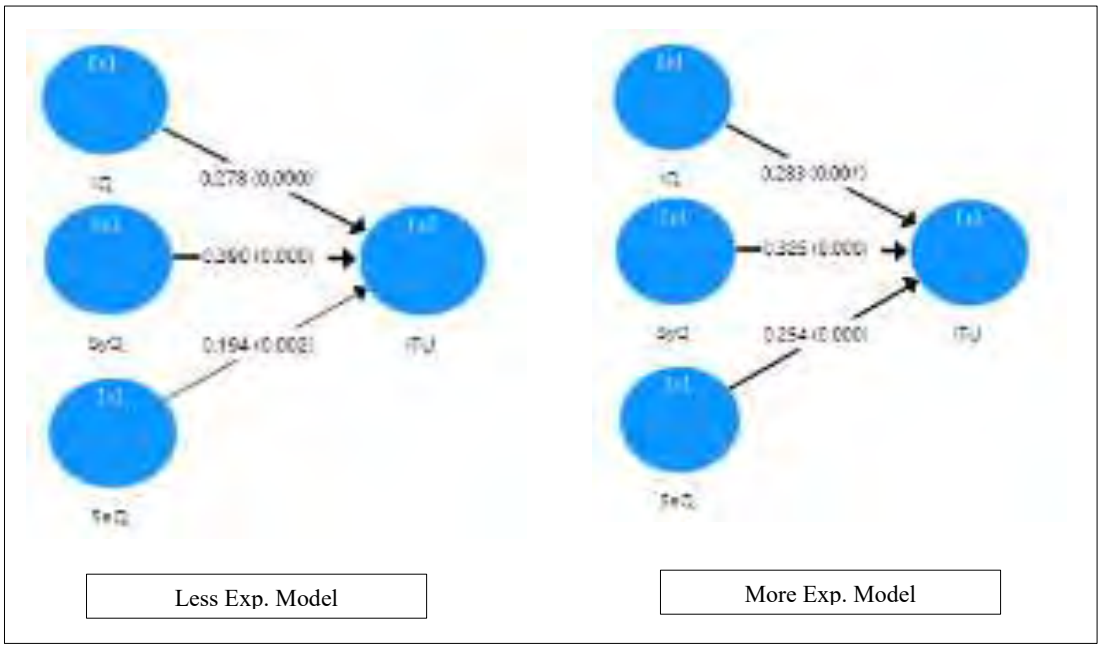


Figure 5.5. Multi-Group Analysis of VLE Experience

From Table 5.18, it is apparent that the differences between *β* values of less and more experienced teachers are minor. Furthermore, the result of PLS-MGA also reveals that all p values of differences between less and more VLE experience are in between the range of 0.05 and 0.95, which calls for the rejection of H_{12g}, H_{12h} and H_{12i}.

Table 5.18

Multi-Group Analysis of VLE Experience

Hypothesis		Group 1: Less		Group 2: More		Group 1 vs. Group 2			
		$p^{(1)}$	Se $p^{(1)}$	$p^{(2)}$	Se $p^{(2)}$	$p^{(1)}$- $p^{(2)}$	t Value	Sig.	p Value
H_{12g}	IQ->ITU	0.278	0.074	0.283	0.086	0.005	0.047	NS	0.519
H_{12h}	SyQ->ITU	0.194	0.064	0.254	0.069	0.06	0.651	NS	0.738
H_{12i}	SeQ->ITU	0.39	0.079	0.325	0.088	0.065	0.553	NS	0.292

**p < 0.05, ***p< 0.01, ****p>0.95, NS=Not Significant

Meanwhile, the Model A also involved the investigation of WL as a continuous moderator in the relationship between ITU and U. The current study applied the product indicator approach. The term ITU*WL (Mod_WL), which is an interaction term, is included into the model. Referring to Figure 5.2 (Model A), the interaction term ITU*WL has a significant effect (β=0.054, t=2.477, p<0.05) on the endogenous variable U. In this sense, it can be concluded that the WL positively moderate the relationship between ITU and U, that is, there will be 0.054 increments in β value for every 1 SD changes of WL (see Table 5.19). Therefore, H_{14} is supported.

Table 5.19

Analysis of Continuous Moderator in Model A

	Hypothesis	Path Coefficient	STDEV	t-Value	p-Value	f^2	Test Results
H_{14}	ITU * WL -> U	0.054	0.022	2.477	0.014**	0.010	Supported

1.96 (**p < 0.05), 2.58 (***0.01)

Equally important, the current study examined the effect size (f^2) of WL moderating effect in producing R^2 of U. The accepted indicators are 0.005 as small, 0.01 as medium and 0.025 as the large effect (Hair et al., 2017; Kenny, 2016). However, even if the f^2 effect size is small, it is still meaningful, especially during the extreme occasions (Chin, Marcolin, & Newsted, 2003). To determine f^2, the following formula was used:

$$f^2 = \frac{R^2 model\ with\ moderator - R^2 model\ without\ moderator}{1 - R^2 model\ with\ moderator}$$

Further analysis showed that the f^2 effect size of WL as the moderator is 0.01. This value indicates the medium effect of interaction term WL*ITU in producing R^2 of U.

5.4.2.2 Structural Model B

The recursive relationships in the conceptual model were examined in structural Model B, which consist of the main hypotheses H_2, H_3, H_4, H_6, H_7 along with the mediation hypothesis H_{11} and moderating hypothesis H_{13}. The analysis of Model B began with the collinearity test. The acquired result from PLS algorithm is consistent with Model A, which all the VIF values of latent variables are below 10. Therefore, it can be concluded that no collinearity issue exist in Model B (Henseler, 2017). Later, using the bootstrapping technique, the significance and path coefficients were calculated. Figure 5.6 and Table 5.20 illustrate the structural Model B of the current study.

Table 5.20

Assessment of Main Hypotheses in Model B

Hypothesis		*ß*	T Values	p Values	95% CI		Result
H_2	US -> ITU	0.352	5.519	0.00***	0.224	0.472	Supported
H_3	U -> ITU	0.088	1.686	0.09^{NS}	-0.011	0.201	Returned
H_4	NB -> ITU	0.402	6.203	0.00***	0.267	0.517	Supported
H_6	U -> US	0.380	11.028	0.00***	0.313	0.45	Supported
H_7	NB -> US	0.583	17.441	0.00***	0.515	0.646	Supported

1.96 (**p < 0.05), 2.58 (***p< 0.01), NS = Not Significant

The hypothesis H_2 presupposed that US would significantly influence ITU of VLE among the teachers. The further statistical analysis revealed that this relationship is significant (β=0.352, t=5.519, p<0.01), which supported hypothesis H_2. Notwithstanding, the result of the relationship between U and ITU is not significant (β=0.088, t=1.686, p>0.05), thus calls for the rejection of hypothesis H_3. Next, hypothesis H_4 was examined. The result has indicated that there is a positive relationship between NB and ITU (β=0.402, t=6.203, p<0.05). Therefore, H_4 is supported. Similarly, the relationship between U and US is found to be significantly positive (β=0.380, t=11.028, p<0.01), thus, hypothesis H_6 is supported. The last main hypothesis examined in Model B is H_7 (NB to US) which is also supported at the significant level of 0.01 (β=0.583, t=17.441, p<0.01).

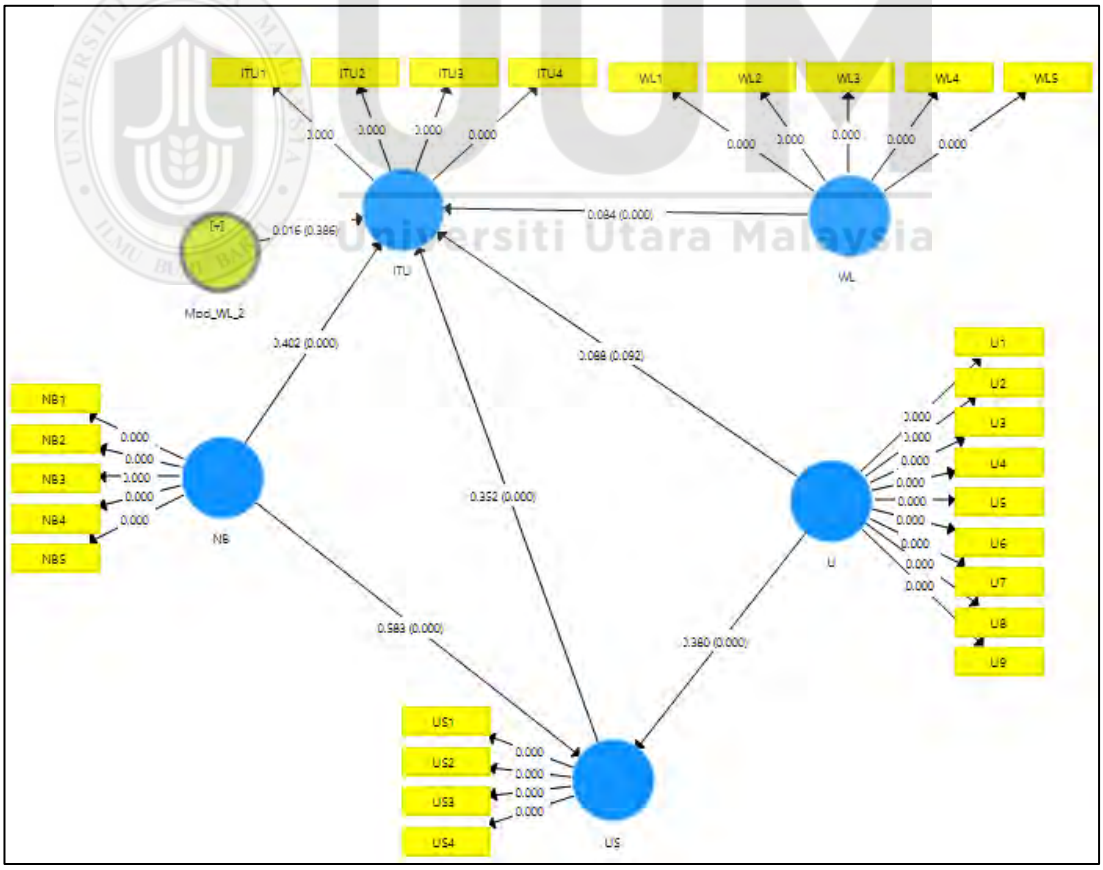


Figure 5.6. The Structural Model B

5.4.2.2.1 Assessment of Coefficient of Determination (R^2) for Model B

Only two endogenous latent variables were involved in structural Model B of the study. As can be seen from Table 5.21, the levels of R^2 in both constructs are roughly consistent with those in Model A. The construct of US achieved the high level of R^2 (0.863). On the contrary, the ITU is rather moderate (0.741), even though the value is very close to high.

Table 5.21

Analysis of Predictive Accuracy in Model B

Endogenous Variable	R^2	Level of R^2
ITU	0.741	Moderate
US	0.863	High

Note. ITU = Intention to Use, US = User Satisfaction

5.4.2.2.2 Assessment of Effect Size (f^2) for Model B

In structural Model B, all the exogenous constructs demonstrate the small f^2 effect sizes in producing R^2 of ITU. The most extrusive is NB (0.100), which is close to medium effect, followed by US (0.065). This is in contrast to the U (0.006) that produced f^2 below the level small effect size, mainly because this relationship is not significant. Despite this, U (0.288) still demonstrates a medium effect to US. On the other hand, the f^2 effect size for NB (0.676) is the most prominent in producing R^2 of US, which is far above the level of large effect. Table 5.22 simplifies the f^2 effect sizes in Model B.

Table 5.22

Analysis of f^2 Effect Sizes in Model B

Exogenous/ Endogenous	ITU	US
NB	0.100	0.676
U	0.006	0.288
US	0.065	

Note. ITU = Intention to Use, US = User Satisfaction, NB = Net Benefits, U = Use, US = User Satisfaction

5.4.2.2.3 Assessment of Predictive Relevance (Q^2) for Model B

As shown in Table 5.23, the cross-validated redundancy Q^2 for both endogenous latent variables in Model B are large. US (0.741) has the largest Q^2 followed by ITU (0.607), which signifies the high level of predictive relevance in the Model B.

Table 5.23

Analysis of Predictive Relevance for Model B

Endogenous Construct	SSO	SSE	Q^2 (=1-SSE/SSO)
ITU	2,572.00	1,009.77	0.607
US	2,572.00	665.198	0.741

Note. ITU = Intention to Use, US = User Satisfaction

5.4.2.2.4 Assessment of Effect Size (q^2) for Model B

As illustrated by Table 5.24, all the predictors for ITU contribute the small q^2 effects in producing its Q^2. The highest q^2 value is from NB (0.064), followed by US (0.046) and U (0.013). In comparison, NB (0.305) has contributed the medium yet close to

large q^2 effect in producing Q^2 of US. This is in contrast to U (0.127) which only has small q^2 effect to produce Q^2 of US.

Table 5.24

Assessment of q^2 Effect Size in Model B

	ITU			US		
	$Q^2_{Included}$	$Q^2_{Excluded}$	q^2	$Q^2_{Included}$	$Q^2_{Excluded}$	q^2
NB	0.607	0.582	0.064	0.741	0.662	0.305
U	0.607	0.602	0.013	0.741	0.708	0.127
US	0.607	0.589	0.046			

Note. ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

5.4.2.2.5 Mediating Effect in Model B

In Model B, the mediating hypothesis H_{11} was tested to investigate the issue of continuous usage. As shown in Figure 5.7, this hypothesis posited that if the teachers are satisfied with the use of VLE, they may intend to continue using it in the future.

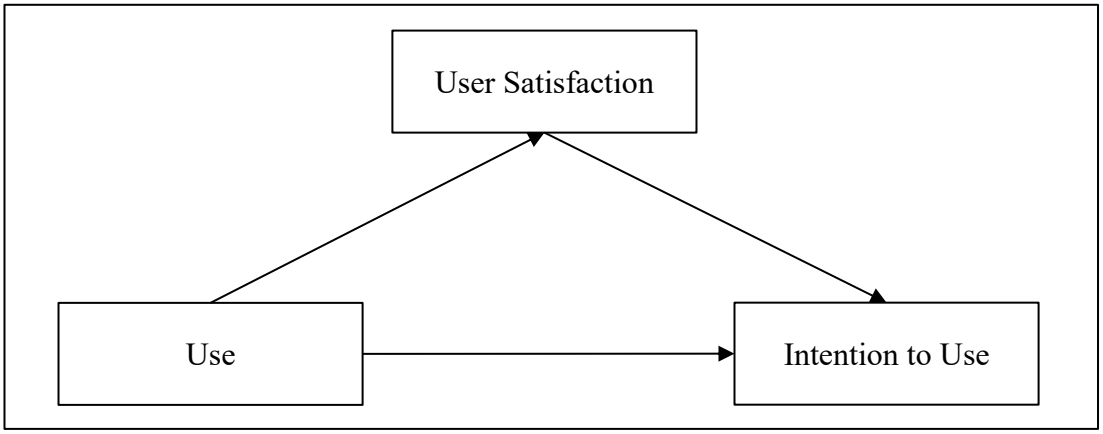


Figure 5.7. The Mediating Role of User Satisfaction

To examine the hypothesized mediating effect, the current study has applied the bootstrapping technique, which produced high accuracy to calculate the path coefficient compared to other methods (Hair et al., 2014). There are three types of mediations, which usually exist in a structural model (X. Zhao, Lynch, & Chen, 2010); complementary, competitive and indirect-only mediation. Both complementary and competitive mediations involve significant direct and indirect relationships. On the other hand, indirect-only mediation has a significant indirect relationship, but not the direct effect. This type of mediation is also known as full mediation relationship. As can be seen in Table 5.25, indirect effect is significant based on 95% of the confident interval (β=0.134, t=5.212, p<0.01). However, the direct effect from U to ITU is not significant (β=0.088, t=1.776, p>0.05). Therefore, the current study concludes that US has fully mediated the U and ITU relationship.

Table 5.25

Analysis of the Mediating Role of US in Model B

	Direct Effect (U->ITU)				**Indirect Effect (U->US->ITU)**			
	ß	**95% CI**	**t Value**	**Sig.**	***ß***	**95% CI**	**t Value**	**Sig.**
H_{11}	0.088	[-0.009, 0.186]	1.776	0.076^{NS}	0.134	[0.086, 0.182]	5.212	0.00***

1.96 (**p < 0.05), 2.58 (***p< 0.01), NS=Not Significant

5.4.2.2.6 Moderating Effect in Model B

In structural Model B, WL is also expected to moderate the relationship between NB and ITU, as illustrated in Figure 5.8. Similar to the analysis in Model A, WL as a

continuous moderator in Model B was tested using product indicator approach by including the interaction term NB*WL (Mod_WL2) into the model B.

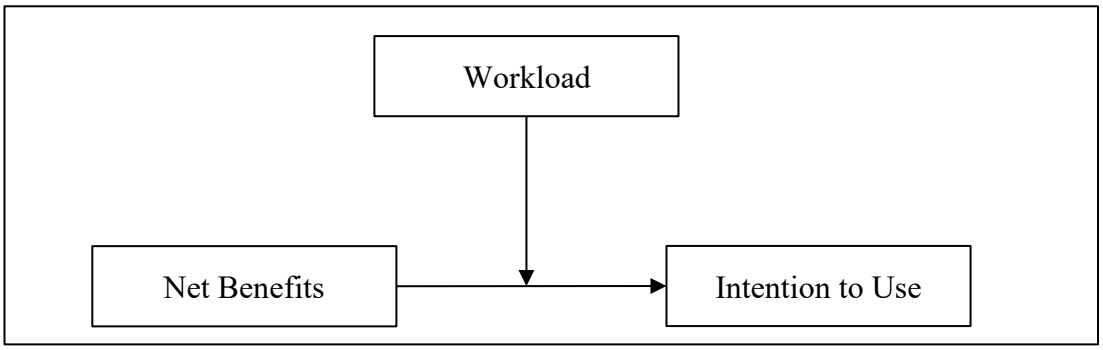


Figure 5.8. The Moderating Role of Workload in Model B

However, this interaction term is found to be not significant (β=0.016, t=0.838, p=0.402), thus rejecting the hypothesis H_{13}. Despite this, the WL has direct positive relationship to the ITU, as shown in Figure 5.6 (Model B). Table 5.26 shows the result of the moderating analysis in Model B.

Table 5.26

Analysis of Continuous Moderator in Model B

	Hypothesis	Path Coefficient	STDEV	t-Value	p-Value	Sig.	Test Results
H_{13}	NB * WL -> ITU	0.016	0.019	0.838	0.402	NS	Returned

**p < 0.05, ***p< 0.01, NS=Not Significant

5.5 The Integrated Structural Model

The outcomes from the hypotheses testing in Model A and Model B indicated positive significant effect between the Quality Dimensions to the ITU. Therefore, the general hypothesis H_1 is supported. However, the moderating effect of Personal

Characteristics onto this relationship is found to be not significant, which calls for the rejection of general moderating hypothesis H_{12}. Furthermore, the hypotheses testing also indicated that Quality Dimensions have a significant positive effect on US, hence, the general hypothesis H_5 is supported. Other direct relationships are also supported except for the relationship between U to ITU (H_3). Nevertheless, this insignificant result has supported the full mediation role US on that particular relationship. On the other hand, the moderating effect of WL has been supported in the relationship between ITU and U, whereas similar moderating effect is found to be insignificant in the relationship between NB and U. Table 5.27 simplifies the overall hypotheses testing in the current study.

Table 5.27

Summary of Hypotheses Testing

Hypothesis		**Model 1**		**Model 2**		**Result**
		β	**p-Value**	***β***	**p-Value**	
H_1	*Quality Dimensions -> ITU*	-	-			*Supported*
H_{1a}	IQ -> ITU	0.285	0.00***			Supported
H_{1b}	SyQ -> ITU	0.356	0.00***			Supported
H_{1c}	SeQ -> ITU	0.224	0.00***			Supported
H_5	*Quality Dimensions -> US*	-	-			*Supported*
H_{5a}	IQ -> US	0.236	0.00***			Supported
H_{5b}	SyQ -> US	0.541	0.00***			Supported
H_{5c}	SeQ -> US	0.14	0.00***			Supported
H_8	ITU -> U	0.719	0.00***			Supported

Table 5.27 Continued

H_9	U -> NB	0.246	0.00***			Supported
H_{10}	US -> NB	0.691	0.00***			Supported
H_{12}	*Personal Characteristics (MGA)*	-	-			*Returned*
H_{12a}	IQ->ITU (MGA-age)	0.074	0.739^{NS}			Returned
H_{12b}	SyQ->ITU (MGA-age)	0.09	0.837^{NS}			Returned
H_{12c}	SeQ->ITU (MGA-age)	0.155	0.097^{NS}			Returned
H_{12d}	IQ->ITU (MGA-gender)	0.088	0.776^{NS}			Returned
H_{12e}	SyQ->ITU (MGA-gender)	0.094	0.837^{NS}			Returned
H_{12f}	SeQ->ITU (MGA-gender)	0.145	0.115^{NS}			Returned
H_{12g}	IQ->ITU (MGA-exp.)	0.005	0.519^{NS}			Returned
H_{12h}	SyQ->ITU (MGA-exp.)	0.06	0.738^{NS}			Returned
H_{12i}	SeQ->ITU (MGA-exp.)	0.065	0.292^{NS}			Returned
H_{14}	ITU * WL -> U	0.054	0.014**			Supported
H_2	US -> ITU			0.352	0.00***	Supported
H_3	U -> ITU			0.088	0.09^{NS}	Returned
H_4	NB -> ITU			0.402	0.00***	Supported
H_6	U -> US			0.380	0.00***	Supported
H_7	NB -> US			0.583	0.00***	Supported
H_{11}	U->US->ITU			0.134	0.00***	Supported
H_{13}	NB * WL -> ITU			0.016	0.402^{NS}	Returned

1.96 (**p < 0.05), 2.58 (***p< 0.01), NS=Not Significant

At the end of the analysis phase, Model A and Model B were integrated to produce one compressive model to measure VLE success. The integrated structural model is presented in Figure 5.9. This model illustrates both significant and non-significant relationships from the hypotheses formed in the Model A and Model B. Solid lines represent the significant relationships, while dotted lines represent the non-significant relationships.

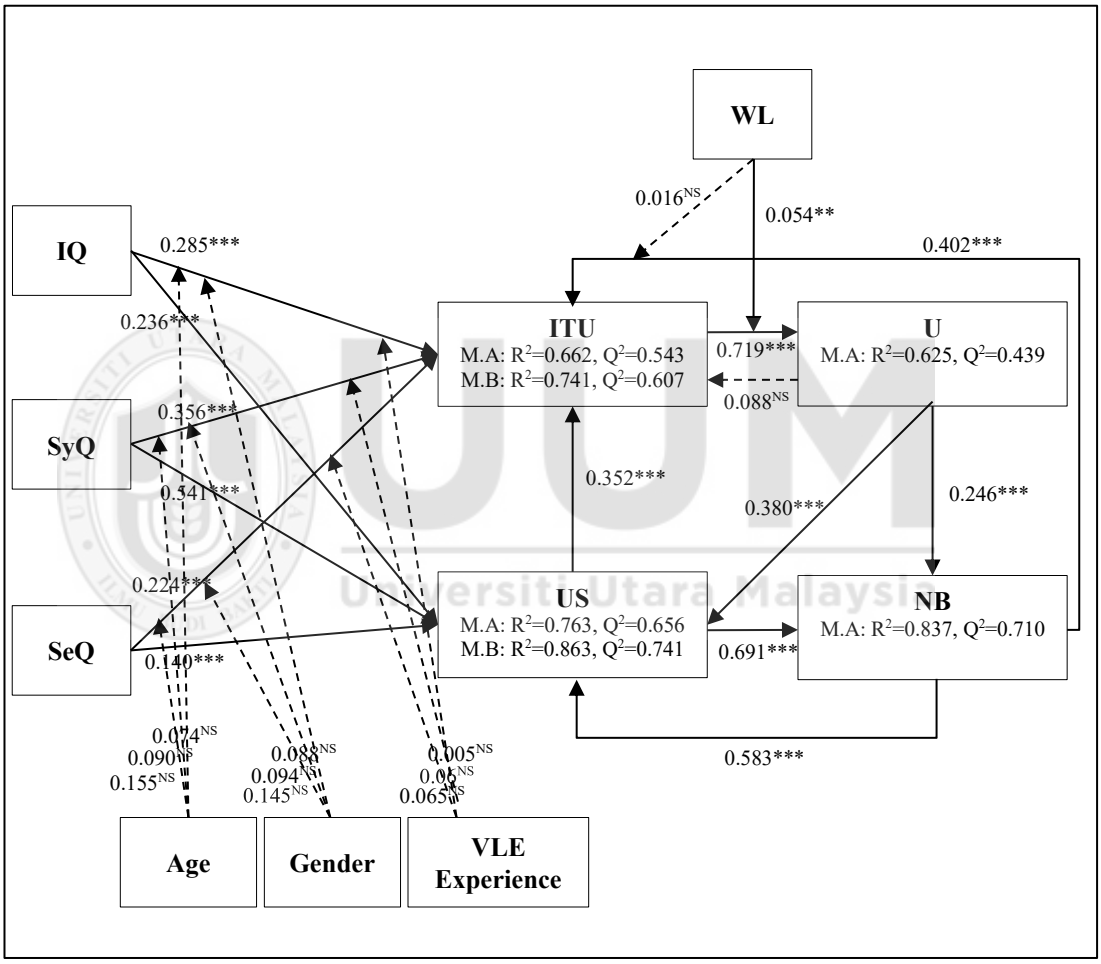


Figure 5.9. Integrated Structural Model. **p < 0.05, ***p< 0.01, NS=Not Significant. M.A = Model A, M.B = Model B, IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload

5.6 Revisiting the Conceptual Model

Structural Equation Modeling analysis did not allow the recursive relationships between the latent variables (Hair et al., 2014). In spite of the ability to test all the proposed hypotheses, the conceptual model that is developed based on D&M cannot be examined on a single SEM structural model. As this conceptual model consists of loopback relationships, it needs to be separated into structural Model A and Model B, as discussed in the previous section. Consequently, two distinct values of R^2 and Q^2 were produced for certain endogenous constructs. Moreover, with the two produced R^2 and Q^2 values, the researcher is unable to accurately determine the f^2 and q^2 effect sizes of the model. This phenomenon, therefore, caused inaccuracy in explaining the real scenario under investigation.

Despite the increasing interest toward D&M among IS researchers, there are lack of studies that examine the recursive relationships proposed by this model. One of the possible explanations is that it is caused by the inexistence of statistical tools that could simultaneously test the whole model, including the loopback relationships. Looking at the trend of D&M empirical studies, most of them have either adopt some part of the model and ignore the recursive relationships, split the model into two structural models, or analyze each relationship using correlation analysis (Al-Debei et al., 2013; Iivari, 2005; Zhou, 2013). One or the other way, each of this approach has the weaknesses, as it will limit the explanatory power of D&M. Unfortunately, the clarification of this concern does not exist thus far. Thus, assessing the D&M using SEM is still considered as the best option available (Chong et al., 2010). Nevertheless,

the limitation of SEM in analyzing D&M has triggered the interest of this study to propose the better approach in measuring the VLE success.

In light of this, this study seeks to establish the best model setting to examine the VLE success among teachers. After conducting further investigation on the current conceptual model, this study found that it can be divided into five possible models that could be examined on the single SEM structural analysis (Refer to Appendix H. Furthermore, three possible final endogenous variables that could compensate the recursive relationships in the current research model were identified, as shown in Table 5.28. After assessing these five potential models, the study discovered that all of them obtain approximately equal quality of predictive accuracy and relevance. In particular, these models have roughly produced a similar level of R^2 and Q^2 compared to structural Model A and Model B. This indicates that the selection of any of these models will not decrease the predictive accuracy and relevance. In this scenario, the selection of the best model should be made based on the issue under investigation.

Table 5.28

Comparison of Possible Models in the Conceptual Model

Model	**Final Endo.**	**R^2**				**Q^2**			
		ITU	**U**	**US**	**NB**	**ITU**	**U**	**US**	**NB**
1	U	**0.753**	**0.626**	0.763	0.823	**0.618**	**0.439**	0.656	0.698
2	U	**0.753**	**0.626**	0.862	N/A	**0.618**	**0.439**	0.74	N/A
3	NB	0.731	0.625	0.763	**0.837**	0.600	**0.439**	0.656	**0.710**
4	US	0.742	0.625	**0.883**	N/A	0.609	**0.439**	**0.758**	N/A

Table 5.28 Continued

5	US	0.662	0.625	**0.883**	0.727	0.543	**0.439**	**0.758**	0.617

Note. Endo. = Endogenous Variable, N/A = Not Available, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits

As for VLE implementation, the continuous usage has been identified as the main issue that could possibly lead the system into a failure. The VLE is a voluntary type of system; hence, the usage should be the indicator of VLE success, because it will represent the teacher's acceptance of the system. Indeed, Al-Debei et al. (2013) defined IS success as the level of acceptance and intention to continue using the system regularly. This definition supports the continuous usage as the indicator for VLE success, which is also compatible with the suggestion by Wu and Wang (2006). Furthermore, the continuous usage will also determine the permanence of VLE in the future. The VLE is considered as a success if it is continuously used or accepted by the teachers (Dennis et al., 2009). In conjunction to this, the abandoned VLE, which is not being used by the teachers can be assumed as a failure (Ewusi-Mensah, 1997; Norshita et al., 2010).

The current study has identified the existence of teachers' resistance toward the VLE (Cheok & Wong, 2016). This refusal is a symptom of VLE failure (McLeod & MacDonell, 2011) that requires further empirical investigation. In light of this, the role of U as the final endogenous construct in Model 1 and Model 2 is appropriate to capture the issue of continuous usage of VLE among the teachers. Therefore, in the first comparison round, Model 1 and Model 2 were chosen (Refer to Table 5.29).

Table 5.29

Comparison of Model 1 and Model 2

Model	**Predictor**	**Outcome**	***ß***	**f^2**	**q^2**
1	US	NB	0.907	4.665	2.311
2	NB	US	0.594	0.714	0.323

Note. US = User Satisfaction, NB = Net Benefits

In the second round, the deeper analysis was done to look for the stronger predictor between US in Model 1 and NB in Model 2. Despite the equal quality of R^2 and Q^2 produced by the both models, the finding has illustrated that the *ß* value (path coefficient) is higher when US predicts NB. In addition, US also produced the better f^2 and q^2 in explaining NB, which implies that the effect of US to NB is stronger than NB to US. In other words, the role of US in determining the NB is more impactful compared to the NB to US. Therefore, it can be concluded that Model 1 is the best model to predict VLE success among teachers. Figure 5.10 illustrates the revised model to evaluate VLE success among teachers (Model 1).

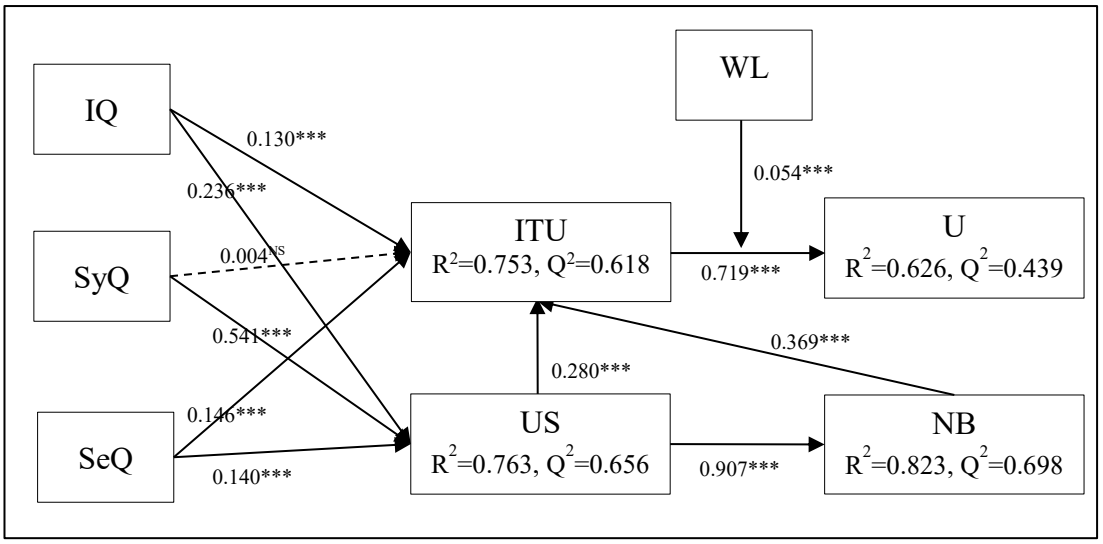


Figure 5.10. The Revised VLE Success Model for Malaysian Teachers (Model 1). **p < 0.05, ***p< 0.01, NS=Not Significant. IQ = Information Quality, SyQ = System Quality, SeQ = Service Quality, ITU = Intention to Use, U = Use, US = User Satisfaction, NB = Net Benefits, WL = Workload.

5.7 Validation of Analysis and Model

For validating the data analysis and the revised model, a senior lecturer in School of Multimedia Technology and Communication was consulted. He is an expert in the PLS-SEM, CB-SEM and SPSS analysis and has vast experience in conducting PLS-SEM workshops throughout Malaysia. After three consultation sessions, he was satisfied with the final analysis and confirmed that the various stages were suitable and correct. He commented, *"I have checked and suitable to be submitted."* Next, for the model validation, this study applied (i) two statistical procedures and (ii) the qualitative analysis based on practitioners' validation.

First is to re-analyze the relationship between SyQ and ITU using the secondary data obtained from 41 schools in the Northern Region since the revised model produced

insignificant result, which contradicts to that of Model A. In this confirmation analysis, SyQ was measured based on VLE accessibility using the upload and download speed (Mbps). On the other hand, the VLE usage was measured based on the average session time (minutes), as shown by Figure 5.11. The result confirm that there is no significant relationship between the variables (β=0.03, p>0.05).

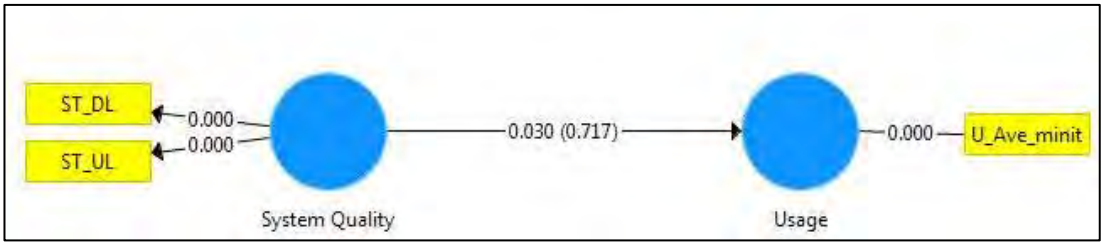


Figure 5.11. Validation of Revised Model using Secondary Data

Another possible explanation for this Revised Model is that the relationship between the SyQ and ITU could be fully mediated by the US. In other words, the teachers would intend to continue using VLE, only if they are satisfied with the system quality of the system. Therefore, the second statistical method that was applied to investigate the inconsistency of the relationship between the SyQ and ITU (in structural Model A and Revised Model) is by mediation analysis. Roughly from the Revised Model, it can be seen that the direct relationship between SyQ and ITU is not significant (β=0.004, t=0.065, p>0.05). Nevertheless, both relationships of SyQ to US (β=0.541, t=10.198, p<0.01) and US to ITU (β=0.280, t=4.462, p<0.01) are significant. Therefore, for the purpose of cross-validation, the current study examined the indirect effect between SyQ through US, to ITU. The result indicates that this indirect effect is significant (β=0.152, t=4.108, p<0.01), which confirmed the role of US as the indirect-only mediator in the relationship between SyQ and ITU, as shown in Table 5.30. This cross-validation through mediation analysis confirms that the inconsistent results of Model

A and Revised Model is caused by the structural changes of the models. Despite that, both of the models still meet the logical basis and accurately explain the VLE success in their own structure. Most importantly, this analysis proved that the Revised Model is valid.

Table 5.30

Cross-Validation through Mediation Analysis

Direct Effect (SyQ->ITU)				**Indirect Effect (SyQ->US->ITU)**			
β	**95% CI**	**T Value**	**Sig.**	***β***	**95% CI**	**T Value**	**Sig.**
0.004	[-0.097, 0.108]	0.065	0.947^{NS}	0.152	[0.083, 0.224]	4.108	0.00***

1.96 (**p<0.05), 2.58 (***p<0.01), NS=Not Significant

Finally, to ensure that the Revised Model is valid and practical (usable), this study has produced the 'VLE Implementation Strategy for Malaysian School' (see Appendix I_1). This action was taken based on the recommendation made by Solar et al. (2013) that strategic planning is essential in every school's ICT initiative. Moreover, an appropriate implementation strategy should lead to the successful implementation of VLE in schools (Y.-T. Lee & Ryu, 2013). However, the evaluation is usually found as the weakest component in the ICT plan (Liang & Wang, 2009), which in turn could lead the whole implementation into a failure. To overcome this, Liang and Wang (2009) concluded that the periodical evaluation mechanism is required. In this study, the VLE Implementation Strategy was developed based on the Revised Model. The emphasis of the strategy was given to the aspect of evaluation especially in teacher's perspective, as they have the greatest authority to determine the success and failure of VLE implementation (McLeod & MacDonell, 2011). To ensure its accuracy and

appropriateness, an expert in the field of education planning and policy, reviewed the VLE Implementation Strategy and the questions. The validation was performed by presenting the VLE Implementation Strategy to the Frog administrators and school leaders in five schools, as well as three PPD officers who are in-charge of the Frog VLE, in Cameron Highlands, Pahang, as shown in Table 5.31.

Table 5.31

Practitioners' Validation

Department	**Practitioners' Post**	**Total**
PPD Cameron Highlands	1BestariNet Major Coach	3
	Major Coach for Frog VLE Champion School	
	Asst. PPD - ICT Officer	
SMK Sultan Ahmad Shah	Principal	2
	Frog Administrator	
SK Telanok	Headmaster	3
	Senior Administrative Assistant	
	Frog Administrator	
SK Brinchang	Frog Administrator	1
SK Lemoi	Headmaster	3
	Senior Administrative Assistant	
	Frog Administrator	
SK Menson	Headmaster	2
	Frog Administrator	
TOTAL		**14**

As a result, only two out of five schools (40%) were found to have a specific VLE strategic planning. One of the schools was found to adapt the strategic planning related documents from external sources by modifying them to suit the school's environment, while the other school adopted the documents without further amendment. All practitioners (n=14, 100%), believed that this Implementation Strategy is practical for VLE implementation in schools. Similarly, all of them (n=14, 100%) agreed that the Revised VLE Success Model could be a guideline for Frog VLE implementation. The analysis of responses is presented in Appendix I_2.

The open-ended question concerning the comments and suggestions related to VLE Implementation Strategy was analyzed using qualitative content analysis. The result indicates that representatives of the schools and PPD officers gave positive feedbacks of this VLE Implementation Strategy. Based on the given answers, 19 responses were recorded from 14 practitioners, which were further coded into three themes (Appendix I_2). In general, the practitioners agreed that this document is applicable and could be used as a guideline for VLE implementation. Seven practitioners (37%) stated that the Implementation Strategy that was developed based on the Revised Model is suitable to be implemented as derived from the following comments:

Practitioner 8, Administrative Assistant Principal, SK Telanok.

"Sesuai dijadikan sebagai panduan di sekolah."

(Suitable to be used as a guideline in school)

Practitioner 13, District Assistant Education Officer - ICT Coordinator, PPD Cameron Highlands.

"Suitable for school management in Frog VLE implementation in classroom."

However, three practitioners (16%) believed that this document is only suitable to be implemented for schools that have internet connection. This notion is agreeable as all of them served in the rural schools. These are their remarks:

Practitioner 1, Frog Administrator, SK Menson.

"*Sesuai dijalankan di sekolah yang mempunyai kemudahan internet."*

(Suitable to be implemented in schools with internet facilities)

Practitioner 2, Headmaster, SK Menson.

"Aktiviti seumpama ini amat sesuai dilaksanakan di sekolah yang mempunyai kemudahan internet."

(This kind of activity is very suitable to be implemented in schools with internet facilities)

Practitioner 3, Headmaster, SK Lemoi.

"School cannot use the VLE all the time because of the limited access in rural area."

Finally, majority of the interviewed practitioners (n=9, 47%) mentioned that the Implementation Strategy will produce positive impacts on VLE implementation by providing guideline to teachers, as understood from these comments:

Practitioner 4, Frog Administrator, SK Lemoi.

"The implementation strategy can help teacher in teaching Frog VLE. It is good and suitable to use in school."

Practitioner 7, Principal, SMK Sultan Ahmad Shah.

"Frog VLE has been successfully conducted in many schools in Malaysia. Further research and enhanced VLE models can bring significant impact to the implementation of the Frog VLE in Malaysian schools."

Another two practitioners, who are the Frog VLE coaches, support the use of this document to improve the VLE implementation in schools. One of them (Practitioner 12) compliments the development of Implementation Strategy based on the empirical study, which represent the real scenario of VLE implementation in Malaysia. These are their comments:

Practitioner 11, 1BestariNet Major Coach, PPD Cameron Highlands.

Disokong. Sesuai dijadikan panduan di sekolah.

(Supported. Suitable to be used as a guideline in schools).

Practitioner 12, Major Coach for Frog VLE Champion School, PPD Cameron Highlands.

Disokong. Amat sesuai dipraktikkan di sekolah kerana dibina berdasarkan kajian empirikal.

(Supported. It is very practical in schools because it is developed based on empirical study).

To sum up, the findings from the entire procedures have supported the Revised Model. First, the analysis and the Revised Model were presented to PLS-SEM experts, which confirmed the accuracy of the analysis and thus validated the model. Second, to examine the cause of inconsistent results in structural Model A and Revised Model, this study conducted two statistical tests; (i) using secondary data, (ii) mediation analysis. The findings indicate that the inconsistencies in both models are caused by the changes in the model's structure. Nevertheless, both models are still valid. Third, to validate the practicality of the Revised Model, this study has developed the 'VLE Implementation Strategy for Malaysian Schools'. As a result, all the interviewed practitioners agreed on the practicality of this document and the Revised Model. Moreover, this document was developed based on the Revised Model. Therefore, as the practitioners validated the document, it can be assumed that the Revised Model is also valid. Based on the preceding discussion, it is therefore concluded that this Revised Model is valid and practical.

5.8 Summary

The data analysis procedures and results are presented in this chapter. Firstly, the analysis of survey response and data preparation were presented. This was followed by the measurement model's analysis, which was essentially related to reliability and validity of the constructs. Later on, the hypotheses testing were done during the structural model analysis. As a result, from the 14 hypotheses, three were rejected. In the next section, the new revised model was proposed to enhance the current structure of the conceptual model. This model did not consist of recursive relationships, therefore, could be examined in a single structural model of SEM analysis. Finally, the analysis and model validations were done using three methods, where the last method involved the qualitative data analysis.

CHAPTER SIX
DISCUSSION

6.1 Introduction

This chapter discusses the results presented in the previous chapter. This includes the discussions on the main, moderating and mediating hypotheses based on the output acquired from the PLS-SEM analysis. Finally, the revised model is also being discussed in this chapter.

6.2 Research Overview

The current study is conducted to investigate the contributing factors of VLE success amongst teachers in Malaysia. In the era of digital education, the adoption of e-learning tools such as VLE is necessary. Nevertheless, the implementation of VLE should come along with proper strategy, including post-implementation evaluation, which represent a crucial Project Life Cycle (PLC) activity of any ICT initiative (Marchewka, 2015). Considering the high cost of VLE implementation in Malaysia, the evaluation of its success is vital, especially to justify the investments and to improve future implementation. Moreover, the review of previous studies and audit report has revealed that in spite of the efforts by the government to promote VLE in schools, the degree of utilization during the first phase of its implementation remains low, particularly among teachers (Kementerian Kewangan Malaysia, 2014). Consequently, this phenomenon may results in the failure, rather than the success of VLE initiative. Furthermore, it may also results in losses for both, the teachers and the

MOE as the education authorities in Malaysia. Therefore, the current study has developed the model for measuring the VLE success amongst Malaysian teachers.

6.3 Discussion of Hypotheses Testing

In discussing the hypothesis testing, the focus is placed on the main, the moderating and mediating effects, which present the interactions between all of the contributing factors in evaluating the VLE success amongst teachers in Malaysia.

6.3.1 Main Effect Hypotheses

The main effect hypotheses deal with the direct relationships between exogenous and endogenous variables in the conceptual framework. This includes the relationships of IQ, SyQ, SeQ to the US, NB, ITU and U.

6.3.1.1 The Relationships between Information Quality, Intention to Use (H_{1a}) and User Satisfaction (H_{5a})

The analysis of the relationship between IQ and ITU is found to be significant at the level of 0.01 (β=0.285, t=4.925, p<0.01). Therefore, this result supports hypothesis H_{1a}. More importantly, it indicates that good quality of information would enhance the intention to use the VLE in the future, which has supported the role of IQ as the significant factor of ITU in research objective (i). Thus, providing accurate, up-to-date and simple, as well as comprehensive and relevant information to teachers lead to continuous use of VLE. With respect to hypothesis H_{1a}, it is found that Malaysian teachers would have a positive attitude toward the intention to continue using the VLE

if the system can provide quality information that is useful for their educational routines. On the contrary, if the information is inaccurate or outdated, the teachers may feel annoyed and refuse to use the VLE again. In this sense, the finding has partially answered research question (i) by proving that poor information quality as one of the reasons why teachers refuse to use VLE. Therefore, to make sure that teachers will continuously use the system for teaching and learning, the VLE should provide relevant information. As the VLE provider, 1BestariNet should regularly update related information to meet expectations of the teachers as well as continuously enhance and amend the content to converge with the rapidly changing education policy and syllabus. This finding is consistent to prior studies that suggested the positive relationship between IQ and ITU (Al-Debei et al., 2013; C.-W. D. Chen & Cheng, 2009; Iivari, 2005).

The hypothesis testing H_{5a} also supports the relationship between IQ and US of VLE among Malaysian teachers (β=0.236, t=5.071, p<0.01). With respect to the third research objective, it was found that IQ is a significant factor that influences US of VLE among teachers. This implies that the good quality of information could strengthen teachers' satisfaction toward the VLE system. User satisfaction is commonly regarded as feelings of users toward certain service. In this case, the satisfaction is on the quality of information. The quality of information provided by the VLE has an influence on the teacher's feelings particularly in meeting their needs. Teachers will be satisfied when requirements of the information can be fulfilled by the VLE. Having such indication, the service provider (1BestariNet) and policymaker (MOE) should take necessary actions to ensure that the teachers are satisfied with the

quality of the information provided by the VLE. The preceding discussion indicates that resistance toward the system is caused by the teachers' dissatisfaction over the information quality of VLE, which has answered the research question (i). Equally important, this finding contributes to the body of knowledge by extending the result of previous studies on the relationships of IQ to ITU and US (Petter et al., 2008) in the context of VLE implementation among school teachers in Malaysia.

6.3.1.2 The Relationships between System Quality, Intention to Use (H_{1b}) and User Satisfaction (H_{5b})

The evaluation of IS success done by previous studies produces inconsistent results on whether or not SyQ influences ITU (H_{1b}). As for this study, this relationship is found to be significant (β=0.356, t=5.979, p<0.01). The first objective of this study was to identify the significant factors that influence ITU of VLE among teachers. Through this hypothesis testing, the role of SyQ as an antecedent of ITU is confirmed and the objective is achieved. This finding broadly enhances the work of other studies within this area that link SyQ to ITU (Al-Debei et al., 2013; Ramayah et al., 2010; Teo et al., 2009). The assumption made through this relationship is that the intention of teachers to use the VLE can be improved when the quality of the system is good. This suggests that the better the quality of VLE, the stronger is the intention to use. Indeed, the finding justifies that successful implementation of VLE requires a good quality of the system as a pre-requisite. In this study, the SyQ was measured based on availability, usability, accessibility and reliability. Therefore, it can be concluded that unless MOE ensures that these elements meet the expectations of the teachers,

continuous usage of the VLE will not be attained, which provide answer for research question (i).

Meanwhile, the hypothesis H_{5b} of this study aimed to investigate the effects of SyQ to the US. The PLS-SEM structural analysis revealed that the relationship between these two variables is significant (β=0.541, t=10.808, p<0.01). This implies that the SyQ is a positive determinant of US, which suggests that teacher's satisfaction was attributed to the quality of VLE. The higher quality of VLE in terms of availability, usability, reliability and accessibility will cause more satisfaction among the teachers as the end users. With respect to the first research question, this finding justifies that a good system quality as one of the reasons that trigger the explicit attitude and perception toward the VLE usage. Moreover, the role of SyQ as an influential factor of US has been confirmed (objective iii). The result obtained from this analysis also adds to the growing body of research that indicates a positive relationship between SyQ and US (Aggelidis & Chatzoglou, 2012; Al-Debei et al., 2013).

6.3.1.3 The Relationships between Service Quality, Intention to Use (H_{1c}) and User Satisfaction (H_{5c})

Hypothesis testing H_{1c} supports the relationship between SeQ and ITU (β=0.224, t=4.765, p<0.01). This finding is in line with the previous studies such as by Choe (1996) and Al-Debei et al. (2013) who reported that proper services and supports are the important elements to encourage the sustainable IS usage. In this study, the service quality refers to the services, supports and encouraging environments provided by the VLE system and service provider for the teachers. The measurement of SeQ toward

the ITU of VLE yielded four measures, which are responsiveness, assurance, empathy and tangibility. There are several possible explanations for this result. First, the significant relationship between SeQ and ITU indicates that service quality is a crucial factor in encouraging a positive attitude toward VLE among teachers. For example, the tangibility in terms of the adequacy of ICT facilities should motivate them to use the system. Hence, the analysis of hypothesis H_{1c} has supported objective (i). In contrast, if the physical appearance of the VLE facilities is out of date or insufficient, the teachers might develop negative feeling that causes resistance toward the system (research question i). Second, this finding also shows that the continuous usage of VLE among Malaysian teachers could be actualized if proper services are provided to them. Although the personal characteristics have been proved insignificant in determining the strength of the relationship between SeQ and ITU, there are several other external factors such as ICT literacy and perceived ease of use that could also increase the teacher's reliance to the services and supports.

Hypothesis H_{5c}, which stated that SeQ would have a significant effect on US of VLE among teachers is also accepted (β=0.140, t=3.620, p<0.01). However, SeQ is found to be the weakest predictor of US in the context of this study. This result, therefore, needs to be interpreted with caution. Consequently, this implies that the quality of VLE services and supports provided to teachers play a minor role in producing their positive feeling toward the system. Nonetheless, the link between these variables is still significant, which supports objective (iii) of this study. One possible explanation for this finding is that the teachers might think that other factors such as information and system quality are more essential to facilitate them in adopting the VLE system.

Despite this weak relationship, the finding still theoretically contributes to the literature by extending the result of prior studies in terms of the SeQ and US relationship (H. H. Chang et al., 2009; Hsieh et al., 2012).

6.3.1.4 The Relationships between Intention to Use and Use (H_8 and H_3)

In investigating the VLE continuous usage, this study postulated the relationships of ITU to U (H_8) and U to ITU (H_3). For hypothesis H_8, the analysis supports the relationship between ITU and U (β=0.719, t=28.921, p<0.01). The second objective of this research was to identify the significant factors that influence Use of VLE among teachers, which was achieved through this hypothesis testing. This finding demonstrates that ITU is a strong predictor for U, suggesting that the higher the intention of a teacher to use the VLE, the more the teacher will be inclined to use it. This finding also proves the applicability of this concept in the context of VLE success, as suggested by the previous IS researchers (C.-W. D. Chen & Cheng, 2009; Mohammadi, 2015). Thus, it can be concluded that ITU is the most important dimension of the VLE success that will ensure the sustainable usage of the system in the future. In addition, the result has provided the answer to research question (i) and signifies that the continuous usage should be the indicator for VLE success, as suggested by Al-Debei et al. (2013).

On the contrary, the hypothesis testing for H_3 did not support the relationship of a similar variable from the opposite direction, U to ITU (β=0.088, t=1.686, p>0.05). This finding shows that there is no direct effect of the current usage to the future intention to reuse the VLE in the future. A probable explanation for this finding is that

the initial usage should produce the satisfaction among the teachers in order for them to build the intention of using VLE again. Moreover, there is no empirical evidence from the past studies that proved the U could influence ITU in the direct relationship.

6.3.1.5 The Relationships between User Satisfaction, Intention to Use (H_2) and Net Benefits (H_{10})

The result of hypothesis H_2 testing indicates that US, which measures the perception of pleasure or displeasure toward the VLE system, influenced the ITU among teachers (β=0.352, t=5.519, p<0.01). Although the US only yielded small f^2 effect size in producing R^2 of ITU, this relationship is considered strong. Accordingly, objective (iii) is achieved by ratifying the role of US in predicting ITU. This finding suggests that the feeling of satisfaction on the use of VLE will develop a positive attitude and trigger teacher's intention to continuously use the system. In this sense, it can be inferred that the ability of VLE in fulfilling teachers' needs and requests will please and motivate them to sustainably integrate the system in performing tasks, either for teaching or education management. Therefore, in the pursuit of a better response to teacher's expectations, MOE should proactively attempt to anticipate the characteristics of desired information, system as well as service quality and then provide these good VLE quality dimensions in a timely manner rather than waiting for complaints or suggestions. Theoretically, this finding strengthens the previous empirical findings that produced the significant positive effect of US on ITU (Al-Debei et al., 2013; Bhattacherjee, 2001).

The result also indicates that US produced a significant influence on NB (H_{10}). This relationship is strong (β=0.691, t=19.359, p<0.01), which explained the important role of US in describing NB. Through this analysis, objective (iv) is achieved. Moreover, the US was proved to produce large f^2 effect size (0.676) in producing R^2 of NB. This finding implies that teacher's satisfaction, which attributed from the good characteristics of quality dimensions, would lead to positive impact on individual performance and personal valuation. This result verifies the findings from previous works related to IS success (Halawi et al., 2008; Iivari, 2005; Tam & Oliveira, 2017). In the practical perspective, it is proved that the achievement of expected benefits relies on the provision of desired VLE characteristics. Meeting these needs will increase teacher's preference toward the system and inspire them to obtain the benefits of using VLE. The finding should trigger MOE to ensure that the provided VLE system is beneficial for teachers in performing their job routines and career development. Therefore, this provides the answer for research question (i) and it can be inferred that US is an important element that justifies a success (continuous usage) or failure (resistance) of VLE implementation.

6.3.1.6 The Relationships between Use, User Satisfaction (H_6) and Net Benefits (H_9)

With respect to hypothesis H_6, this study found that the relationship between U and US is significant (β=0.380, t=11.028, p<0.01). This finding proves that U is one of the influential factor for US and thus, contributes to the achievement of objective (iii). Despite the inconsistent results from the previous studies, this study yielded a positive link between these two variables. The thorough analysis reveals that US changed

0.380 for every unit of changes in U. Furthermore, U also produced medium but relatively close to large f^2 effect size (0.288) in producing R^2 of US. This result indicates that the feeling of pleasure or displeasure of VLE among the teachers is caused by their experience of system usage. Consequently, this finding has added to the body of knowledge in the IS literature by extending the results of prior researchers such as those from Al-Debei et al. (2013) and Chiu et al. (2007). However, it is important to note that less studies on the relationship between U and US were conducted by the previous researchers, indicating the requirement of additional studies to evaluate this relationship (Petter et al., 2008).

Although the U is not related to US for mandatory IS (Seddon & Kiew, 1996), this study demonstrates the opposite finding for VLE. As discussed in the previous section, even though VLE is not a total mandatory system, there is a KPI of its usage, which sometimes forced the teachers to employ it for certain target. This finding indicates the possibility of variations in D&M's relationships across different environments, as evidenced by Iivari (2005). Therefore, it can be assumed that with the positive experience of initial use, the user satisfaction is achievable, even for mandatory type of system. More importantly, this study has responded to the suggestion of Petter et al. (2008) to examine the relationship between U and US in other perspective, such as VLE.

In the same way, hypothesis H_9 which suggested the relationship between U and NB is also supported (β=0.246, t=6.528, p<0.01). The finding indicates that the usage of VLE leads to the positive impacts such as career improvement, time-saving and

productivity improvement. With regard to research objective (iv), this hypothesis testing has confirmed the role of U as a significant factor that influences NB of VLE among teachers. From a practical perspective, it can be assumed that teachers who consistently use VLE is more prone to conceive that the system is beneficial to them. Moreover, the significant influence of U to the NB could also be associated to the perception that VLE as a voluntary type of system, is worth to be used if only it is beneficial for teachers.

This finding is congruent with the result obtained by several previous IS researchers (Alshibly, 2014; H. J. Chen, 2010). In addition, this finding has expanded the boundary of knowledge by providing the empirical evidence of the positive relationship between U and NB in the VLE success context. Equally important, the current study outweighs some previous studies that found no relationship between these variables (Iivari, 2005; J. H. Wu & Wang, 2006). These contradicted outcomes could possibly be explained by the following justifications. First, the study by Iivari (2005) was conducted based on the mandatory IS in one specific organization. Second, Wu and Wang (2006) stated that their finding could be influenced by several uncontrolled factors such as facilitating conditions and environmental factors. Therefore, the generalizability of these studies is arguable.

6.3.1.7 The Relationships between Net Benefits, User Satisfaction (H_7) and Intention to Use (H_4)

User satisfaction is achieved by compiling all the users' anticipated benefits obtained using IS. Hypothesis H_7 in this study postulated that NB would significantly influence

US. As expected, this hypothesis is accepted (β=0.583, t=17.441, p<0.01), which supports the role of NB as a strong determinant of US in the context of VLE success among teachers. Accordingly, research objective (iii) that is to identify the significant factors that influence US, is achieved. This positive result also suggests that teacher's satisfaction can be improved when the VLE fulfilled the expected benefits. Furthermore, the finding also indicates that there is a loop correlation between these two variables. However, the link from NB to US is weaker compared to that of US to NB. Consequently, the obtained result has strengthened the findings from the past studies by proving a positive relationship between NB to US (Al-Debei et al., 2013; Lwoga, 2013).

Hypothesis H_4 which postulated the relationship between NB and ITU is also supported (β=0.402, t=6.203, p<0.01). The positive relationship between NB and ITU shows that the benefits gained through VLE would motivate the teachers to reuse the system. This circumstance will ensure the continuous usage and survival of the system in the future. With respect to the first research objective, it was found that NB is the strongest predictor of ITU that explains the important role of it in the context of VLE success among teachers. This relationship also justifies the selection of U, which attributed by ITU as an indicator of VLE success among teachers. Accordingly, this finding has extended the cumulative findings from the previous studies that produced similar results in various IS contexts (Al-Debei et al., 2013; Fang et al., 2011; Zheng et al., 2013).

6.3.2 Mediating Effect Hypothesis

Objective (vii) in this study sought to test the mediating effect of US in the relation between U and ITU. This objective was achieved through hypothesis H_{11}. In this study, only one mediator was tested. It was postulated that the US mediates the relationship between U and ITU (H_{11}), which is supported by the hypothesis testing. Further analysis has shown that the direct effect of U to ITU was not significant (β=0.088, t=1.776, p=0.076). However, the indirect effect through ITU was found to be significant (β=0.134, t=5.212, p<0.01). Therefore, it can be concluded that US plays a fully mediation role in the relationship between U to ITU. Interestingly, this finding proves that teachers would only be interested to re-use the VLE system if they are satisfied by the experience from their initial usage. This also indicates the important role of US in determining the VLE success among teachers. The feeling of satisfaction will contribute to the survival of the system. Thus, necessary actions should be taken to increase teachers' satisfaction, especially in terms of the information, system and service quality provided by the VLE. Teachers' satisfaction is associated to the extent of perception that the VLE fulfilled their expectations. Consequently, this perception would lead to the feeling of pleasure or displeasure to the system. Hence, the outcome of the hypothesis testing H_{11} expressed the urgent need to investigate the teachers' requirements and finally ascertain the proper VLE implementation strategy in which could increase the satisfaction among teachers.

6.3.3 Moderating Effect Hypotheses

This study tested three categorical moderators, namely age, gender and VLE experience (Personal Characteristics) in the relationship between the Quality

Dimensions (IQ, SyQ and SeQ) and ITU. Additionally, one continuous moderator (WL) was examined in the relationships between U to ITU and NB to ITU.

6.3.3.1 The Moderating Effects of Personal Characteristics (H_{12a} to H_{12i})

The inspection of PLS-MGA's result indicates that the personal characteristics such as gender, age and VLE experience did not moderate all the relationships within the Quality Dimensions and ITU. The hypotheses involved are; H_{12a} - IQ to ITU (MGA-Age), H_{12b} – SyQ to ITU (MGA-Age), H_{12c} - SeQ to ITU (MGA-Age), H_{12d} - IQ to ITU (MGA-Gender), H_{12e} – SyQ to ITU (MGA-Gender), H_{12f} - SeQ to ITU (MGA-Gender), H_{12g} - IQ to ITU (MGA-VLE Experience), H_{12h} – SyQ to ITU (MGA-VLE Experience), H_{12i} - SeQ to ITU (MGA-VLE Experience). This finding indicates that the discrepancies of personal characteristics did not change the strength of the relationship between IQ, SyQ and SeQ to ITU. It is almost certain that this unexpected result may be due to the digital lifestyle of the teachers these days.

As the ICT usage becomes a routine in a lifestyle nowadays, so do in the education system. ICT gadgets such as phone and tablet have become a necessity for a human being regardless of gender and age. Moreover, the Internet has been widely used for various purposes. Therefore, it can be assumed that the familiarity with ICT tools has eliminated the effects of gender and age in the VLE adoption among teachers. Consequently, the moderating effect of VLE experience also becomes irrelevant with the abolishment of gender and age variances. The finding consequently renounces the suggestions of Venkatesh et al. (2012) and several local researchers such as Raman

and Yamat (2014), and Cheok and Wong (2016) who advocate that personal characteristics have influence on the VLE success among teachers.

6.3.3.2 The Moderating Effects of Workload (H_{13} and H_{14})

In reviewing the literature, no empirical evidence was found on the moderating role of WL in the association between NB and ITU (H_{13}), or ITU and U (H_{14}), especially in the perspective of VLE success. Nevertheless, a number of prior studies have suggested that the WL could be a major obstacle in the VLE continuous usage. With reference to objective (vi), which was to test the moderating effect of WL, these hypotheses, H_{13} and $H_{14,}$ were proposed. The most obvious finding emerged from the analysis is that only hypothesis H_{14} is supported (β=0.054, t=2.477, p<0.05), whereas hypothesis H_{13} is returned (β=0.016, t=0.838, p=0.402) by this study. Contrary to the expectations, this study did not find a significant moderating effect of WL in the relationship between NB and ITU. This result may be explained by the fact that the workload of the teachers is caused by their own daily routine in schools, such as teaching, managing students and others. Therefore, the influence of VLE benefits to the continuous usage will not be harmed by their workload. In addition, this insignificant result may also due to the positive role of WL in the H_4.

Hypothesis $H_{4,}$ which postulated the moderating role of WL in the relationship between ITU and U is supported by this study. However, the analysis yields the unpredictable outcome, as this study found that WL plays positive interference in the link between ITU and U. The positive moderating role of WL explains that the increase of workload caused the teachers to use more VLE. In other words, the heavy workload

is found to provoke the teachers to use VLE more. In the absence of WL as the moderator, the ITU is already recognized as the forceful antecedent for U. It is discovered that U will change 0.719 for each unit of ITU change. In general, it seems that teachers are likely to use VLE when they have positive intention toward it. Equally important, with the inclusion of WL as the moderator (β=0.054), this relationship is found to be affected. For each standard deviation change of WL, the path coefficient of the relationship between ITU and U will increase 0.054 unit, producing a new β value of 0.773.

From the literature, the WL is expected to influence the VLE adoption in either of the following ways; (i) WL hinders the teacher from using VLE, (iii) VLE as another workload, and (iii) VLE as a solution in dealing with the workload. In light of this, it can be concluded that VLE could be the great medium in combating the heavy workload of the teachers. This is parallel to a qualitative study by Cheok et al. (2017) who found that many teachers appreciate the ability of VLE in facilitating their works. In a practical sense, this finding provides a meaningful direction for MOE as the educational authority and policy maker to improve VLE implementation in Malaysian schools. Working on reducing teacher's workload might be challenging because of the changes in educational demands, which cause the rapid increment of job phase and amount of works carried by teachers. Furthermore, to reduce teachers' workload is costly and the MOE has to invest more in workforce. The finding of this study proves that VLE could be an effective and inexpensive option to ease teachers' workload. Therefore, instead of planning to reduce teachers' workload, MOE can now focus on how VLE could facilitate teachers in dealing with it. One of the way is by designing

the VLE system that meet the requirements of the teachers in terms of information, system and service quality.

6.4 The Revised Model

Urbach and Müller (2012) recommended the application of the entire model to present the comprehensive approach and to extend the validity of D&M. However, analyzing a single model in two PLS-SEM structural models will limit its explanatory power, and thus reducing the validity of the D&M. This indicates the need for a model that can be tested as a whole, simultaneously and holistic, which could compensate the recursive relationships in D&M. This notion is supported by Chong et al. (2010) who suggested that the future research should pay attention to this issue for further clarification. In fact, this analysis will support the suggestion of DeLone and McLean (2003) to continue enhance and refine the D&M. Hence, the current study has produced the single structural model after revisiting and comparing five possible models. Although the recursive relationships in the original conceptual framework were removed, this model still produced the approximately similar quality of R^2 and Q^2. Most importantly, this model could be run at a single SEM structural analysis.

Based on previous works, further reflection on the D&M recursive issue is hardly found as well as studies that empirically test the loop relationships between US and NB. The analysis of 20 empirical studies based on the D&M from 2005 to 2018 revealed that only one study by Al-Debei et al. (2013) tested all the recursive relationships in the D&M. However, they only applied correlation analysis, which is weaker compared to SEM. For the studies that remove recursive relationships in

D&M, 16 out of 19 past studies choose to retain the relationship from US to NB, with only one of them was found to be non-significant. In contrast, only three studies were found to test the relationship between NB to US. This analysis of literature has supported the chosen of Model 1 as the model to measure VLE success among teachers. Table 6.1 shows the analysis of the relationships between US and NB of previous studies related to D&M (2005 to 2018).

Table 6.1

Literature Analysis of the Recursive Relationships between US and NB

No	Authors	Context	Recur.	US>NB	Sig.	NB>US	Sig.
1.	(K. Kim et al., 2012)	e-Learning	-	*	Yes	-	-
2.	(Jang, 2010)	e-Government	-	*	Yes	-	-
3.	(Freeze et al., 2010)	e-Learning	-	*	Yes	-	-
4.	(Tsai, Lee, Shen, & Lin, 2012)	ERP	-	*	Yes	-	-
5.	(Hassanzadeh, Kanaani, & Elahi, 2012)	e-Learning	-	*	Yes	-	-
6.	(Tam & Oliveira, 2017)	m-Banking	-	*	Yes	-	-
7.	(Fang et al., 2011)	e-Commerce	-	-	-	*	Yes

Table 6.1 Continued

8.	(Halawi et al., 2008)	KM System	-	*	Yes	-	-
9.	(Chong et al., 2010)	e-Commerce	-	*	Yes	-	-
10.	(Iivari, 2005)	AIS	-	*	Yes	-	-
11.	(Eom et al., 2012)	e-Learning	-	*	Yes	-	-
12.	(Ramayah, Ahmad, & Hong, 2012)	e-Training	-	*	No	-	-
13.	(Zheng et al., 2013)	Virtual Community	-	-	-	*	Yes
14.	(Lwoga, 2013)	e-Learning	-	-	-	*	Yes
15.	(Wei, Tang, Kao, Tseng, & Wu, 2017)	Healthcare System	-	*	Yes	-	-
16.	(Vel, Park, & Liu, 2018)	Enterprise Crowdsourcing	-	*	Yes	-	-
17.	(Monika & Gaol, 2017)	e-Cargo	-	*	Yes	-	-

Table 6.1 Continued

18.	(Abrego-Almazan, Sanchez-Tovar, & Medina-Quintero, 2017)	e-Commerce	-	*	Yes	-	-
19.	(Chaveesuk & Hongsuwan, 2017)	ERP	-	*	Yes	-	-
20.	(Al-Debei et al., 2013)	Web Portal	Yes	*	Yes	*	Yes
				Sig. = 16/17		**Sig. = 4/4**	

Recur. - Recursive Relationship (both directions), Sig. - Significant

CHAPTER SEVEN
CONCLUSION

7.1 Introduction

This chapter provides the results of achieving the objectives and answers the research questions of the study. This chapter also highlights the contributions of the study, research limitations and suggestions for future research.

7.2 Research Achievements

In an attempt to provide the answers to the research questions, this study has reviewed previous studies and many models related to IS success. This study finally adapted the D&M model with some modifications by incorporating both ITU and U, while adding personal characteristics and WL as the moderators. The following sub-sections explain the answers to two main research questions. Figure 7.1 presents an overview of the achievements.

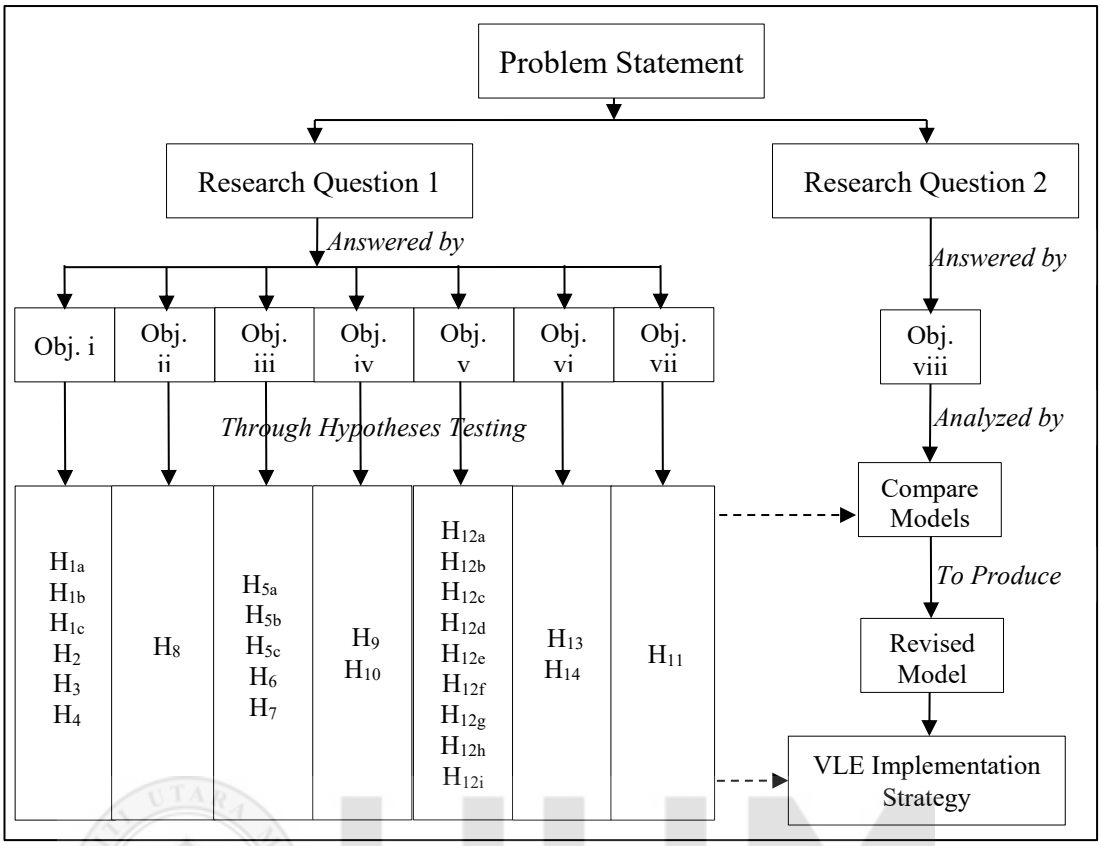


Figure 7.1. An Overview of Research Achievements. *Obj. = Objective.

7.2.1 Research Question 1 - *Why are the teachers not using the VLE?*

✓ Research Question 1 is answered by 'Objective i' until 'Objective vii'.

7.2.1.1 Objective i

The first objective of this study is to identify the significant factors that influence the Intention to Use of VLE among teachers. This objective is achieved through hypotheses H_{1a}, H_{1b}, H_{1c}, H_2, H_3, H_4 and H_5. The structural analysis of Model A and Model B have uncovered five significant and one insignificant factors of ITU. Figure 5.9 depicts the significant factors that influence ITU of VLE among Malaysian teachers, namely IQ, SyQ, SeQ, NB, US. These factors have direct influences to the ITU. NB was found to be the most dominant predictor (β=0.402) followed by SeQ

(β=0.356), US (β=0.352), IQ (β=0.285) and SeQ (β=0.224). The obtained results prove that these factors are related to teachers' intention to use VLE, thus justify their selection as the contributing factors of the VLE success among Malaysian teachers.

7.2.1.2 Objective ii

The second objective of this study is to identify the significant factors that influence the Use of VLE among teachers. This objective is also achieved as shown in Figure 5.9. In this study, only ITU was tested (H_8) as a factor of U and it was proved that this factor is significant (β=0.719). The high path coefficient or relative importance of ITU in predicting U signifies that this factor is substantial, and thus proving its role in measuring the VLE success among Malaysian teachers.

7.2.1.3 Objective iii

The third objective of this study is to identify the significant factors that influence the User Satisfaction of VLE among teachers. By assessing hypotheses H_{5a}, H_{5b}, H_{5c}, H_6 and H_7, this objective is achieved (Figure 5.9). It represents the significant factors that affect the teacher's satisfaction of VLE in Malaysia. The factors IQ, SyQ, SeQ, U and NB are found to have direct effect on the US of VLE. The relative importance values of the relationships between these factors to the US demonstrate that NB is the most authoritative determinant of US (β=0.583). This is followed by SyQ (β=0.541), U (β=0.246), IQ (β=0.236) and SeQ (β=0.140). The significant result obtained from the hypotheses testing justifies the selection of these factors as the VLE success dimensions among Malaysian teachers.

7.2.1.4 Objective iv

The fourth objective of this study is to identify the significant factors that influence the Net Benefits of VLE among teachers. This objective is also achieved by testing hypotheses H_9 and H_{10} as shown in Figure 5.9. Two factors were identified to have direct effect on the NB of VLE, which are U and US. The comparison of relative importance unveiled US as the most prominent predictor of NB (β=0.691), while U was also significant (β =0.246). Consequently, this result confirms the relevance of these factors in measuring the success of VLE among Malaysian teachers.

7.2.1.5 Objective v

The fifth objective of this study is to test the moderating effect of personal characteristics in the relationship between Quality Dimension and Intention to Use of VLE among the teachers. This objective is also achieved. However, the analysis has revealed that the personal characteristics; age, gender and VLE experience are insignificant in moderating the relationship between the Quality Dimensions; IQ, SyQ and SeQ, to the ITU. Through the MGA analysis, the weak and meaningless moderating role of personal characteristics has become tangible as the entire categorical moderation hypotheses (H_{12a} to H_{12i}) were returned.

7.2.1.6 Objective vi

The sixth objective of this study is to test the moderating effect of teacher's workload in the relationship between Intention to Use and Use, and Net Benefits to Intention to Use of VLE among teachers. This objective is also achieved by investigating the hypotheses H_{13} and H_{14}. To examine the role of WL as the continuous moderator, the

product indicator approach was applied. As a result, WL was found to moderate the relationship between ITU to U (β=0.054, p<0.05), but not in the relationship between NB to ITU (β=0.016, p=0.402).

7.2.1.7 Objective vii

The final objective to answer Research Question 1 is 'Objective vii', which is to test the mediating effect of User Satisfaction in the relationship between Use and Intention to Use of VLE among teachers. This objective is achieved through hypothesis H_{11}. The statistical result from this study indicates that US mediated the relationship between U and ITU. Deeper investigation also revealed that the relationship is 'indirect-only relationship' or also known as full mediation, where the indirect is significant (β=0.134, p<0.01) but not the direct effect (β=0.088, p=0.076).

7.2.1.8 Answer to Research Question 1

The teachers do not use the VLE because the quality of information, system and services provided to them did not meet their expectation. The low quality dimensions have negatively influenced their intention to use (attitude) and consequently, prevent them from using it (behavior). These factors also caused them to feel unsatisfied with the system. In addition, the negative experience of initial use and the feeling of fewer benefits of using VLE also caused the teachers' dissatisfaction. In the longer run, this feeling of dissatisfaction will lead to resistance toward the VLE usage. An interesting finding of this study is the positive moderating role of teacher's workload. Surprisingly, this finding implies that the teachers used less VLE system when they have fewer workloads.

7.2.2 Research Question 2 - *Is the modified D&M suitable for the post-implementation evaluation of VLE?*

- ✓ Research Question 2 is answered by 'Objective viii'; to identify the suitable model for post-implementation evaluation of VLE.

The previous studies on D&M only focused on adopting or extending the model to suit their context of studies. From the analysis, most of the researchers either adopted certain part of the model and disengaged the recursive relationships, tested each relationship separately using correlation test, or separated the model into two structural models. As the conceptual framework of this study retains the recursive relationships of the D&M, the analysis was done by separating it into two structural models using PLS-SEM. This technique is believed to be better than testing each relationship separately using correlation analysis because SEM is known as an advanced second-generation technique compared to the first-generation technique like correlation analysis. Moreover, the technique is widely applied for model testing. However, this procedure has limited the explanatory power of the conceptual model, as two distinct values of predictive accuracy and relevance were produced for the endogenous constructs.

This study concludes that all the constructs in the modified D&M (conceptual framework) are suitable for measuring VLE success among teachers. However, due to the limitation of PLS-SEM in assessing the recursive relationships, which exist in the conceptual model, this modified D&M is considered as less suitable for measuring post-implementation of VLE. The analysis in the previous chapter has shown that the revised model, which has been produced by comparing five possible models, is the

best model to measure VLE success among teachers. Moreover, the finding of qualitative content analysis on VLE Implementation Strategy for Malaysian Schools that was developed based on the revised model has proved that this model is practical and valid. Therefore, 'Objective viii' is achieved and Research Question 2 is answered.

7.3 Contributions of the Study

The findings produced by the current study have some valuable contributions to the existing knowledge, methodology as well as practical point of views. It provides the insight explanation of VLE success factors amongst Malaysian teachers. The following sections describe all of the related contributions.

7.3.1 Theoretical Contributions

The findings from this study make several contributions to the current literature. Based on the D&M, this study produces a model to evaluate the VLE success among teachers, which is useful for researchers in both areas, IS and education, as shown in Figure 5.10. DeLone and McLean (2003) encouraged the researchers to continuously tested the D&M in various IS contexts to increase the validity of the model. Hence, this study extends the existing knowledge by integrating the WL and personal characteristics as the moderators. In addition, this study also uses both constructs of ITU and U constructs to measure the continuous usage of the VLE. Although the D&M proposed that ITU as an alternative of U, this study has proven the positive relationships between these two constructs. Therefore, both constructs should exist together in the context of VLE continuous usage.

7.3.2 Methodological Contributions

In terms of the methodological contributions, first, instead of just using either the paper-based questionnaire or online questionnaire, the study uses both of these methods, which have significantly produced high response rate and decreased the duration of data collections. By using QR Code technology, the study can reach the target respondents without violating the rules of probability sampling. The QR code is placed on the front page of the questionnaire and only the selected respondents (who received the questionnaire during the procedure of simple random sampling) can scan the code. Furthermore, to avoid multiple submissions, this online questionnaire was set to accept only one respond from each respondent. The use of such strategy during the data collection procedure has sped up and increased the questionnaire return rate. Hence, this is the methodological contribution, which can be applied by future researchers in reducing the cost of data collection time and budget.

Second, the current study has produced a reliable and validated instrument to measure the VLE success among teachers. The development of this instrument has gone through a thorough analysis of translation, content validity by seven experts, face validity by 16 respondents and six experts (language, IS, e-learning and statisticians) as well as pilot study to 150 respondents for reliability and factor structure examination. Although this questionnaire was developed under the Malaysian environment, it is still applicable for other geographical, political and cultural disparities, with some modification to suit the context of the study. Moreover, this questionnaire also consists of the teacher's workload measurement, which is developed specially for the context of the VLE success.

Finally, in an attempt to test for the suitability of the modified D&M for the VLE evaluation, this study compares the five possible models based on the final endogenous variables, R^2, Q^2, β, f^2 and q^2. Therefore, this study has produced the best model to measure VLE success among teachers, which did not decrease the quality of predictive accuracy and relevance, and could compensate the recursive relationships in the D&M. Indeed, the comparison of these models has become the major methodological contributions of this study.

7.3.3 Practical Contributions

There are two main reasons for conducting a post-implementation evaluation of VLE, which are to justify the investment and improve the VLE implementation. In light of this, this study has proven that the Quality Dimensions, User Satisfaction, Usage and Net Benefits are important for measuring the VLE success among teachers. Therefore, MOE should consider these factors in implementing the VLE in Malaysian education system. The survival of the system, which attributed from the continuous usage will ensure the worth of the investment made by the MOE. Furthermore, Quality Dimensions were found to be the strong predictors for Intention to Use and User Satisfaction. This finding is also valuable for VLE developer in designing the system that meets the requirement of the teachers.

Next, the Workload is also proved influential to the VLE in a positive way. This study has proven that VLE is a great medium in combating teacher's heavy workload. Hence, the finding has provided a meaningful direction for MOE to ensure that the system truly meets the teachers' requirement. Based on this finding, the MOE can now

focus on assessing how the system can ease the teacher in dealing with excessive workload. The final practical contribution of this study is through 'VLE Implementation Strategy for Malaysian Schools' which was developed by embedding the elements of VLE success model. This implementation strategy has emphasized on the evaluation aspects, derived from the outcomes of the study. As discussed earlier, the existing literature described the evaluation as the weakest part of school's ICT planning. Moreover, this strategy was developed based on the empirically tested model. Therefore, it could be a useful guideline for the school authorities, especially in the aspect of evaluation.

7.4 Limitations and Directions for Future Research

This study provides the groundwork for forthcoming direction into the VLE success research. The generalizability of the study's results is subject to certain limitations, which provide the opportunities for future exploration. First, the workload was measured solely based on the teacher's perception. Therefore, the future study should develop specific ratio measurement to assess workload, which is not based on self-rating scale. For example, the workload could be measured based on hours spent on teaching, administrative works and extracurricular activities. Furthermore, it would be appealing if the future research could include certain weights in formulating the workload measurement. Various elements such as the number of students in each classroom, number of administrative and academic posts assigned to the teacher and the position of the class are worth to be pondered upon. The more posts being held and more number of students in each class taught; the heavier workload is expected to be supported by particular teachers. Similarly, the class that will sit for the public

examination in the present year is expected to bring more workloads for teachers. By considering all these elements, more accurate measurement for workload could be produced, which could also increase the accuracy of the overall result of the study.

Second, this study does not address the VLE success among other groups of VLE users. Therefore, follow-up research could study the factors that could trigger the interest among students or parents. For example, kids in this era are exposed to gadgets and Internet since their early ages. The activities such as playing online games and watching videos on YouTube channel are among those that they love the most. Comparatively, VLE is the closest learning tool to their digital cultures. Hence, future research should investigate how the elements such as video and gamification could attract the student to use VLE.

Third, only personal characteristics and workload were tested as the external factors in this study. As this study was conducted in the Malaysian education environment, the generalizability of the result might be restricted. Therefore, future research should focus on investigating other factors of VLE success, particularly those that represent local issues and characteristics. For example, the factors like trust and normative influence could be influential especially in developed countries. On the contrary, monitoring, ICT literacy, skills, training, and political instability are among the factors that could affect the VLE success in developing countries. However, because this study is cross-sectional, the accurate result might not be produced when investigating these factors. Therefore, conducting a longitudinal study in the future could increase

the accuracy of the result when investigating how the factors like ICT literacy and training could transform the VLE success over the time span.

Finally, another source of weakness in this study that could have affected the measurements of VLE success was the existence of recursive relationships in the conceptual framework. Although the final analysis that compares five possible models has been conducted and produced the best model, this method has omitted a part of the original model by eliminating the recursive relationships. As demonstrated by the finding, these relationships are significant in both ways. Unfortunately, the tool to analyze the recursive relationships is unavailable thus far. Therefore, it would be interesting if future research could develop a statistical tool or method to test this type of relationship. By doing so, the real investigation of D&M can be done to examine the explanatory power of the model as well as to accurately describe the complex phenomenon like VLE success.

7.5 Conclusions

This study was conducted to test the conceptual framework that was developed based on D&M, with the main goal of exploring the contributing factors of VLE success among the Malaysian teachers. The research findings have been discussed, and conclusions are drawn. All the alternative hypotheses for direct relationships were supported except H_3. On the other hand, only H_{14} was supported for moderating hypotheses, while H_{11} was supported for mediating hypothesis. Finally, after few steps of analysis, this study has confirmed the role 'VLE usage' as the key construct in investigating VLE success. From these results, the two main research questions have

been answered and the research objectives achieved. Finally, theoretical, practical and methodological contributions, as well as the research limitations and recommendations for future research were discussed.

In conclusion, this study has successfully determined the factors affecting VLE success among Malaysian teachers. The important quality dimensions and teachers' workload identified in this study should be the major considerations for related parties such as VLE developers and MOE to increase the satisfaction of using VLE, as well as increase the benefits and ensure VLE continuous usage.

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APPENDICES

Appendix A

Questionnaire

Tarikh : _____

Nama Sekolah : _____

No Soal Selidik

Pusat Pengajian Pengkomputeran
UNIVERSITI UTARA MALAYSIA

Tajuk Kajian: Model Penilaian Pasca-Pelaksanaan untuk Mengukur Kejayaan Frog VLE di Kalangan Guru-Guru Malaysia.

Responden yang dihormati,

Saya adalah pelajar ijazah kedoktoran dari Pusat Pengajian Pengkomputeran, UUM. Soal selidik ini dibina untuk mengukur kejayaan Frog VLE di kalangan guru-guru Malaysia. Di Malaysia, Frog VLE boleh dicapai di semua sekolah dalam negara hasil daripada inisiatif 1BestariNet. Frog VLE adalah persekitaran pembelajaran maya yang direka untuk memudahkan dan menambah baik pengajaran dan pembelajaran, serta komunikasi dan pentadbiran. Saya amat berbesar hati sekiranya tuan/puan sudi memperuntukkan sedikit masa dan fikiran untuk menjawab soal selidik ini. Jawapan tuan/puan adalah sulit dan hanya akan digunakan untuk tujuan kajian sahaja. Jawapan yang diberikan tidak akan ada yang betul atau salah. Untuk makluman, dengan mengisi soal selidik ini, tuan/puan akan membantu untuk menambah baik pelaksanaan Frog VLE. Terima kasih atas kesudian tuan/puan untuk turut serta dalam kajian ini.

Yang Benar,

Hapini Bin Awang
Universiti Utara Malaysia (UUM), 06010 Sintok, Kedah, Malaysia.
012-5891300, *hapini_awang@ahsgs.uum.edu.my*, *hapiniawang@gmail.com*

*S*oal selidik ini mengandungi empat bahagian (7 muka surat). **Bahagian A** mengandungi soalan berkaitan latar belakang anda. **Bahagian B** disediakan dalam dwi bahasa (Bahasa Melayu dan Inggeris), mengandungi pernyataan berkaitan Kualiti Maklumat, Kualiti Sistem, Kualiti Perkhidmatan, Keinginan untuk Guna, Penggunaan, Kepuasan Pengguna, Faedah Bersih Frog VLE dan Beban Kerja. **Bahagian C** mengandungi empat soalan tambahan berkaitan pelaksanaan Frog VLE. **Bahagian D** mengandungi dua soalan terbuka untuk mereka yang tidak pernah menggunakan Frog VLE.

Sebagai alternatif, anda juga boleh menjawab secara atas talian dengan mengimbas Kod QR di sebelah pada telefon bimbit, atau layari laman https://goo.gl/forms/JeEYTCbXsT7NQooy2

Bahagian A: Maklumat Peribadi

Kami ingin mendapatkan sedikit maklumat peribadi anda untuk lebih memahami pandangan anda berkaitan Frog VLE. Sila tandakan (✓) pada bulatan yang berkaitan.

A1. Umur: _____ Tahun

A2. Jantina: 1. Perempuan ○ 2. Lelaki ○

A3. Kelayakan akademik tertinggi:
1. Diploma ○ 2. Sarjana Muda ○ 3. Sarjana ○ 4. PhD ○

A4. Pengalaman mengajar:
1. ≤ 1 Tahun ○ 2. 2-4 Tahun ○ 3. 5-7 Tahun ○
4. 8-10 Tahun ○ 5. 11-13 Tahun ○ 4. ≥ 14 Tahun ○

A5. Bilangan waktu mengajar seminggu:
1. ≤ 10 Waktu ○ 2. 11-15 Waktu ○ 3. 16-20 Waktu ○
4. 21-25 Waktu ○ 5. 26-30 Waktu ○ 6. ≥ 31 Waktu ○

A6. Berapa jam biasanya anda peruntukkan untuk tugas akademik dalam seminggu? (contoh: persedian mengajar, menanda, refleksi, penilaian dan lain-lain)
1. 3 Jam ○ 2. 4-6 Jam ○ 3. 7-9 Jam ○
4. 10-12 Jam ○ 5. 13-15 Jam ○ 6. ≥ 16 Jam ○

A7. Berapa jam biasanya anda peruntukkan untuk tugas-tugas selain mengajar dalam seminggu? (contoh: tugas pentadbiran, ko-kurikulum, pengurusan murid dan lain-lain)
1. ≤ 3 Jam ○ 2. 4-6 Jam ○ 3. 7-9 Jam ○
4. 10-12 Jam ○ 5. 13-15 Jam ○ 6. ≥ 16 Jam ○

A8. Berapa kali anda menggunakan Frog VLE dalam sebulan?
1. Langsung tidak menggunakan ○ 2. Kira-kira sekali ○ 3. 2-4 kali ○
4. 5-7 kali ○ 5. 8-10 kali ○ 6. 11 kali atau lebih ○

A9. ** Pengalaman menggunakan Frog VLE:

1. Tiada ○ } ** *Terus ke Bahagian D, tanpa perlu menjawab Bahagian B & C.*

2. ≤ 1 Tahun ○ 3. 2 Tahun ○ 4. 3 Tahun ○
5. 4 Tahun ○ 6. 5 Tahun ○ 7. ≥ 6 Tahun ○ } ** *Sila ke Bahagian B, dan seterusnya ke Bahagian C.*

Nota: Sekiranya jawapan anda adalah **'Tiada', Sila terus ke **Bahagian D**. Jika anda memilih jawapan lain, sila ke **Bahagian B** & **C**.*

Bahagian B: Dimensi Kejayaan Frog VLE

Kami ingin mengetahui pandangan anda tentang faktor-faktor yang mempengaruhi Penggunaan, Kepuasan Pengguna dan Faedah Frog VLE di kalangan guru-guru Malaysia. Soalan di bahagian ini disediakan dalam dwi bahasa.

Sila bulatkan nombor yang sesuai berdasarkan skala di bawah:

1---------- 7

Sangat Tidak Setuju ***Sangat Setuju***

1.0 – KUALITI MAKLUMAT (IQ)	**Tahap Persetujuan**
1. Frog VLE memberikan maklumat sepertimana yang saya kehendaki. *The Frog VLE provides information that is exactly what I need.*	**1 2 3 4 5 6 7**
2. Frog VLE memberikan maklumat yang berguna untuk pengajaran. *The Frog VLE provides information that is relevant to teaching.*	**1 2 3 4 5 6 7**
3. Frog VLE memberikan maklumat yang mencukupi. *The Frog VLE provides sufficient information.*	**1 2 3 4 5 6 7**
4. Frog VLE memberikan maklumat yang mudah difahami. *The Frog VLE provides information that is easy to understand.*	**1 2 3 4 5 6 7**
5. Frog VLE menyediakan maklumat yang terkini. *The Frog VLE provides up-to-date information.*	**1 2 3 4 5 6 7**
6. Melalui Frog VLE, saya memperolehi maklumat pada masa yang diperlukan. *Through Frog VLE, I get the information I need in time.*	**1 2 3 4 5 6 7**
7. Maklumat yang disediakan oleh Frog VLE boleh dipercayai. *Information provided by Frog VLE is reliable.*	**1 2 3 4 5 6 7**

2.0 – KUALITI SISTEM (SyQ)	**Tahap Persetujuan**
1. Frog VLE sentiasa tersedia. *The Frog VLE is always available.*	**1 2 3 4 5 6 7**
2. Frog VLE adalah mesra pengguna. *The Frog VLE is user-friendly.*	**1 2 3 4 5 6 7**
3. Frog VLE mempunyai ciri-ciri yang menarik bagi saya. *The Frog VLE has attractive features that appeal to me.*	**1 2 3 4 5 6 7**
4. Frog VLE membolehkan saya menyelesaikan tugas dengan lebih cepat. *The Frog VLE enables me to accomplish task quicker.*	**1 2 3 4 5 6 7**
5. Frog VLE mudah dilayari. *The Frog VLE is easy to navigate.*	**1 2 3 4 5 6 7**
6. Frog VLE menyediakan capaian maklumat yang pantas. *The Frog VLE provides high-speed information access.*	**1 2 3 4 5 6 7**
7. Frog VLE berfungsi dengan tepat pada kebanyakan masa. *The Frog VLE functions accurately most of the time.*	**1 2 3 4 5 6 7**

Sila bulatkan nombor yang sesuai berdasarkan skala di bawah:

1---------- **7**

Sangat Tidak Setuju ***Sangat Setuju***

3.0 – KUALITI PERKHIDMATAN (SeQ)	**Tahap Persetujuan**
1. Meja bantuan Frog VLE memberi respon segera terhadap pertanyaan saya. *The Frog VLE helpdesk is prompt in responding to my queries.*	**1 2 3 4 5 6 7**
2. Meja bantuan Frog VLE sentiasa tersedia sekiranya saya menghadapi masalah teknikal. *The Frog VLE helpdesk is available in case I have a technical problem.*	**1 2 3 4 5 6 7**
3. Meja bantuan Frog VLE sudi membantu sekiranya saya memerlukan sokongan pada bila-bila masa. *The Frog VLE helpdesk is willing to help whenever I need support.*	**1 2 3 4 5 6 7**
4. Meja bantuan Frog VLE memberikan perhatian individu kepada pengguna. *The Frog VLE helpdesk gives users individual attention.*	**1 2 3 4 5 6 7**
5. Meja bantuan Frog VLE adalah sangat berpengetahuan. *The Frog VLE helpdesk is highly knowledgeable.*	**1 2 3 4 5 6 7**
6. Meja bantuan Frog VLE memperuntukkan masa yang mencukupi untuk menyelesaikan permasalahan teknikal saya. *The Frog VLE helpdesk dedicates enough time to resolve my specific technical concerns.*	**1 2 3 4 5 6 7**
7. Meja bantuan menunjukkan minat untuk menyelesaikan masalah teknikal berkaitan Frog VLE. *The helpdesk shows a sincere interest in solving technical problems related to Frog VLE.*	**1 2 3 4 5 6 7**
8. Frog VLE mempunyai peralatan yang terkini. *The Frog VLE has up-to-date equipment.*	**1 2 3 4 5 6 7**
9. Kemudahan fizikal Frog VLE kelihatan menarik. *The Frog VLE's physical facilities are visually appealing.*	**1 2 3 4 5 6 7**

*** Meja bantuan Frog VLE: Perkhidmatan berkaitan Frog VLE oleh pentadbir Frog sekolah, Guru Besar/Pengetua, PKG, Meja bantuan secara atas talian, Hotline dan sebagainya.*

4.0 – KEINGINAN UNTUK GUNA (ITU)	**Tahap Persetujuan**
1. Saya berhasrat untuk terus menggunakan Frog VLE. *I intend to continue using the Frog VLE.*	**1 2 3 4 5 6 7**
2. Saya akan menggunakan Frog VLE secara kerap di masa hadapan. *I will regularly use the Frog VLE in the future.*	**1 2 3 4 5 6 7**
3. Sekiranya saya mempunyai capaian kepada Frog VLE, saya berhasrat untuk menggunakannya. *Assuming that I have access to the Frog VLE, I intend to use it.*	**1 2 3 4 5 6 7**
4. Saya berhasrat untuk menjadi pengguna tegar Frog VLE. *I intend to be a heavy user of Frog VLE.*	**1 2 3 4 5 6 7**

Sila bulatkan nombor yang sesuai berdasarkan skala di bawah:

1---------- **7**

Sangat Tidak Setuju ***Sangat Setuju***

5.0 – PENGGUNAAN (U)	**Tahap Persetujuan**
1. Saya kerap menggunakan Frog VLE. *I frequently use the Frog VLE.*	**1 2 3 4 5 6 7**
2. Saya menggunakan Frog VLE pada bila-bila masa yang sesuai. *I use the Frog VLE whenever appropriate.*	**1 2 3 4 5 6 7**
3. Saya menggunakan Frog VLE secara sukarela. *I use Frog VLE voluntarily.*	**1 2 3 4 5 6 7**
4. Saya menggunakan Frog VLE untuk mengajar. *I use Frog VLE for teaching.*	**1 2 3 4 5 6 7**
5. Saya menggunakan Frog VLE untuk memberikan ujian kepada pelajar. *I use Frog VLE to give tests to my students.*	**1 2 3 4 5 6 7**
6. Saya menggunakan Frog VLE untuk berkomunikasi dengan pelajar. *I use Frog VLE to communicate with students.*	**1 2 3 4 5 6 7**
7. Saya menggunakan Frog VLE untuk bekerjasama dengan guru lain. *I use Frog VLE to collaborate with other teachers.*	**1 2 3 4 5 6 7**
8. Saya menggunakan Frog VLE untuk mendapatkan maklumat pendidikan. *I use Frog VLE to retrieve educational information.*	**1 2 3 4 5 6 7**
9. Saya menggunakan Frog VLE untuk mendapatkan sumber pengajaran. *I use Frog VLE to retrieve teaching resources.*	**1 2 3 4 5 6 7**

6.0 – KEPUASAN PENGGUNA (US)	**Tahap Persetujuan**
1. Saya berasa puas hati menggunakan Frog VLE. *I feel contented using Frog VLE.*	**1 2 3 4 5 6 7**
2. Saya berasa gembira menggunakan Frog VLE. *I feel pleased using Frog VLE.*	**1 2 3 4 5 6 7**
3. Saya rasa Frog VLE adalah sangat membantu. *I think the Frog VLE is very helpful.*	**1 2 3 4 5 6 7**
4. Saya rasa Frog VLE berjaya. *I think the Frog VLE is successful.*	**1 2 3 4 5 6 7**

Sila bulatkan nombor yang sesuai berdasarkan skala di bawah:

1---------- **7**

Sangat Tidak Setuju ***Sangat Setuju***

7.0 – FAEDAH BERSIH (NB)	**Tahap Persetujuan**
1. Frog VLE menjimatkan masa. *The Frog VLE is time-saving.*	**1 2 3 4 5 6 7**
2. Frog VLE meningkatkan kebolehan mengajar saya. *The Frog VLE enhances my teaching skills.*	**1 2 3 4 5 6 7**
3. Frog VLE membantu meningkatkan prestasi kerja saya. *The Frog VLE helps me improve my job performance.*	**1 2 3 4 5 6 7**
4. Frog VLE memperkasakan saya. *The Frog VLE empowers me.*	**1 2 3 4 5 6 7**
5. Frog VLE menyumbang kepada kejayaan kerjaya saya. *The Frog VLE contributes to my career success.*	**1 2 3 4 5 6 7**

8.0 – BEBAN KERJA (WL)	**Tahap Persetujuan**
1. Kadar kelajuan dalam tugas saya adalah terlalu pantas. *The pace in my job is too fast.*	**1 2 3 4 5 6 7**
2. Tugas saya adalah terlalu mendesak. *My job is too demanding.*	**1 2 3 4 5 6 7**
3. Tugas saya adalah sangat sibuk. *My job is very hectic.*	**1 2 3 4 5 6 7**
4. Saya mempunyai terlalu banyak kerja yang perlu dilakukan. *I have too much work to do on the job.*	**1 2 3 4 5 6 7**
5. Saya harus belajar strategi pengajaran yang baru untuk menggunakan Frog VLE. *I will have to learn new teaching strategies in order to use Frog VLE.*	**1 2 3 4 5 6 7**
6. Penggunaan Frog VLE akan meningkatkan beban kerja saya. *The use of Frog VLE will increase my workload.*	**1 2 3 4 5 6 7**

Bahagian C: Soalan Tambahan

Kami ingin bertanya kepada anda tentang senario semasa pelaksanaan Frog VLE di sekolah-sekolah di Malaysia.

1. Adakah anda menerima sebarang jenis latihan berkaitan Frog VLE? Jika YA, sila senaraikan.
   Ya ○ Tidak ○

   a. _____ c. _____

   b. _____ d. _____

2. Adakah terdapat jadual penggunaan Frog VLE di sekolah anda?
   Ya ○ Tidak ○

3. Adakah pihak pentadbir sekolah anda menyediakan sebarang sokongan atau panduan berkaitan Frog VLE?
   Ya ○ Tidak ○

4. Adakah pihak PPD, PKG atau Pengetua/Guru Besar memantau penggunaan Frog VLE di kalangan guru-guru?
   Ya ○ Tidak ○

SOALAN TAMAT - BAGI MEREKA YANG MEMPUNYAI PENGALAMAN MENGGUNAKAN FROG VLE

Bahagian D: Soalan Terbuka

(Untuk mereka yang tidak pernah menggunakan Frog VLE)

1. Kenapa anda tidak menggunakan Frog VLE?

……

……

……

……

2. Sila guna ruang ini untuk menulis sebarang komen atau cadangan berkaitan Frog VLE.

……

……

……

……

……

SOALAN TAMAT - BAGI MEREKA YANG TIDAK PERNAH MENGGUNAKAN FROG VLE

Masa dan kerjasama anda adalah sangat dihargai,
Terima Kasih.

Appendix B

List of Selected Schools

No	School	Level	Location	State	Method	Respondent
1	SK Padang Mat Sirat	Primary	Rural	Kedah	Postage	10
2	SK Taman Ria	Primary	Rural	Kedah	Postage	10
3	SK Hj. Salleh Masri	Primary	Rural	Kedah	Postage	10
4	SK Temonyong	Primary	Rural	Kedah	Postage	10
5	SK Permatang Tiong	Primary	Rural	Kedah	Postage	10
6	SBP Integrasi Kubang Pasu	Secondary	Rural	Kedah	Postage	10
7	SMK Batu 17	Secondary	Rural	Kedah	Postage	10
8	SMK Ayer Puteh Dalam	Secondary	Rural	Kedah	Postage	10
9	SMKA Sik	Secondary	Rural	Kedah	Postage	10
10	SMK Syed Ibrahim	Secondary	Rural	Kedah	Postage	10
11	SK Taman Bersatu	Primary	Urban	Kedah	Postage	10
12	SK Taman Rakyat	Primary	Urban	Kedah	Postage	10
13	SK Gurun (Pusat)	Primary	Urban	Kedah	Postage	10
14	SK Laguna Merbok	Primary	Urban	Kedah	Postage	10
15	SMK Taman Jelutong	Secondary	Urban	Kedah	Postage	10
16	Maktab Mahmud Pokok Sena	Secondary	Urban	Kedah	Postage	10
17	SMA Nurul Islam Ayer Hitam	Secondary	Rural	Kedah	Postage	10
18	SMK Sungai Pasir Kecil	Secondary	Urban	Kedah	Postage	10
19	SMK Simpang Kuala	Secondary	Urban	Kedah	Postage	10
20	SK Alma Jaya	Primary	Rural	Penang	Postage	10
21	SK Rantau Panjang	Primary	Rural	Perak	Postage	10
22	SK Pangkalan TLDM II	Primary	Rural	Perak	Postage	10
23	SK Permatang Tok Mahat	Primary	Rural	Penang	Postage	10
24	SK Batu Maung	Primary	Rural	Penang	Postage	10
25	SJKT Ladang Padang Meiha	Primary	Rural	Kedah	Postage	10
26	SMA Darrusaadah	Secondary	Rural	Kedah	Postage	10
27	SK Seri Impian	Primary	Rural	Penang	Postage	10
28	SK Bandar Baru Perda	Primary	Rural	Penang	Postage	10
29	SK Batu Feringghi	Primary	Rural	Penang	Postage	10
30	SMK Mutiara Impian	Secondary	Rural	Penang	Postage	10
31	SMK Taman Widuri	Secondary	Rural	Penang	Postage	10
32	SMKA Al-Irshad	Secondary	Rural	Penang	Postage	10
33	SMK Bukit Mertajam	Secondary	Urban	Penang	Walk-In	10
34	SMK Pmtg Tok Labu	Secondary	Rural	Penang	Postage	10
35	SK Convent 1	Primary	Urban	Penang	Postage	10
36	SK Tanjong Tokong	Primary	Urban	Penang	Postage	10
37	SMK Abdullah Munshi	Secondary	Urban	Penang	Postage	10
38	SMK Hamid Khan	Secondary	Urban	Penang	Postage	10
39	SMK Bertam Indah	Secondary	Urban	Penang	Postage	10
40	SMK Kuala Perlis	Secondary	Urban	Perlis	Walk-In	10
41	SMK Derma	Secondary	Urban	Perlis	Walk-In	10
42	SMK Syed Alwi	Secondary	Rural	Perlis	Walk-In	10

43	SK Behor Empiang	Primary	Rural	Perlis	Postage	10
44	SK Guar Nangka	Primary	Rural	Perlis	Postage	10
45	SK Padang Keria	Primary	Rural	Perlis	Postage	10
46	SK Santan	Primary	Rural	Perlis	Postage	10
47	SMK Arau	Secondary	Rural	Perlis	Postage	10
48	SMK Syed Sirajuddin	Secondary	Rural	Perlis	Postage	10
49	SMK Padang Besar Utara	Secondary	Rural	Perlis	Postage	10
50	SK Dato Wan Ahmad	Primary	Urban	Perlis	Postage	10
51	SMK Sanglang	Secondary	Rural	Perlis	Postage	10
52	SMK Putra	Secondary	Urban	Perlis	Postage	10
53	SM Sains Tuanku Syed Putra	Secondary	Urban	Perlis	Postage	10
54	SK Padang Gajah	Primary	Rural	Perak	Postage	10
55	SK Batu Hampar	Primary	Rural	Perak	Postage	10
56	SK Jelutong	Primary	Rural	Perak	Postage	10
57	SK Tun Dr Ismail	Primary	Rural	Perak	Postage	10
58	SMK Raja Lope Nor Rashid	Secondary	Rural	Perak	Postage	10
59	SMK Bukit Jana	Secondary	Rural	Perak	Postage	10
60	SMK Tanjong Rambutan	Secondary	Rural	Perak	Postage	10
61	SK Labu Besar	Primary	Rural	Kedah	Walk-In	10
62	SK Bukit Selambau	Primary	Rural	Kedah	Walk-In	10
63	SK Convent Father Barre	Primary	Urban	Kedah	Walk-In	10
64	SMK Simpang Pulai	Secondary	Rural	Perak	Postage	10
65	SK Jelapang	Primary	Urban	Perak	Postage	10
66	SK Datin Khadijah	Primary	Urban	Perak	Postage	10
67	SMK Kg. Dato' Seri Kamaruddin	Secondary	Urban	Perak	Postage	10
68	SM Sains Tapah	Secondary	Rural	Perak	Postage	10
69	SMK Kg. Dato' Ahmad Said	Secondary	Urban	Perak	Postage	10
70	SMK Bukit Merchu	Secondary	Urban	Perak	Postage	10
71	SMK St. Bernadette's Convent	Secondary	Urban	Perak	Postage	10
72	SK Sultan Abdul Aziz	Primary	Urban	Perak	Postage	10
73	SK (P) Treacher Methodist	Primary	Urban	Perak	Postage	10
74	SMK Panglima Bukit Gantang	Secondary	Urban	Perak	Postage	10
75	SK Sungai Nibong	Primary	Urban	Penang	Postage	10
76	SMK Datuk Onn	Secondary	Urban	Penang	Postage	10
77	SJKC Chong San	Primary	Rural	Perak	Postage	10
78	SMA Shamsul Maarif Al Wataniah	Secondary	Rural	Perak	Postage	10
79	SMK Syed Hassan	Secondary	Urban	Perlis	Postage	10
80	SK Seberang Ramai	Primary	Urban	Perlis	Postage	10
81	SK Seri Perlis	Primary	Urban	Perlis	Postage	10
82	SJKT Palanisamy Kumaran	Primary	Rural	Kedah	Postage	10
83	SMA (Arab) Annajah	Secondary	Rural	Kedah	Postage	10
84	SK Kampung Baharu	Primary	Rural	Perak	Postage	10
85	SK Bendang Kering	Primary	Rural	Perak	Postage	10
TOTAL		Primary: 43 Secondary: 42	Rural: 51 Urban: 34	Perlis: 17 Kedah: 26 Penang: 18 Perak: 24	Postage: 78 Walk-In: 7	850

Appendix C

Current EIS Implementation in Malaysia

System	Function(s)	User(s)	Category
Sistem Analisa Peperiksaan Sekolah (SAPS)	Store, retrieve & analyze examination result.	Teachers, Parents	Education Management
Sistem Pengurusan Pentaksiran Berasaskan Sekolah (SPPBS)	Manages data related to students assessment.	Teachers	Education Management
Sistem Pertukaran Guru (egTUKAR)	Manages teachers' transfer application.	Teachers	Education Management
Sistem Pengoperasian Data (e-Operasi)	Manages teachers' service information (academic b.g., service history, personal info, training info etc.)	Teachers	Education Management
Sistem Pengurusan Latihan Guru (eSPLG)	Manages information of teachers' training / workshop / courses etc.	Teachers	Education Management
Sistem Kenaikan Pangkat (ePANGKAT)	Manages data related to teachers' promotion.	Teachers	Education Management
Aplikasi Pangkalan Data Murid (APDM)	Manages students' data	Teachers	Education Management
Sistem Pengurusan Literasi & Numerasi (LINUS-NKRA)	Manage LINUS data (e.g., screening test result and pupils' profile)	Teachers	Education Management
Smart School Qualification Standard (SSQS)	Manages data of ICT implementation in schools (for smart school standard measurement).	Teachers, Students	Education Management

Sistem Automasi Penarafan Pusat Sumber Bersepadu (IQ-PSS)	Manages Resource Center data for library rating.	Teachers	Education Management
Sistem Automasi Program NILAM Bersepadu (i-NILAM)	Manages data of students' reading program (NILAM)	Teachers	Education Management
Learning Management System (LMS)	Manages material for teaching & learning, including courseware.	Teachers, Students, Parents	Teaching & Learning
Sistem Pengurusan Sekolah (EMIS) / (SPS)	Integrates all the current EIS (single sign-on).	Teachers, Students	Education Management Teaching & Learning
Frog Virtual Learning Environment (Frog VLE)	A web-based learning system that replicates real-world learning by integrating virtual equivalents of conventional concepts of education.	Teachers, Students, Parents	Education Management, Teaching & Learning
eKEHADIRAN	Sub-module in APDM – for students' attendance management.	Teachers	Education Management
Sistem Pengurusan Aset Alih Kerajaan (SPA)	Manages assets in schools	Teachers	Education Management
Sistem e-Profil Kerjaya Murid (SePKM)	For counseling teachers	Teachers	Education Management
Sistem Salahlaku Disiplin Murid (SSDM)	Manages student's discipline record	Teachers	Education Management
Sistem Maklumat Prasekolah Kebangsaan (SMPK)	Pre-school management system	Teachers	Education Management
Sistem Pengurusan Buku Teks (eSPBT)	Text book management system	Teachers	Education Management

Appendix D_1

Studies of ICT in Education (Malaysia)

Authors	Issue	Findings
(Ghavifekr et al., 2014)	Identified the level of ICT integration in teaching and learning activity in the classroom by primary school teachers.	Most of the teachers are general users who frequently used the ICT facilities for doing their work in the staffroom rather than using them in their classroom for teaching and learning purposes.
(Narinasamy & Mamat, 2013)	Discussed the need for incorporating the use of ICT in teaching Moral Education.	Lack of ICT utilization by teachers in teaching Moral Education.
(Rahman et al., 2013)	The use of ICT throughout the implementation of standard based curriculum in the national preschools of Malaysia, focusing on the preschool teachers' attitude and practices, and the problems they faced in using ICT in the teaching and learning process.	Teachers in the national preschools were positive in their attitudes toward employing ICT in teaching and learning; however, they still lacked in terms of their practices.
(Sharifah Nor & Kamarul Azman, 2011)	The readiness of using ICT in teaching and its effects on the work and behavior of preschool children.	No significant difference in the pupils' work and behavior based on the teaching approach used by preschool teachers.
(Surif et al., 2014)	Science teacher's level of awareness and practice towards the importance of ICT integration in the process of teaching and learning.	Most teachers had a high level of awareness towards the importance of ICT integration in the process of teaching and learning Science. However, teacher's practice of ICT application in the process of teaching and learning Science was average.

Appendix D_2

Previous Studies of EIS in Malaysia

Author(s)	Type of EIS	Issue(s)	Finding(s)	Model(s)	Focus
(Norin Farizah, 2013)	Maklumat Murid (SMM) & Aplikasi Pangkalan Data Murid (APDM)	The implementation of SMM & APDM in student's data management.	1. Strong relationship APDM & SMM – student data management 2. Similar function.	TAM, Scientific Management Theory	Adoption (Acceptance / Usage)
(Mohd Faizal et al., 2014)	Education Management Information System (EMIS)	The EMIS is not being fully utilized. To evaluate the EMIS	Model of Successful Use of EMIS	Delone & McLean IS Success Model	Evaluation (Benefits to users)
(Norashikin et al., 2014)	Sistem Pengurusan Sekolah (SPS)	Pilot Study - to measure the acceptance of SPS	The real study can be conducted.	TAM	Adoption (Acceptance / Usage)
(Anuar & Mohd Nordin, 2015)	SPS	The implementation of SPS needs an effective method.	Kaizen routine in SPS implementation.	-	Implementation Strategy
(Norazilawati et al., 2013)	Frog VLE	To investigate the strengths and weaknesses of Frog VLE implementation in initial stage among Science teachers.	Teachers are familiar with the system. Frog VLE improves the quality of education. There several challenges and barriers in implementing Frog VLE.	-	Pedagogy
(Nor Azlah & Fariza, 2014)	Frog VLE	To investigate the role of communication skills in the implementation of Frog VLE in schools.	The implementation of Frog VLE is still weak. Communication skills among the teachers need to be improved in order to enhance the utilization of Frog VLE.	Communication Theory	Pedagogy
(Ummu Salma & Fariza, 2014)	Frog VLE	To investigate teachers' competency in Frog VLE for teaching and learning.	There is an improvement of Frog VLE competencies among teachers.	-	Pedagogy

(Kaur & Hussein, 2015)	Frog VLE	To observe the readiness of Frog VLE utilization as a teaching method among teachers in a secondary schools	The readiness level is low. The main constraint in Frog VLE implementation: Workload & Training Issues.	TRA, TAM & Theory of Reflective Model (Wallace, 1991)	Adoption (Acceptance / Usage)
(Campbell et al., 2015)	Frog VLE	Evaluation of the rubric & learning designs of the cloud-based (Frog VLE) content.	The rubric is reliable, with a few modifications needed, especially in navigation flow.	Technological Pedagogical and Content Knowledge (TPACK) framework	Pedagogy
(Mohd Rosli et al., 2015)	Frog VLE	To measure the acceptance of Frog VLE	Significant -Perceived usefulness, perceived ease of use, instructional design, convenience, technological factor and computer self-efficacy.	TAM	Adoption (Acceptance / Usage)
(Cheok & Wong, 2014)	Frog VLE	To identify factors of e-learning satisfaction among teachers (Frog VLE)	The new model of End User IS Satisfaction	TAM, D&M	Evaluation (Usage / User Satisfaction)
(Cheok & Wong, 2016)	Frog VLE	Teachers' experiences in using FROG VLE in their teaching and learning.	The challenges and limitations. The benefits and strength of the e-learning.	-	Pedagogy
(Saiful Afzan et al., 2014)	Frog VLE	To examine the student's acceptance toward Frog VLE	Model of student's acceptance toward VLE	UTAUT	Adoption (User Satisfaction)
(Hiong & Umbit, 2015)	Frog VLE	Factors that influence the use of Frog VLE among lecturers in the Teacher Education Institute.	Attitude is the main factor that influenced the use.	TAM	Adoption (Acceptance / Usage)
(Shahaimi & Fariza, 2015)	Frog VLE	Implementation and the challenges.	Overview of the implementation and challenges.	-	Concept
(Thah, 2014)	Frog VLE	Success criteria for Frog VLE implementation	Functionality and usability of the VLE and the ability to facilitate collaborations are what a VLE should be.	Scriven (1967) evaluation paradigm	Evaluation (Pedagogical Tool, User-Friendly & Collaboration Tool)

Appendix E1

Previous Studies of VLE in Malaysia

No	Author	Issue(s)	Finding(s)	Model(s)	Focus	Setting
1.	(Campbell et al., 2015)	Teachers' cloud- based resource development.	A rubric to evaluate the TPACK alignment of cloud-based learning designs.	Technological Pedagogical and Content Knowledge (TPACK)	Pedagogy	-
2.	(Cheok & Wong, 2016)	Teachers' experiences in using FROG VLE in their teaching and learning.	The challenges and limitations. The benefits and strength of the e-learning.	-	Pedagogy	Urban
3.	(Cheok & Wong, 2014)	Teachers' e-learning satisfaction.	Model of teachers' e-learning satisfaction.	TAM, D&M (1992)	Usage, User satisfaction	-
4.	(Hiong & Umbit, 2015)	Factors that influence the use of Frog VLE among lecturers in the Teacher Education Institute.	Attitude is the main factor that influenced the use.	TAM	Usage (adoption)	Urban
5.	(Kaur & Hussein, 2015)	Teachers' readiness to use Frog VLE.	Teacher's ICT literacy and training as the influential factors.	TRA, TAM, Theory of Reflective Model	Adoption	Urban
6.	(Mohd Rosli et al., 2015)	The acceptance of Frog VLE	Significant -Perceived usefulness, perceived ease of use, instructional design, convenience, technological factor and computer self-efficacy.	TAM	Adoption	Urban

7.	(Nor Azlah & Fariza, 2014)	Communication skills among teachers to attract student toward Frog VLE.	Low usage of Frog VLE.	Communication theory	Pedagogy	-
8.	(Norazilawati et al., 2013)	Frog VLE usage among science teachers	The Internet connection speed should be increased, reduce teacher's workload, and teacher's attitude toward VLE training.	-	Pedagogy	Urban
9.	(Saiful Afzan et al., 2014)	Student's acceptance of Frog VLE	Model of Frog VLE Students' Acceptance.	UTAUT	Adoption	Urban
10.	(Shahaimi & Fariza, 2015)	Implementation and the challenges.	Overview of the implementation and challenges.	-	Concept	-
11.	(Thah, 2014)	Success criteria for Frog VLE implementation	Functionality and usability of the VLE and the ability to facilitate collaborations are what a VLE should be.	Scriven (1967) evaluation paradigm	Evaluation	Rural & Urban
12.	(Ummu Salma & Fariza, 2014)	The level of Frog VLE literacy among teachers.	There is an improvement in terms of Frog VLE literacy among teachers.	-	Pedagogy	Urban

Appendix E_2

Example of Previous Studies that Applied DeLone & McLean IS Success Model

Educational Information Systems (EIS)

No	Authors	Scope / IS	Country
1.	(Mohd Faizal et al., 2014)	Education Management Information System (EMIS)	Malaysia
2.	(Eom, 2012)	E-learning management systems (LMS) in university	USA
3.	(Dai et al., 2011)	Easy Teaching (ET) Web	Taiwan
4.	(Eom et al., 2012)	E-learning management systems (LMS) in university	USA
5.	(Cheok & Wong, 2014)	Frog VLE	Malaysia
6.	(Cheng, 2014)	Digital library - university	Taiwan
7.	(Lwoga, 2013)	Library 2.0 technologies - university	Tanzania

Other IS

No	Authors	Scope / IS	Country
1.	(Aggelidis & Chatzoglou, 2012)	Hospital Information System	East Macedonia and Thrace
2.	(Hosnavi & Ramezan, 2010)	HRMIS in Iranian Oil Company	Iran
3.	(Davarpanah & Mohamed, 2013)	Human Resource Information Systems (HRIS) success factors in a higher education context.	Malaysia
4.	(Göğüş & Özer, 2014)	Accounting Software	Turkey
5.	(Iskender & Ozkan, 2015)	E-government transformation success.	Turkey
6.	(Jing et al., 2014)	G2C E-governance systems	China
7.	(Khayun et al., 2012)	e-Excise (On-line tax payment system)	Thailand
8.	(Visser, Van Biljon, & Herselman, 2013)	Further Education and Training (FET) IS	South Africa
9.	(Al-Debei et al., 2013)	The role of web portals in improving job performance	Jordan
10.	(Ainin et al., 2012)	PTPTN portal	Malaysia

Appendix F_1

Summary of Studies Related to the Information Quality (IQ) of IS

Author(s)	Information System	Country	Measurement(s)
(Bento & Costa, 2013)	ERP	Portugal	Content, Accuracy, Format, Relevance, Usability, Reliability & Information Integrity
(J. V. Chen et al., 2015)	Online Tax Filling System	Philippine	Completeness, Reliably, Relevance, Responsiveness & Timeliness
(Floropoulos, Spathis, Halvatzis, & Tsipouridou, 2010)	Taxation IS	Greece	Completeness, Accuracy, Reliability & Timeliness
(Iivari, 2005)	Mandatory IS	Finland	Completeness, Precision, Accuracy, Reliability, Currency & Format
(Nelson, Todd, & Wixom, 2005)	Data Warehousing	USA	Accuracy, Completeness and Currency & Format
(Rai et al., 2002)	Integrated Student IS (quasi-voluntary IS)	USA	Content, Accuracy & Format
(Seddon & Kiew, 1996)	Departmental Accounting System	USA	Timeliness, Accuracy, Relevance & Format
(Gorla, Somers, & Wong, 2010)	Accounting Information Systems	Hong Kong	Accuracy, Timeliness (response time), Completeness, Relevance & Consistency
(Zhou, 2013)	Mobile Payment Services	China	Relevance, Sufficiency, Accuracy & Timeliness
(Hazen et al., 2014)	Reverse Logistic IS	USA	Accuracy, Timeliness
(Eom et al., 2012)	E-learning	USA	Accuracy, Relevance, Sufficiency, Format & Timeliness
(Wixom & Todd, 2005)	Data Warehousing	USA	Currency, Accuracy, Completeness & Format
(Teo et al., 2009)	G2C E-Government	Singapore	Sufficiency, Timeliness, Accuracy, Relevance, Format & Reliability
(C.-W. D. Chen & Cheng, 2009)	Online Shopping	Taiwan	Currency, Accuracy & Relevance

Appendix F_2

Summary of Studies Related to the System Quality (SyQ) of IS

Author(s)	Information System	Country	Measurement(s)
(Alshibly, 2014)	E-HRM	Jordan	Performance Characteristics, Functionality & Usability
(Chatterjee, Chakraborty, Sarker, Sarker, & Lau, 2009)	Mobile Work in Healthcare	USA	Extent of Data Processing, Extent of Information Access, Communicability & Portability
(Floropoulos et al., 2010)	Taxation IS	Greece	Reliability, Validity, Flexibility and Understandability
(Iivari, 2005)	Mandatory IS	Finland	Flexibility, Integration, Response Time, Error Recovery, Convenience of Access & Language
(Nelson et al., 2005)	Data Warehousing	USA	Accessibility, Reliability, Response time, Flexibility & Integration
(Y. S. Wang & Liao, 2008)	G2C E-Government	Taiwan	User-Friendly & Ease of Use
(Wixom & Todd, 2005)	Data Warehousing	USA	Reliability, Flexibility, Integration, Accessibility & Timeliness
(Gorla et al., 2010)	General IS	Hong Kong	Flexibility & Sophistication
(Teo et al., 2009)	G2C E-Government	Singapore	Ease of Use & User-Friendly
(Goh, 2014)	E-Commence Website	Singapore	Availability, Usability, Reliability, Adaptability and Response Time
(Lee-Post, 2009)	e-learning (Online Course)	USA	Ease of Use, User-Friendly, Stability, Security, Timely & Responsive
(Eom, 2012)	LMS	USA	Availability, Usability & Accessibility
(C.-W. D. Chen & Cheng, 2009)	Online Shopping	Taiwan	Response time, Reliability, Flexibility & Usability
(J. V. Chen et al., 2015)	Online Tax Filling System	Philippine	Ease of Use, Usability & Accessibility
(Zhou, 2013)	Mobile Payment Services	China	Response Time & Ese of Use
(Lwoga, 2013)	Library 2.0	Africa	Usability, Availability & Reliability

Appendix F_3

Summary of Studies Related to the Service Quality (SeQ) of IS

Author(s)	Information System	Country	Measurement(s)
(Chatterjee et al., 2009)	Mobile Work in Healthcare	USA	Reliability & Support
(J. V. Chen et al., 2015)	Online Tax Filling System	Philippine	Reliability, Responsiveness, Assurance & Empathy
(Floropoulos et al., 2010)	Taxation IS	Greece	Improved Quality, Simplified and Standardized Process, Flexible Interaction, Improved Control, Improved Cooperation & Reduced Time
(Goh, 2014)	E-Commence Website	Singapore	Assurance, Responsiveness, Empathy & Support
(Lee-Post, 2009)	e-learning (Online Course)	USA	Prompt, Responsiveness, Fair, Assurance & Availability
(Teo et al., 2009)	G2C E-Government	Singapore	Reliability, Prompt, Responsiveness, Empathy, Meet the Users' Need & Timely
(Y. S. Wang & Liao, 2008)	G2C E-Government	Taiwan	Empathy, Security & Personalization
(Zhou, 2013)	Mobile Payment Services	China	Reliability, Responsiveness, Assurance & Personalization
(Yengin et al., 2011)	e-learning	-	Prompt, Responsive, Fair, Assurance & Available
(L. Zhao, Lu, Zhang, & Chau, 2012)	Mobile Value-Added Services	China	Interaction, Environment & Outcome
(El-kiki & Lawrence, 2006)	M-Government	-	Awareness, Accessibility, Availability, Reliability, Accuracy, Responsiveness, Courtesy & Helpful

Appendix F_4

Summary of Studies Related to the Intention to Use (ITU) of IS

Author(s)	Information System	Model	Country	Measurement(s)
(Agarwal & Prasad, 1997)	World Wide Web	TAM, TRA, DOI	-	Intention for future use
(Al-Debei et al., 2013)	Web Portal	Updated D&M	Jordan	Intention for future use/re-use
(Khader, 2015)	M-Learning	TAM	Jordan	Intention for continuous use
(C. Kim, Mirusmonov, & Lee, 2010)	M-Payment	TAM	Korea	Intention for future use (for non-user) & Intention to continuously use.
(Klein, 2007)	Patient-Physician Portal	TAM	U.S.A	Behavioral intention
(Limayem & Cheung, 2008)	Internet-Based Learning Technologies (Blackboard)	IS Continuous Model/Expected Confirmation Model	-	Continuous intention
(Bhattacherjee, 2001)	Online Banking	Expectation Confirmation Theory (ECT)	-	Continuous intention for usage
(Lwoga, 2013)	Library 2.0	Updated D&M	Tanzania	Intention to re-use
(Mohammadi, 2015)	e-learning	Updated D&M, TAM	Iran	Intention for future use
(Ramayah et al., 2010)	e-learning	Updated D&M	Malaysia	Intention to continue use
(Teo et al., 2009)	E-Government	Updated D&M	Singapore	Intention to continue use
(Y. S. Wang, 2008)	E-Commerce	Updated D&M, TAM	Taiwan	Intention to re-use
(L. Zhao et al., 2012)	Mobile Value Added Services	Updated D&M	China	Continuance intention
(Zhou, 2013)	Mobile Payment Service	Updated D&M	China	Continuous intention
(Zhu et al., 2013)	Travelling Web-sites	Updated D&M, TAM	-	Continuous intention

Appendix F_5

Summary of Studies Related to the Use (U) of IS

Author(s)	Information System	Country	Measurement(s)
(Iskender & Ozkan, 2015)	E-Government IS	Turkey	Nature of Use, No of Site Visit & No of Transaction
(Yengin et al., 2011)	e-learning	-	PowerPoint slides, Audio, Script, Discussion board, Case studies, Practice problems, Excel tutorials, Assignments & Practice exam - (Nature of Use)
(Goh, 2014)	E-Commence Website	Singapore	Visit, Place Order, Payment, Feedback and Inquiries, Discussion & Advertising and Marketing
(Al-Debei et al., 2013)	Web Portal	Jordan	Voluntary of Use, Frequency of Use, Duration of Use, & Use to Perform Specific Task
(Baraka et al., 2013)	Call Center IS	Egypt	Nature of Usage (Inquiry, Orders, Technical Support, Financial Transaction and Other Services) & Amount of Use (User Retention Rate, New Customer, Customer Re-occurrence)
(Chong et al., 2010)	Web-based Business-to-Consumer (B2C) E-Commerce	USA	Updating account information, Accessing information to solve problems, Information retrieval to solve problems & Completion of the transaction
(Eom, 2012)	Learning Management System (LMS)	USA	Frequency of Use, Dependency to the LMS
(Eom et al., 2012)	e-learning	USA	Frequency of Use, Dependency to the LMS
(Halonen et al., 2010)	Knowledge Transfer in VLE	Finland	Density, Timetable, Study Material, Exercise & Guideline to Accomplishing Degree

Appendix F_6

Summary of Studies Related to the User Satisfaction (US) of IS

Author(s)	Information System	Country	Measurement(s)
(Yengin et al., 2011)	e-learning	-	Overall Satisfaction, Enjoyable Experience, Overall Success & Recommend to Other Faculties
(Balasubramaniam, Jagannathan, & Natarajan, 2014)	Internet Banking	India	Efficiency, Recommend to Others, Correct Decision & Overall Satisfaction
(Alhendawi & Baharudin, 2014)	Web-Based IS	International Organization	Internal Satisfaction & Overall Satisfaction
(Iskender & Ozkan, 2015)	E-Government Services	Turkey	Repeat Use, Repeat Visit
(Manchanda & Mukherjee, 2014)	DSS in Banking	Oman	Meet the Users' Need, Efficient, Effective & Overall Satisfaction
(Zhou, 2013)	Mobile Payment Services	China	Overall Satisfaction, Contented (willing to use) & Enjoyment
(Lawrence, 2011)	Healthcare IS	USA	Efficiency, Effectiveness & Overall Satisfaction
(Goh, 2014)	E-Commence Website	Singapore	Repeat Visit, Repeat Order, Reduced Complains (Information, System, and Services) & Overall Satisfaction

Appendix F7

Summary of Studies Related to the Net Benefits (NB) of IS

Author(s)	Information System	Country	Measurement(s)
(Al-Debei et al., 2013)	Web Portal	Jordan	Job Performance (Productivity, Task Innovation, Customer Satisfaction & Management Control)
(Baraka et al., 2013)	Call Center IS	Egypt	Growth in customer base, Increased sale, Market share, Global reach, Profit, Productivity & Return on investment
(Chong et al., 2010)	Web-based Business-to-Consumer (B2C) E-Commerce	USA	Reduction of administrative costs, Reduction in time, Enhancement of service, Enhancement of customer relationship & Improved communication
(Halonen et al., 2010)	Knowledge Transfer in VLE	Finland	Positive Aspects (Benefits to studies, Benefits to accomplishing degrees) & Negative Aspects (Use of time, Self-guidance, Teachers' output)
(Iskender & Ozkan, 2015)	E-Government IS	Turkey	Cost savings in public institutions, Expanded ways to reach stakeholders, Additional services provided to stakeholders, Reduced search costs for information & Time savings for stakeholders
(Yengin et al., 2011)	e-learning	-	Positive aspects (Enhanced learning / Improved Productivity, Empowered / Personal Valuation, Time savings, Academic Success), Negative aspects (Lack of contact, Isolation, Quality concerns, Technology) & Dependence

Appendix F_8

Workload (WL) Measurement by the Previous Studies

Author(s)	Issue	Country	Measurement(s)
(Reyes & Imber, 1992)	Teachers' Workload	USA	Fairness of Overall Workload
(Kember & Leung, 2006)	Student's Workload	Hong Kong	Task Completion Without Stress & Reasonable Amount of Workload
(Sharifah et al., 2014)	Teachers' Workload – Technical Secondary Schools	Malaysia	Total Hours (Score for Test and Exam, School-Based Assessment, Management of Workshop, Student Information, Equipment and Machine, Teachers and Staff Information & Management of Workshop Store)
(Smith & Bourke, 1992)	Teachers' Workload	Australia	Administration, Teaching, Resources & Assessment
(Denton et al., 2002)	Homecare Workers - Healthcare	Canada	Job Pace, Job Demand, Excessive Jobs, Multiple Task at the Same Time, Responding to Crisis, Work-related-problem to Home & Hectic
*(Sanchez & Aleman, 2011)	ICT Tools to Support Attendance-Based Teaching	Spain	ICT as another workload
(Selwood, 2005)	Primary School Teachers' Use of ICT for Administration and Management	England	ICT to reduce Workload
(Boyle et al., 1995)	Dimensions of Teacher Stress	Mediterranean Islands of Malta and Gozo	Responsibility & Volume of Works
(Selwood & Pilkington, 2005)	ICT to reduce Teachers' Workload	England & Wales	-

Appendix F9

Previous IS Studies Related to Teacher's Workload

No	Author(s)	Approach	Country	Type of EIS	Empirical Evidence (Related to Workload)	Remarks
1	(Higgins, Beauchamp, & Miller, 2007)*	SLR	UK	Interactive Whiteboard	-N/A	- WL is not the focus of the study. - Might reduce teacher's workload.
2	(Selwood & Pilkington, 2005)*	Government Report - Survey	UK	ICT (for teaching)	ICT reduce teachers' workload	- Did not focus on specific EIS. - Descriptive analysis. - Did not mention how Workload influence the use of ICT.
3	(Abuhmaid, 2011)**	Qualitative	Jordan	ICT (in general)	Workload hinders teachers from using ICT	- Result cannot be generalized.
4	(Cheok & Wong, 2016)**	Qualitative	Malaysia	Frog VLE	Workload hinders teachers from using ICT	- Result cannot be generalized.
5	(Hu et al., 2003)**	Survey	Hong Kong	MS PowerPoint	- N/A	- WL is not the focus of the study. - Workload hinders teachers from using ICT - Suggestion based on literature review.

6	(Inan & Lowther, 2009)#	Survey	USA	Technology (in general)	-N/A	- WL is not the focus of the study. - Suggesting the future research should integrate WL into the framework.
7	(Johari & Siti Norazlina, 2010)**	Survey	Malaysia	ICT (in general)	-N/A	- WL is not the focus of the study. - Workload (time barrier) hinders teachers from using ICT. - Discussed in conclusion.
8	(M. S. H. Khan et al., 2012)**	Traditional Review	Bangladesh	ICT (in general)	-N/A	- WL is not the focus of the study. - Discussion based on the LR. - Workload hinders teachers from using ICT.
9	(Letsoalo et al., 2014)**	Survey	South Africa	NIECS - Examination IS	- Workload hinders officers from using the system.	- Descriptive analysis. - Did not map out WL in framework.
10	(Norazilawati et al., 2013)**	Qualitative	Malaysia	Frog VLE	- Workload hinders teachers from using the system.	- Result cannot be generalized.
11	(Rahman et al., 2013)**	Survey	Malaysia	ICT (in general)	- Workload (time barrier) hinders teachers from using the system.	- Descriptive analysis. - Only use 30 respondents. - Did not map out WL in framework.
12	(Raman & Yamat, 2014)**	Qualitative	Malaysia	ICT (in general)	- Workload hinders teachers from using the system.	- Result cannot be generalized.
13	(Sanchez & Aleman, 2011)***	Survey	Spain	ICT (in general)	- ICT as extra workload for teachers.	- Descriptive analysis. - Did not map out WL in framework.
14	(Selwood, 2005)*	Survey	UK	ICT (for management)	- ICT reduce teachers' workload	- Descriptive analysis. - Did not map out WL in framework. - Did not mention how Workload influence the use of ICT.

15	(Vinluan, 2011)*	Survey	Philippines	ICT (for management)	- ICT reduce teachers' workload	- Descriptive analysis. - Did not map out WL in framework.
16	(D. Wu et al., 2010)***	Survey	US & Austria	Asynchronous Participatory Examinations	- N/A	- WL is not the focus of the study. - Discussion in LR section. - The system (could) bring extra workload for teachers.
17	(Zawiyah & Mariah, 2008)***	Survey	Malaysia	SMPP-KP (EMIS)	- The system as extra workload for teachers	- Did not map out WL in framework. - Old study - 10 years ago. - Data collected in one district only.
18	(Condie & Munro, 2007)*	Traditional Review	UK	ICT (in general)	- ICT reduce teachers' workload	- Discussion based on the LR.
19	(Sharifah et al., 2014)***	Survey	Malaysia	EIS	- The system as extra workload for teachers	- WL is not the focus of the study. -To investigate sources of teachers' workload. - Descriptive analysis. - Did not mention how Workload influence the use of ICT.

Note: ** - ICT could reduce teachers' workload, ** - Workload hinders teachers from using ICT, *** - ICT as extra workload, # -suggestion for future research.*

Appendix G

The Analysis of Instrument's Content Validity using Content Validity Index (CVI)

1. Information Quality

Items:

1a - The Frog VLE provides information that is exactly what I need.
1b - The Frog VLE provides information that is relevant to teaching.
1c - The Frog VLE provides sufficient information.
1d - The Frog VLE provides information that is easy to understand.
1e - The information provided by Frog VLE is clearly presented on the screen.
1f - Information provided by Frog VLE is in a useful format.
1g - The Frog VLE provides up-to-date information.
1h - Through Frog VLE, I get the information I need in time
1i -. Information provided by Frog VLE is reliable.
1j - Overall, the Frog VLE provides me with high-quality information.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	1a	4	4	3	3	4	4	3	7	1.00	Retain
2	1b	4	3	3	4	4	4	3	7	1.00	Retain
3	1c	4	4	2	3	3	4	3	6	0.86	Retain
4	1d	4	4	4	4	4	4	3	7	1.00	Retain

5	1e	2	2	4	4	4	3	3	5	0.71	Delete
6	1f	4	2	2	4	4	3	4	5	0.71	Delete
7	1g	4	4	4	4	4	4	4	7	1.00	Retain
8	1h	4	4	1	4	4	4	3	6	0.86	Retain
9	1i	4	4	4	2	4	4	4	6	0.86	Retain
10	1j	4	4	2	4	1	4	1	4	0.57	Delete
									s-CVI/Ave	**0.86**	**PASS**

2. System Quality

Items:

2a - The Frog VLE is always available.
2b - The Frog VLE is user-friendly.
2c - The Frog VLE has attractive features that appeal to users.
2d - It is easy for me to share the content on Frog VLE.
2e - It is easy for me to post comments on Frog VLE.
2f - It is easy to find the information I need from the Frog VLE.
2g - The Frog VLE provides interactive features between users and system.
2h - The Frog VLE enables me to accomplish task quicker.
2i - The Frog VLE provides a personalized information presentation.
2j - The Frog VLE is easy to use.
2k - The Frog VLE is easy to navigate.
2l - The Frog VLE provides high-speed information access.
2m - The Frog VLE enables me to get on to it quickly.
2n - The Frog VLE quickly loads all the text and graphics.
2o - The Frog VLE is accessed easily from inside the school.
2p - The Frog VLE is accessed easily from outside the school.
2q - The Frog VLE is available most of the time.
2r - The Frog VLE functions accurately most of the time.
2s - Overall, in terms of system quality, I would rate the Frog VLE highly.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	2a	4	4	4	4	4	4	3	7	1.00	Retain
2	2b	4	4	3	3	4	4	4	7	1.00	Retain
3	2c	4	4	3	3	4	4	4	7	1.00	Retain
4	2d	4	2	1	4	4	4	4	5	0.71	Delete
5	2e	4	2	1	4	4	4	4	5	0.71	Delete
6	2f	2	1	4	4	3	4	4	5	0.71	Delete
7	2g	4	4	2	4	4	4	2	5	0.71	Delete
8	2h	4	4	4	3	4	4	4	7	1.00	Retain
9	2i	4	2	1	3	4	4	3	5	0.71	Delete
10	2j	4	2	4	4	4	2	4	5	0.71	Delete
11	2k	4	4	4	4	4	4	4	7	1.00	Retain
12	2l	4	4	4	4	4	3	4	7	1.00	Retain
13	2m	4	2	4	2	4	4	3	5	0.71	Delete
14	2n	4	4	4	4	2	4	2	5	0.71	Delete
15	2o	4	2	2	4	3	4	3	5	0.71	Delete
16	2p	4	2	2	4	4	4	1	4	0.57	Delete
17	2q	4	4	1	4	4	3	1	5	0.71	Delete
18	2r	4	4	4	3	4	4	3	7	1.00	Retain
19	2s	4	3	3	3	1	3	1	5	0.71	Delete
									s-CVI/Ave	**0.81**	**PASS**

3. Service Quality

Items:

3a - The Frog VLE offers diversiform contact channels (FAQ, email, toll-free number, etc.)
3b - The Frog VLE provides a proper level of on-line assistance.
3c - The Frog VLE helpdesk is prompt in responding to my queries.
3d - The Frog VLE helpdesk respond in a cooperative manner.
3e - The Frog VLE helpdesk provide high availability for consultation.
3f - The Frog VLE helpdesk is available in case I have a technical problem.
3g - The Frog VLE helpdesk is willing to help whenever I need support.
3h - The Frog VLE helpdesk gives users individual attention.
3i - The Frog VLE helpdesk is highly knowledgeable.
3j - The behavior of Frog VLE helpdesk instills confidence in me.
3k - The Frog VLE is designed with teachers' best interests at heart.
3l - The Frog VLE is designed to satisfy the needs of teachers.
3m - Service provided by Frog VLE understands my needs.
3n - The Frog VLE helpdesk dedicate enough time to resolve my specific technical concerns.
3o - The helpdesk shows a sincere interest in solving technical problems related to Frog VLE.
3p - The Frog VLE has up-to-date equipment.
3q - The Frog VLE's physical facilities are visually appealing.
3r - Overall, in terms of service quality, I would rate the Frog VLE highly.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	3a	4	2	1	3	4	4	3	5	0.71	Delete
2	3b	4	4	1	4	4	4	1	5	0.71	Delete
3	3c	4	4	4	4	4	4	3	7	1.00	Retain
4	3d	4	2	4	3	4	2	3	5	0.71	Delete
5	3e	3	4	2	3	2	4	4	5	0.71	Delete
6	3f	3	3	4	4	4	4	4	7	1.00	Retain
7	3g	4	4	2	3	4	4	3	6	0.86	Retain

8	3h	4	4	2	3	4	4	4	6	0.86	Retain
9	3i	4	4	4	4	4	4	4	7	1.00	Retain
10	3j	2	4	2	4	4	4	3	5	0.71	Delete
11	3k	4	2	3	4	4	4	1	5	0.71	Delete
12	3l	2	3	2	3	4	4	3	5	0.71	Delete
13	3m	2	2	4	3	4	4	2	4	0.57	Delete
14	3n	4	4	2	3	4	4	3	6	0.86	Retain
15	3o	4	4	4	4	4	4	3	7	1.00	Retain
16	3p	3	4	4	3	4	4	3	7	1.00	Retain
17	3q	4	4	2	3	3	4	3	6	0.86	Retain
18	3r	4	4	2	4	1	4	1	4	0.57	Delete
									s-CVI/Ave	**0.81**	**PASS**

4. Intention to Use

Items:

4a - I intend to continue using the Frog VLE.
4b - I will regularly use the Frog VLE in the future.
4c - I will continue using the Frog VLE in the future.
4d - My intention is to continue using the Frog VLE rather than traditional classroom teaching.
4e - Assuming that I have access to the Frog VLE, I intend to use it.
4f - I intend to be a heavy user of Frog VLE.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	4a	4	4	2	3	4	4	4	6	0.86	Retain
2	4b	4	4	4	4	4	4	4	7	1.00	Retain
3	4c	4	2	1	4	1	4	4	4	0.57	Delete

4	4d	4	4	1	3	4	2	2	4	0.57	Delete
5	4e	4	4	4	4	4	4	3	7	1.00	Retain
6	4f	4	4	2	4	4	4	4	6	0.86	Retain
									s-CVI/Ave	**0.81**	**PASS**

5. Use

Items:

5a - I frequently use the Frog VLE.
5b - I use the Frog VLE a lot.
5c - I use the Frog VLE whenever possible.
5d - I use the Frog VLE whenever appropriate.
5e - I depend upon the Frog VLE.
5f - I use Frog VLE voluntarily.
5g - I use Frog VLE for teaching.
5h - I use Frog VLE to conduct tests to my students.
5i - I use Frog VLE to communicate with students.
5j - I use Frog VLE for collaboration with other teachers.
5k - I use Frog VLE to retrieve educational information.
5l - I use Frog VLE to retrieve teaching resources.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	5a	4	4	1	4	4	4	4	6	0.86	Retain
2	5b	4	2	1	4	4	4	3	5	0.71	Delete
3	5c	4	2	1	3	4	4	4	5	0.71	Delete
4	5d	4	4	1	3	4	4	4	6	0.86	Retain
5	5e	1	4	1	4	4	4	4	5	0.71	Delete
6	5f	4	4	4	2	4	4	4	6	0.86	Retain
7	5g	4	4	4	4	4	4	4	7	1.00	Retain

8	5h	4	4	4	4	4	4	4	7	1.00	Retain
9	5i	4	4	4	4	4	4	4	7	1.00	Retain
10	5j	4	4	4	4	4	4	4	7	1.00	Retain
11	5k	4	4	2	4	4	4	4	6	0.86	Retain
12	5l	4	4	4	4	4	4	4	7	1.00	Retain
									s-CVI/Ave	**0.88**	**PASS**

6. User Satisfaction

Items:

6a - Most of the teachers bring a positive attitude towards the Frog VLE function.
6b - Most of the teachers bring a positive evaluation towards the Frog VLE function.
6c - I feel contented with using Frog VLE.
6d - I feel pleased with using Frog VLE.
6e - I think the Frog VLE is very helpful.
6f - I think the Frog VLE is successful.
6g - Overall, I am satisfied with the Frog VLE.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	6a	1	4	1	4	4	4	3	5	0.71	Delete
2	6b	1	4	1	2	4	4	3	4	0.57	Delete
3	6c	4	4	4	3	4	4	4	7	1.00	Retain
4	6d	4	4	1	3	4	4	4	6	0.86	Retain
5	6e	4	4	4	4	4	4	4	7	1.00	Retain
6	6f	4	4	4	3	4	4	4	7	1.00	Retain
7	6g	4	4	1	4	1	4	2	4	0.57	Delete
									s-CVI/Ave	**0.82**	**PASS**

7. Net Benefits

Items:

8a - The Frog VLE is time-saving.
8b - The Frog VLE enhances my teaching skills.
8c - The Frog VLE helps me improve my job performance.
8d - The Frog VLE empowers me.
8e - The Frog VLE contributes to my career success.
8f - Overall, Frog VLE is more beneficial to use.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	8a	4	4	4	3	4	4	4	7	1.00	Retain
2	8b	4	4	4	4	4	4	4	7	1.00	Retain
3	8c	4	4	4	4	4	4	4	7	1.00	Retain
4	8d	4	4	4	3	4	4	4	7	1.00	Retain
5	8e	4	4	4	3	4	4	3	7	1.00	Retain
6	8f	4	4	1	3	1	3	1	4	0.57	Delete
									s-CVI/Ave	**0.93**	**PASS**

8. Workload

Items:

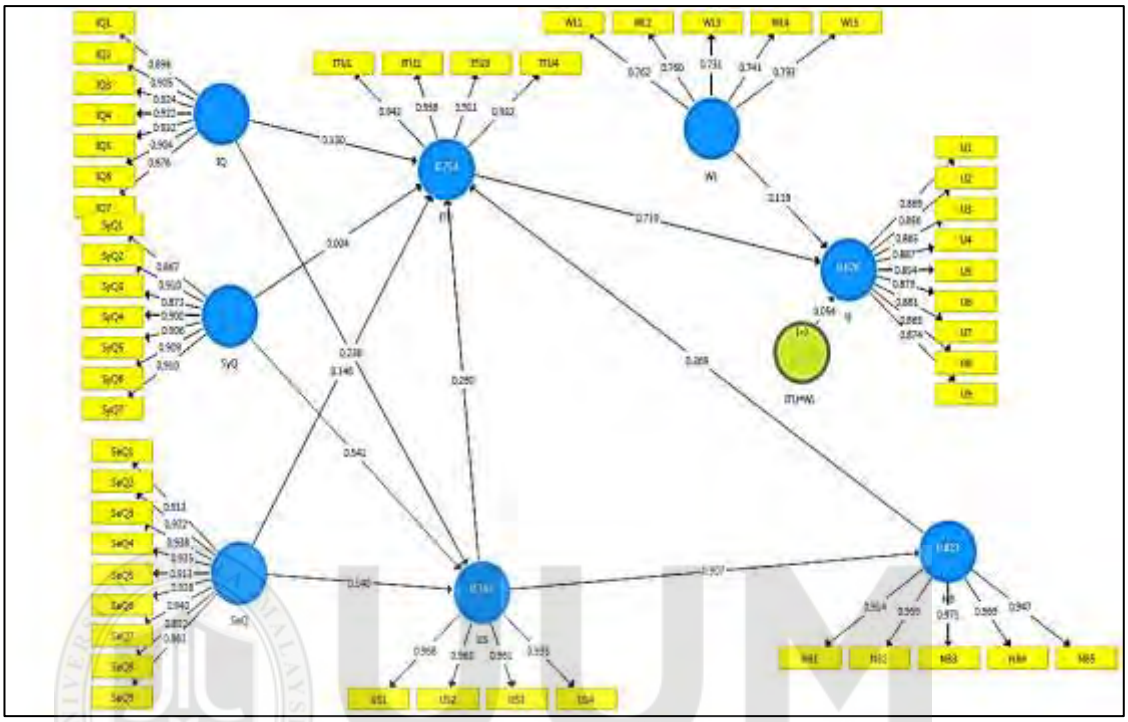
7a - The pace in my job is too fast.
7b - My job is too demanding.
7c - My job is very hectic.
7d - I have too much work to do.
7e - I am expected to do too many different tasks at the same time.
7f - I will have to learn new teaching strategies in order to use Frog VLE.
7g - The use of Frog VLE will increase my workload.
7h - The use of Frog VLE requires extra effort from me.

No	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Total Agreement	i-CVI	Action
1	7a	4	4	4	3	4	4	4	7	1.00	Retain
2	7b	4	4	4	3	4	4	4	7	1.00	Retain
3	7c	4	4	4	3	4	4	4	7	1.00	Retain
4	7d	4	4	4	1	4	4	4	6	0.86	Retain
5	7e	2	4	1	1	4	3	4	4	0.57	Delete
6	7f	4	3	3	2	4	4	4	6	0.86	Retain
7	7g	4	4	2	3	4	4	4	6	0.86	Retain
8	7h	4	4	4	2	4	4	2	5	0.71	Delete
									s-CVI/Ave	**0.86**	**PASS**

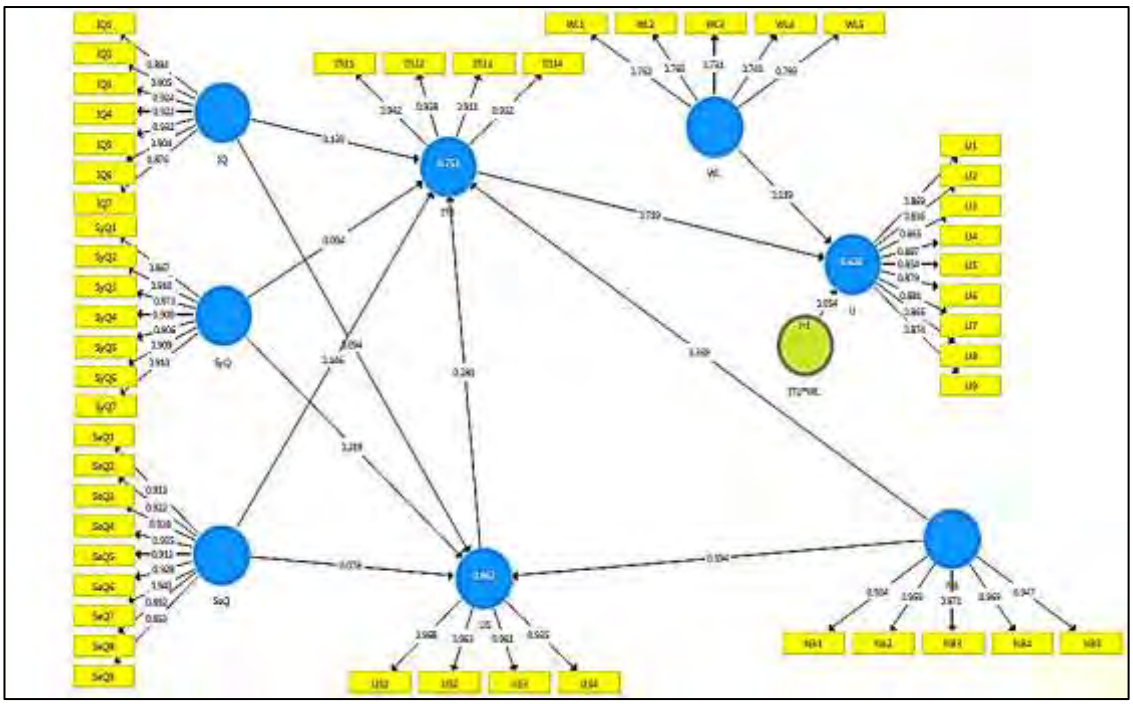
Note:
** Cut Off Point for i-CVI = 0.78 (Lynn, 1986), Cut Off Point for s-CVI/Ave = 0.80 (Davis, 1992)*

Appendix H

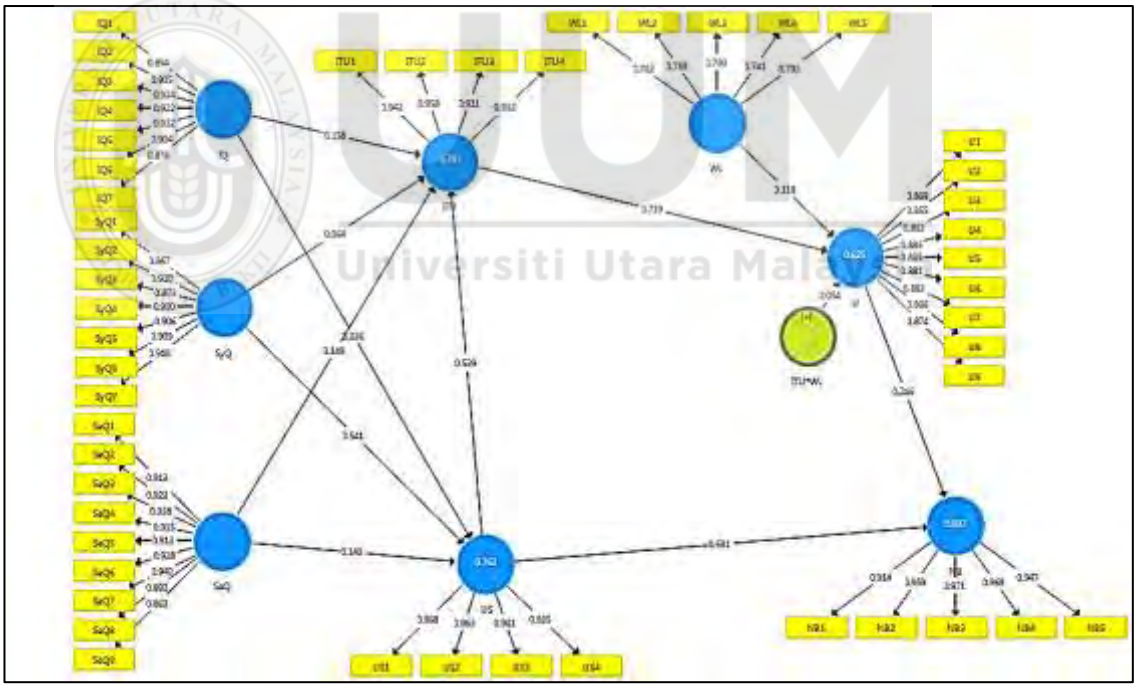
Comparison of Possible Models Retrieved from the Conceptual Model



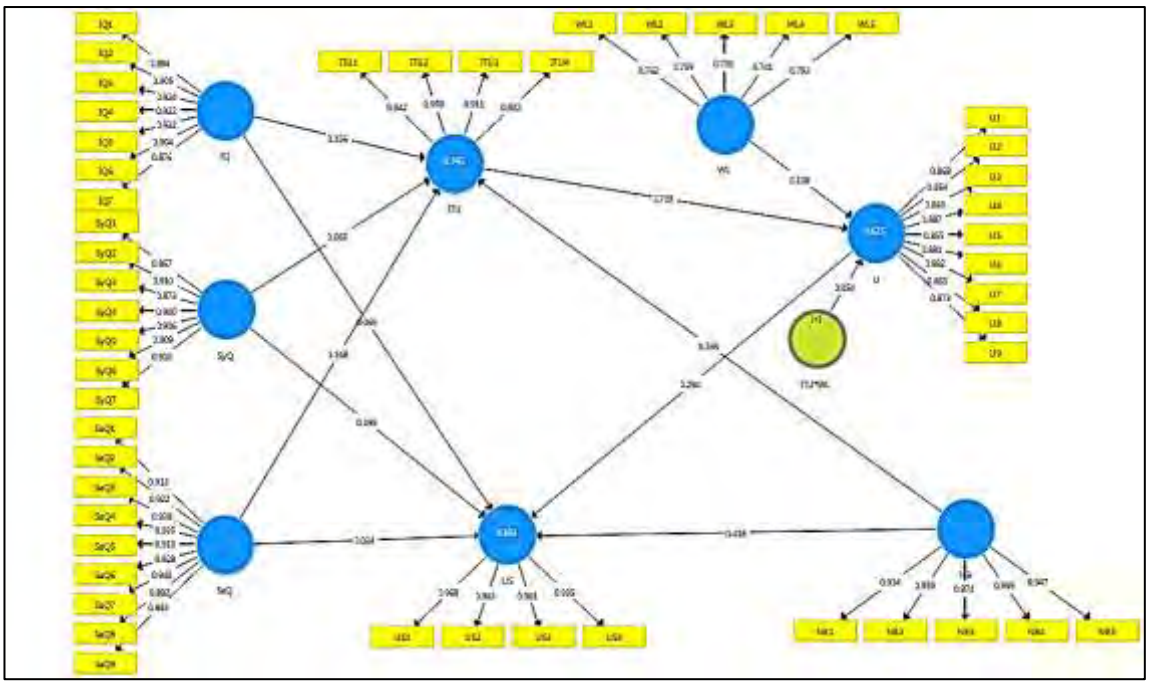
MODEL 1



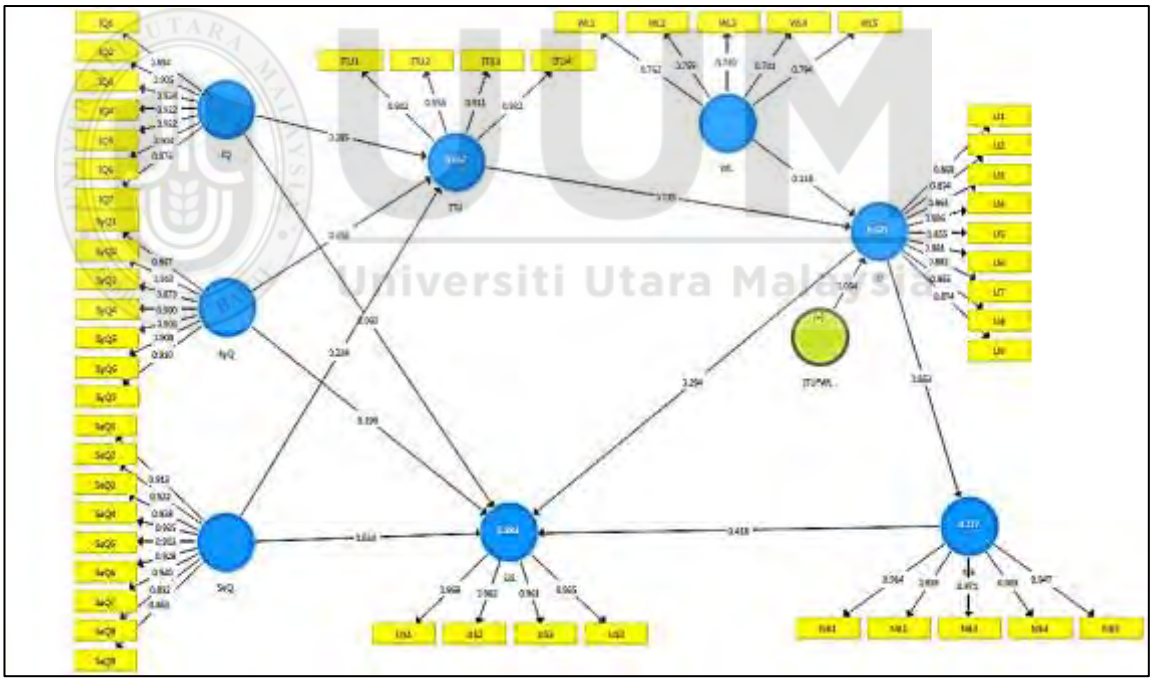
MODEL 2



MODEL 3



MODEL 4



MODEL 5

Appendix I_1

VLE Implementation Strategy for Malaysian Schools

Frog Virtual Learning Environment

Implementation Strategy for Malaysian Schools
(Appertaining to the VLE Success Model)

By:

Hapini Awang, Zahurin Mat Aji & Wan Rozaini Sheik Osman © 2018
School of Computing, Universiti Utara Malaysia.

TABLE OF CONTENT

1 CONTEXT

1.1 Background Information

Advances in technology together with changes in pedagogic methodologies have seen many educational institutions around the world invest in implementing virtual learning environments (VLE) to support the teaching and learning process. A VLE provides school communities with a unified platform for content delivery, communication, assessment, and course management. It also helps to improve students' skills through engaging them in online learning activities and communication. It is one of the largest digital learning platforms available to schools with over 10 million students and teachers using it around the world. In Malaysia, the Frog VLE is available to all 10,000 schools throughout the country through the 1BestariNet project. It is an award-winning, cloud-based virtual learning environment that has been designed by Frog Education to simplify and enhance teaching and learning, communication and administration. With experience in the market for nearly 15 years, the Frog VLE is not just used in Malaysia but is also being used worldwide in 23 countries, in over 12,000 schools, and more than 20 million users within a community of teachers and learners.

1.2 VLE Success Model

Despite the successful record of Frog VLE in other countries, the statistic of usage in Malaysia is still disappointing, which indicated that it is not on the right path of success. Therefore, we have conducted an empirical research to investigate the factors of VLE success among Malaysian teachers. As a result, we have successfully produced the VLE success Model. This model, which structurally map out the related significant factors, describes how the VLE continuous usage could be established, as shown in Figure 1.

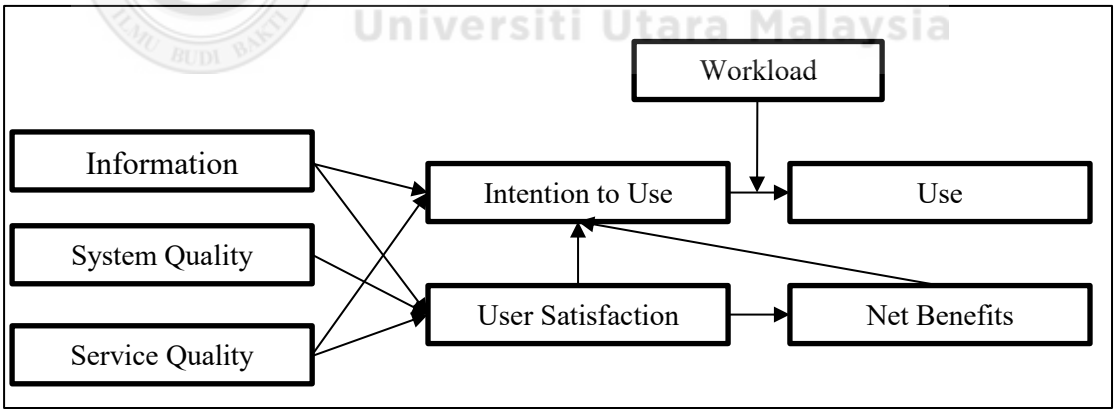


Figure 1. VLE Success Model

The VLE Success Model portrays the inter-relationship between technology and human aspects in securing the VLE success, which indicated by the continuous usage. The constructs of Information Quality, System Quality and Service Quality represent the technology aspects, whereas the Intention to Use, Use, User Satisfaction, Net Benefits and Workload serve as the human aspects. To interpret this model, we have operationalized the entire related constructs, as shown in Table 1.

Table 1
Operational Definition of VLE Success Constructs

Construct	Operational Definition	Desired Criteria
INFORMATION QUALITY	The extent of output quality produced by Frog VLE.	Accurate, Relevant, Sufficient, Easy to understand, Current, Timely and Reliable.
SYSTEM QUALITY	The extent of Frog VLE technical performance.	Always available, Usable, User-Friendly, Attractive, Accessible and Reliable.
SERVICE QUALITY	The extent of services, supports and encouraging environments provided by Frog VLE and 1BestariNet.	Responsive, Assurance, Empathy and Tangible.
INTENTION TO USE	The extent of intention for future use.	High intention.
USE	The utilization of Frog VLE.	Frequent and Regular.
USER SATISFACTION	The feeling of pleasure or displeasure toward the Frog VLE.	High satisfaction.
NET BENEFITS	The impacts or benefits of using Frog VLE.	Saves time, improves productivity and improves personal value.
WORKLOAD	The amount of works and the phase of job requirements in teachers' career.	Frog VLE eases the teachers in dealing with the workload.

The VLE Success Model explains that the user satisfaction is caused by the good quality of information, system and service by Frog VLE. This feeling of satisfaction will trigger the development of intention to continue using the system, which further leads to the actual usage. In addition, the benefits of using Frog VLE should also cause the teachers to continue using Frog VLE. As for the workload, this model suggests that the heavier workload carries by teachers, the more they will be motivated to use Frog VLE.

Practically, this model suggests that; to ensure the VLE success, the quality of Frog VLE, in terms of produced information, the system itself and support services need to meet the teacher's expectation. Furthermore, the Frog VLE should be beneficial for teachers. Only when these criteria are met, then the Frog VLE could be a good solution in combating teachers' ever-increasing workload.

It has been identified from previous 'whole-school school system changes' e.g. a case study from The High School of Glasgow, UK, that without an efficient implementation strategy, many objectives and advantages of the VLE may remain unachieved. Therefore, it is vital to the success of an effective implementation, that a considered strategy should be put in place. As a guideline to fully utilize this model, we present the implementation strategy for Frog VLE implementation in Malaysian Schools. This document is intended to provide the VLE authorities and school's management with an overview of that strategy. Its intention is to ensure appropriate consideration is given to the deployment of the Frog VLE and should be seen as a working document which will continually evolve as matters are further evaluated.

1.3 Rationale

The addition of a Frog VLE within the school has the potential to bring a plethora of benefits, and these will be outlined below. However, it is also recognized that to implement such a large project, which is woven through the fabric of every aspect of school life, it will inevitably be met with some resistance. Therefore, why teachers resist change, and what steps we can do to minimize this, will also be examined in more detail before any implementation plan is formulated. The benefits of the Frog VLE will only be realized if teachers have been appropriately trained, understand those benefits and are encouraged to embrace its use.

In Malaysia, the teachers' resistance has been identified as the major issue, contributing the Frog VLE's overall statistic of low usage. In responding to this, we have started a study since 2015 to investigate the factors that influence the continuous usage of VLE. After almost three years of research, we have successfully produced the VLE Success Model, which mapped out the relationships between the factors. Therefore, in this paper, we outline the practical contributions of this model through the implementation strategy.

1.4 Frog VLE - Benefits to the Schools

A Frog VLE could make a significant contribution to many education areas by enhancing student learning and improving the student's school experience. Some of the main benefits it is capable of delivering include:

a) An 'anytime, anywhere' ethos, which better meets the needs of school's community.
b) Increasing range of options for teachers in terms of teaching, learning and assessment approaches, which in turn better support the diversity of student learning approaches.
c) Facilitating online learning experiences, which encourage student-centered learning, flexibility and choice.
d) Allowing teachers to provide instant and personalized feedback, as well as online self-assessment as a means to aid learning.
e) Encouraging development of the independent, self-motivated learner as well as engaging students in collaborative, creative multimedia group projects.
f) Creating online communities, which can provide a supportive environment for students through peer-to-peer interaction, peer review and assessment, group activities; which in turn help to build student's confidence in their own learning capabilities.
g) Supporting learning through an increased provision of, and access to, study materials.
h) Improving transparency and communication throughout the school community.
i) Reducing the school's carbon footprint.
j) Developing an integrated information system, providing enhanced user functionality and resulting in increased efficiency.
k) Allowing students, parents, and teacher to track progress.
l) Standardizing protocols resulting in a consistent, high-quality approach to learning materials.
m) Giving a single access point for timetables / school and student information / calendars / e-mail / grade books, etc.

n) Allowing teachers to use e-learning materials to support knowledge-based activities thus ensuring class contact time is more focused on active, student-centered learning exercises.

1.5 Challenges to Change

Before any plan can be devised it would be prudent to be aware of the inevitable resistance to change that will be encountered. This is due to the fact that most organizational changes are unsuccessful because of different forms of resistance. People are the most important asset in any organization, particularly schools, and their commitment and acceptance will be the main factor in determining effective implementation. Therefore, it is important to be aware of the reasons behind resistance so that these issues can be overcome. Teacher's resistance to VLE change includes the fear of:

a) Perception that VLE is less beneficial to them.
b) Feeling of unsatisfied with the quality of VLE.
c) Less control in their change than they had before.
d) Lowering the quality of their subject.
e) Limited access to ICT.
f) Their limited IT skills.
g) Migrating to new pedagogical approach.
h) Intellectual property rights and ownership of materials produced.
i) Change in their teaching practices.
j) Lack of official recognition for work with new technologies.
k) Lack of time.
l) Doing more than their job remit.
m) An increase in their workload.

Some of the key recommendations to minimize teacher's resistance include:

a) Prepare to make gradual changes and keep teachers informed along the way, so they feel part of the process and 'in the loop'.
b) Involve teachers in the design, development and understanding on the need for change.
c) Discuss with teachers their new roles, which will ensure their involvement and commitment.
d) Ensure adequate training at a variety of levels.
e) Share good practices among colleagues.

In summary, resistance to change is behind the failure of most IT-based projects. Therefore, addressing and realizing the factors behind the resistance and building those into our strategy will increase significantly our chances of a successful Frog VLE implementation.

2 STRATEGIC PLANNING

Strategic planning provides inputs for strategic thinking, which guides the actual strategy formation. By referring to VLE Success Model, we propose the school's VLE strategic plan,

including a diagnosis of the goal, strategy and situational analysis. To facilitate, the following template for Frog VLE Strategic Plan could be helpful (Table 2).

Table 2
Example of Template for School's Strategic Plan

FROG VLE STRATEGIC PLAN 2018 *SK Telanok, Cameron Highlands.*	
ABOUT US	
PAST	Where we have been.
TODAY	Where we are now.
VISION	Where we should go and why.
MISSION	Who we are, how we work toward our vision, what makes us unique.
CORE VALUE	Guiding principles of our work and how we operate.
GOALS	
OBSTACLES	What could prevent us from realizing our vision.
LONG-TERM GOAL	What we will do to realize our vision.
SHORT-TERM GOAL	What will be done in every month, for example.
MEASUREMENT OF SUCCESS	What benchmarks will be used as an indicator of success. In this case, VLE Success Model suggested the usage as an indicator.
STRATEGY	
RESOURCE ASSESSMENT	Infrastructure required to realize vision.
FINANCING	Assess strategy financial needs and avenues of income.
IMPLEMENTATION	Plan what needs to be done along implementation phases.
DISSEMINATION	How the plan will be announced/assigned, and to whom.
PROGRESS ASSESSMENT PLAN	How we will oversee progress, monitor success, and implement revisions.
PREVIOUS YEAR'S REFLECTION	
WEAKNESS	What has been identified as the weaknesses in last year's implementation.
STRENGTH	What has been identified as the strengths in last year's implementation.
SITUATIONAL ANALYSIS (SWOT)	
Internal Factors	
Strengths (+)	**Weaknesses (-)**
External Factors	
Opportunities (+)	**Threats (-)**
SWOT Analysis	
The overall analysis	

3 IMPLEMENTATION

From the VLE Success Model and our reading of literature available for successful change management within educational systems as well as identifying possible strategies to deal with resistance to change, it would appear that there are a number of steps that we have to integrate into the framework to ensure full utilization.

3.1 School Management - Vision and Sharing Awareness

To ensure that Frog VLE implementation run smooth;

a) School management and VLE strategic group need to have a clear vision of what they hope to achieve and share this fully and regularly with teachers.
b) The realization that nothing will happen without 'people' on board, i.e. teachers, students and parents.
c) Gradually raise the awareness of the impending changes.

3.2 VLE Facilities

Without a doubt, the facilities and infrastructure are the principal concern of the teachers in adopting Frog VLE, especially in rural schools. Indeed, our investigation has unveiled that the facilities and infrastructure's limitation, which leads to VLE availability and accessibility have been the main reason that hinders the teachers from employing the Frog VLE in their educational routines. In light of this, the school management and VLE strategic group should take some pro-active actions, especially in terms of monitoring and maintenance, as will be described in the later sections.

3.3 Training and Support

The level of training and support available to academic teachers has been crucial to the success of such a project, a factor often underemphasized in change, and one that has previously undermined the success of many e-learning projects. Therefore;

a) Ensure there is a program devised for on-going training and development.
b) Train teachers by showing the examples of VLE teaching methods to help them embed it into their pedagogy.
c) Ensure there is substantial development time given to teachers.

3.4 School's VLE Policy

The policy should;

a) Ensure the pace of change is controlled so as not to overwhelm the teacher, e.g. phased implementation.
b) Establish a robust yet flexible policy, with clearly defined protocols and processes.
c) Set clearly defined goals and targets that everyone is aware of.
d) Clear protocols identified for assessing supports, services, and VLE quality dimensions.

3.5 Teacher's Voice

Teachers are the most important group VLE users. Therefore, to establish the harmony and win-win situation of Frog VLE implementation, we should;

a) Identify the teachers perceived strengths, weaknesses, opportunities and threats (SWOT analysis) of developing a VLE – give them a voice.
b) Give them opportunities to voice and challenge their beliefs about VLE.
c) Identify teachers' needs and how the Frog VLE can be used to assist them.
d) Evaluative feedback procedures – lead to a realistic and effective approach to change management, as we will provide the guideline of teacher's perception assessment in the later section.

4 ROLES AND REPONSIBILITIES - DECISION-MAKING PROCESS

As part of this strategy, it is important to establish the necessary decision-making bodies that will help deliver the VLE implementation. It is significant also to establish clear remits for these groups and individuals.

4.1 Overview of VLE Group Structure

A. Members of Strategic Group
Role: Monitor individual initiatives, gauge overall development progress and make decisions with respect to maintaining a comprehensive cohesive look at the Frog VLE.
Members: Headmaster / Principal, Administrative Assistant Principal, Frog Admin, ICT coordinator.

B. Members of VLE Working Party
Role: Learning and teaching aspects of the Frog VLE, i.e. methodology, pedagogy, resources and assessment.
Members: Headmaster / Principal, Administrative Assistant Principal, Head of Unit / Head of Subject's Committee, Head of Digital Learning, Frog Administrator, District or School's Frog VLE Coach.

C. Frog VLE Coach
Role: Person responsible of creating resources and showcasing good practice.
Members: To be selected by Frog VLE Coach.

D. VLE Room (Computer Laboratory) Administrator
Role: Person responsible of the room, equipment, and facilities inside.
Members: To be selected.

E. VLE Gadgets Supervisor
Role: Person responsible of gadgets such as smartphones, tablets, dongles, etc., provided by MOE and 1BestariNet.
Members: To be selected.

F. Virtual Class Teachers
Role: Person responsible of creating their own class pages.
Members: All the class teachers

4.2 Detailed Responsibility of Individuals

As can be seen in Table 3, each of the members in Frog VLE group should be clarified of their role and job scope.

Table 3
Detailed Responsibility of Individuals

PERSON / GROUP	**RESPONSIBILITY / ROLE**
Principal / Headmaster	Overall responsibility for the whole school's VLE usage.
Technical Administrator	Overall responsibility for implementing software and technical maintenance. a) Controlling portal access. b) Linking to website. c) Email ownership, all students & teachers. d) Hardware requirements, maintenance & reports.
Curricular Resource Manager	a) Manage development of resources within a particular curricular area. b) Deploy resources into Frog VLE.
Head of Department / Head of Unit / Head of Subject's Committee	Overall responsibility for their department's usage. a) Generating/identifying overview of curricular goals (with help from VLE working party/curriculum working party). b) Quality assurance of teacher's planning (timetables, goals, etc.). c) Analyzing students' progress/data – future recommendations. d) Overall implementation of Frog VLE within the school. e) Development of file structure requirements. f) Ensuring new teacher are suitably trained in using Frog VLE. g) Collating data for future improvement. h) Responsibility for the development of resources in their department.
Classroom Teachers	Overall responsibility for their class page: a) Homework assignments. b) Information. c) Images / pictures. d) Managing goals / tracking students' progress. e) Creating their weekly educational timetable. f) Extra-curricular page. g) Termly goals / topics. h) Termly newsletter / information.
Head of Digital Learning / Frog Administrator	Responsible for : a) Creating & implementing the strategy. b) Develop protocols and management of administrative tasks. c) Generate/delete rooms and members.

	d) Evaluate usage data. e) Provide strategic operational direction. f) Creating users and room allocation. g) Continual teacher training. h) General housekeeping i) Development of assessment/reporting systems. j) Reviewing strategy / next steps.

5 MONITORING AND EVALUATION

Monitoring and evaluation of Frog VLE success should be devised by the 'VLE Strategic Group' and reviewed regularly. Quarterly or monthly meetings of this group will monitor and evaluate the delivery of effective teaching and learning through the Frog VLE. It is anticipated that activities related to 'good practice' will encourage the identification, dissemination and adoption of innovations and techniques beyond those specified in this version of the Frog VLE Strategy.

In this guideline, we suggest that the monitoring of Frog VLE implementation should be done based on the two perspectives in our VLE Success Model, which are technology and human. The following sections will explain in detail of each dimension that we should put into consideration.

5.1 Information Quality

As illustrated in our VLE Success Model, the information quality is one of the important technological aspects that will ensure the teacher's satisfaction and the sustainable usage of Frog VLE. To ensure that the information provided by Frog VLE truly meets the teacher's requirement, consistent monitoring and evaluation need to be done by the Frog Administrator. We suggest the following form for evaluating the information quality of Frog VLE (Table 4). This form should be filled monthly to reflect their VLE experience in the whole month. As we know, the education demand and syllabus rapidly change, and thus, the information quality should also congruently changes. This is just for a guideline, you may adjust the form accordingly. Upon the collective reflections by the teachers, Frog Administrator should produce the overall report to be included in the monthly documentation.

Table 4
Example of Information Quality Assessment Form

INFORMATION QUALITY ASSESMENT					
Name: _____Sarip Doll_____				**Date:** __12/03/2017____	
Subject Teaches: _Pemulihan Khas (Bahasa Melayu)_____				**Class:** _2 Harapan____	
Criteria	**No**	**Metric**	**Yes**	**No**	**Remark**
Accuracy	1	As required			The content of e-syllabus contains the wrong format for the remedial class.
Relevance	2	Relevant to teaching and learning activity			
Sufficiency	3	Sufficient			
Format	4	Easy			
Currency	5	Up to date			
Timeliness	6	In time			
Reliability	7	Reliable			Information in Frog Bulletin mentioned the wrong date for School's Sports Carnival.

Apart from this, Frog Administrator and Virtual Class teachers in school should also periodically update the related information under his/her authority such as on the notice board. This will ensure the currency of the information, and the teachers and students will get the full advantage of it.

5.2 System Quality

For monthly assessment of system quality, we suggest the following form to be filled by school's Frog Administrator (Table 5).

Table 5
Example of System Quality Assessment Form

SYSTEM QUALITY ASSESSMENT					
Month: ____January___		**Year:** ____2018___			
Criteria	**No**	**Metric**	**Yes**	**No**	**Remark**
Availability	1	Always available			VDI server offline on 12, 17 Jan.
Usability	2	Usable			
	3	User-Friendly			
	4	Attractive			
Accessibility	5	High-speed access			Speed below average on 3, 6 Jan.
Reliability	6	Function accurately			

5.3 Service Quality

As suggested by our VLE Success Model, the service quality is one of the most important elements in ensuring the teacher's VLE continuous usage. Therefore, we recommend the monthly assessment based on the following form (Table 6):

Table 6
Example of Service Quality Assessment Form

SERVICE QUALITY ASSESSMENT **Month:** ___January___ **Year:** ___2018___						
Source	**Criteria**	**No**	**Metric**	**Yes**	**No**	**Remark**
Helpdesk & Technical Supports	Responsiveness	1	Prompt			
		2	Always available			
	Assurance	3	Willing to help			
		4	Highly knowledgeable			
	Empathy	5	Sincere			
		6	Friendly			12 Jan - technician come to the school with an arrogant face, to fix the server break down.
Physical Facilities	Tangibility	7	Up-to-date equipment			

5.4 Measuring Frog VLE Success among Teachers

As we all know, teachers are the most important group of Frog VLE users. We cannot simply expect that the students use, while the teachers resist the system. Therefore, we should conceive the teachers as the determinant group of Frog VLE success. To ensure that the Frog VLE implementation truly meets the teachers' expectation, we suggest that the evaluation of their perceptions to be conducted for every semi-yearly. Based on our VLE Success Model, we propose that it can be done using the following instrument (see Table 7). This instrument has gone through strict validity and reliability tests and was proved to be robust for Frog VLE evaluation.

Table 7
Instrument to Measure Teacher's Perception of Frog VLE

1---------- 7
Extremely Disagree ***Extremely Agree***

2.0 – SYSTEM QUALITY	**Degree of Agreement**
1. The Frog VLE is always available.	**1 2 3 4 5 6 7**
2. The Frog VLE is user-friendly.	**1 2 3 4 5 6 7**
3. The Frog VLE has attractive features that appeal to me.	**1 2 3 4 5 6 7**
4. The Frog VLE enables me to accomplish task quicker.	**1 2 3 4 5 6 7**
5. The Frog VLE is easy to navigate.	**1 2 3 4 5 6 7**
6. The Frog VLE provides high-speed information access.	**1 2 3 4 5 6 7**
7. The Frog VLE functions accurately most of the time.	**1 2 3 4 5 6 7**

3.0 – SERVICE QUALITY	**Degree of Agreement**
1. The Frog VLE helpdesk is prompt in responding to my queries.	**1 2 3 4 5 6 7**
2. The Frog VLE helpdesk is available in case I have a technical problem.	**1 2 3 4 5 6 7**
3. The Frog VLE helpdesk is willing to help whenever I need support.	**1 2 3 4 5 6 7**
4. The Frog VLE helpdesk gives users individual attention.	**1 2 3 4 5 6 7**
5. The Frog VLE helpdesk is highly knowledgeable.	**1 2 3 4 5 6 7**

6. The Frog VLE helpdesk dedicates enough time to resolve my specific technical concerns.	1 2 3 4 5 6 7
7. The helpdesk shows a sincere interest in solving technical problems related to Frog VLE.	1 2 3 4 5 6 7
8. The Frog VLE has up-to-date equipment.	1 2 3 4 5 6 7
9. The Frog VLE's physical facilities are visually appealing.	1 2 3 4 5 6 7

4.0 – INTENTION TO RE-USE	**Degree of Agreement**
1. I intend to continue using the Frog VLE.	1 2 3 4 5 6 7
2. I will regularly use the Frog VLE in the future.	1 2 3 4 5 6 7
3. Assuming that I have access to the Frog VLE, I intend to use it.	1 2 3 4 5 6 7
4. I intend to be a heavy user of Frog VLE.	1 2 3 4 5 6 7

5.0 – TEACHER'S SATISFACTION	**Degree of Agreement**
1. I feel contented using Frog VLE.	1 2 3 4 5 6 7
2. I feel pleased using Frog VLE.	1 2 3 4 5 6 7
3. I think the Frog VLE is very helpful.	1 2 3 4 5 6 7
4. I think the Frog VLE is successful.	1 2 3 4 5 6 7

5.0 – NATURE OF USAGE	**Degree of Agreement**
10. I use Frog VLE voluntarily.	1 2 3 4 5 6 7
11. I use Frog VLE for teaching.	1 2 3 4 5 6 7
12. I use Frog VLE to give tests to my students.	1 2 3 4 5 6 7
13. I use Frog VLE to communicate with students.	1 2 3 4 5 6 7
14. I use Frog VLE to collaborate with other teachers.	1 2 3 4 5 6 7
15. I use Frog VLE to retrieve educational information.	1 2 3 4 5 6 7
16. I use Frog VLE to retrieve teaching resources.	1 2 3 4 5 6 7

6.0 – VLE BENEFITS	**Degree of Agreement**
1. The Frog VLE is time-saving.	1 2 3 4 5 6 7
2. The Frog VLE enhances my teaching skills.	1 2 3 4 5 6 7
3. The Frog VLE helps me improve my job performance.	1 2 3 4 5 6 7
4. The Frog VLE empowers me.	1 2 3 4 5 6 7
5. The Frog VLE contributes to my career success.	1 2 3 4 5 6 7

To determine the level of each VLE success dimension, the average of score needs to be calculated, as we provide the example in the next paragraph. As an indicator, the following range can be used (if you use 7-point scale).

1.0 - 3.0: Low
3.1 – 5.0: Moderate
5.1 – 7.0: High

For example, based on the following rating, the average of this teacher A's intention to continue using Frog VLE is;

$$\frac{1+2+3+2}{4} = 2$$

So, the average score of 2 means that the Teacher A has low intention to continue using the Frog VLE. Same goes to Teacher B, which gave the average score of 3.75

(moderate). Therefore, to calculate the mean score of all the teachers in that particular school, let's say; SK Telanok has two teachers, Teacher A and Teacher B. The average score for teachers' intention to continue using Frog VLE is 2.88, which falls in the category of low intention.

$$\frac{2 + 3.75}{2} = 2.88$$

Teacher A

4.0 – INTENTION TO RE-USE	Degree of Agreement
1. I intend to continue using the Frog VLE.	1 2 3 4 5 6 7
2. I will regularly use the Frog VLE in the future.	1 2 3 4 5 6 7
3. Assuming that I have access to the Frog VLE, I intend to use it.	1 2 3 4 5 6 7
4. I intend to be a heavy user of Frog VLE.	1 2 3 4 5 6 7

Teacher B

4.0 – INTENTION TO RE-USE	Degree of Agreement
1. I intend to continue using the Frog VLE.	1 2 3 4 5 6 7
2. I will regularly use the Frog VLE in the future.	1 2 3 4 5 6 7
3. Assuming that I have access to the Frog VLE, I intend to use it.	1 2 3 4 5 6 7
4. I intend to be a heavy user of Frog VLE.	1 2 3 4 5 6 7

5.5 Reports and Documentations

To ensure the successful implementation of Frog VLE, the proper documentation and reports need to be prepared. This reports and documentation will be the strong evidence for Frog VLE authorities like 1BestariNet to enhance their services. In this guideline, we suggest the monthly, semi-yearly and annual reports that need to be prepared (Table 8).

Table 8
VLE Reports and Documentations

Monthly			
No	**Report**	**Elements**	**Person-In-Charge**
1	Speed Test	Upload time	Frog Administrator Technical Administrator
		Download time	
2.	Facilities Monthly Report (e.g. Table 9)	Number of equipment	Frog Administrator VLE Room Administrator Technical Administrator
		Number of working equipment	
		Number of damaged/lost equipment	
		Details of the damaged, including the cause etc.	
		Maintenance	
3.	Usage (all type of users)	Average session time	Frog Administrator Head of Digital Learning Head of Department
		Unique users	
		Total log-ins	
4.	Teacher's Reflection on Information Quality	Generated based on Table 4	Frog Administrator Head of Digital Learning

5.	System Quality Assessment	Generated based on Table 5	Frog Administrator Head of Digital Learning
6.	Service Quality Assessment	Support	Frog Administrator Head of Digital Learning
		Maintenance	
Semi-Yearly			
No	**Report**	**Elements**	**Person-In-Charge**
1.	Teacher's perception (e.g. Table 10)	Information Quality (IQ)	Frog Administrator Head of Digital Learning
		System Quality (SyQ)	
		Service Quality (SeQ)	
		Intention to Re-use (ITU)	
		Teacher's Satisfaction (US)	
		VLE Benefits (NB)	
Annual			
No	**Report**	**Elements**	**Person-In-Charge**
1.	Strategic planning for next year	Goal	Strategic Group
		Strategy	
		Previous year's reflection	
		Situational analysis	

Table 9
Facilities Monthly Report

Date:					
No	**Equipment / Gadget**	**Quantity (Serial No)**	**Working**	**Lost / Damaged**	**Service**
1.	Frog Appliance	1 SKT/VLE/001	Yes	-	*Date: 10.02.17* *Details: Short circuit burned the switch. The service was done by 1BestariNet Technical Support*
2.	VDI Clients	5			
		SKT/VLE/2/001	Yes		
		SKT/VLE/2/002	Yes		
		SKT/VLE/2/003		Yes	
		SKT/VLE/2/004	Yes		
		SKT/VLE/2/005	Yes		

Table 10
Analysis of Teacher's Perceptions

School Name: SK Telanok, Cameron Highlands **Term:** 1/2018 **Total Teachers:** 12							
No	**Teacher**	**Average Score**					
		IQ	**SyQ**	**SeQ**	**ITU**	**US**	**NB**
1.	Said	2.10 Low	3.12 Average	2.50 Low	3.28 Average	4.06 Average	5.31 High
2.	Samad	2.12 Low	3.13 Average	2.58 Low	3.26 Average	4.03 Average	5.32 High
3.	Wok Yoh	2.22 Low	3.14 Average	2.54 Low	3.25 Average	4.04 Average	5.33 High

…	…	…	…	…	…	…	…
Overall Score		2.22 Low	3.23 Average	2.56 Low	3.21 Average	4.07 Average	5.34 High

6 SUMMARY

"The Internet is changing the way we work, socialize, create and share information, and organize the flow of people, ideas, and things around the globe. Yet the magnitude of this transformation is still underappreciated."

If we can capitalize on the very real potential the VLE has to transform educational pedagogy at our school and ensure that the teachers are motivated to embrace new ideas and methodologies, we will be in a position of having our school identified as the school for excellence in not only ICT but in forward-thinking, innovative and creative education. We will be delivering the very best education to our students in a context that fits 'their world' and equipping them with the essential skills for their future in the 21st century.

The implementation strategy presented in this paper is not necessarily fit all the school's environments, cultures and climates. Here, we only provide the guidelines and examples based on our VLE Success Model, and thus, the further adjustments are required to cope with the respective disparities. Nevertheless, this implementation strategy should be the basis for every school to ensure the successful implementation of Frog VLE in Malaysia.

"For tomorrow belongs to the people who prepare for it today"

7 PRACTITIONER'S VALIDATION

a) Do you refer to any 'Implementation Strategy' or 'Strategic Planning' for your school's VLE implementation?

YES ☐ NO ☐

a1. If **YES**, How do you get it? Please tick (/).

- Developed by school's management ☐
- Adopt from external sources (e.g. Internet, other schools etc.) - Without modification ☐
- Adapt from external sources (e.g. Internet, other schools etc.) - Modified to suit the school's environment ☐
- Others (Please mention) ☐

_____

_____

b) Do you think that this Implementation Strategy is practical for VLE implementation in school?

YES ☐ NO ☐

c) Can VLE Success Model be used as a guideline for Frog VLE implementation?

YES ☐ MAYBE ☐ NO ☐

d) Comments or suggestions.

_____

_____

_____

School/Department: _____

Name: _____

Position: _____

Signature: _____ Date: _____

Official Stamp:

Appendix I_2

Analysis for Practitioners' Validation

a) Do you refer to any 'Implementation Strategy' or 'Strategic Planning' for your school's VLE implementation?

* *This question is answered by practitioners in schools only.*

Practitioner	School	Post	Answer
A	SK Brinchang	Frog Administrator	No
B	SK Menson	Frog Administrator	Yes
C	SK Menson	Headmaster	Yes
D	SK Lemoi	Headmaster	Yes
E	SK Lemoi	Administrative Asst. Principal	Yes
F	SK Lemoi	Frog Administrator	Yes
G	SMK Sultan Ahmad Shah	Frog Administrator	No
H	SMK Sultan Ahmad Shah	Principal	No
I	SK Telanok	Administrative Asst. Principal	No
J	SK Telanok	Headmaster	No
K	SK Telanok	Frog Administrator	No

YES	School		NO	School	
Response	*f*	%	Response	*f*	%
5	2	40	6	3	60

**Total schools - 5, Total Response - 11*

YES - How do you get it?	
Develop by school's management.	-
Adopt from external sources - without modification	1
Adopt from external sources - modified to suit the school's environment	1
Others	-

b) Do you think that this Implementation Strategy is practical for VLE implementation in school?

No	Practitioner	Dept	Post	Answer
1	L	PPDCH	Frog Coach (Champion School)	Yes
2	M	PPDCH	ICT Coordinator	Yes
3	N	PPDCH	Frog Coach (1BestariNet)	Yes
4	A	SK Brinchang	Frog Administrator	Yes
5	B	SK Menson	Frog Administrator	Yes
6	C	SK Menson	Headmaster	Yes
7	D	SK Lemoi	Headmaster	Yes
8	E	SK Lemoi	Administrative Asst. Principal	Yes
9	F	SK Lemoi	Frog Administrator	Yes
10	G	SMK Sultan Ahmad Shah	Frog Administrator	Yes
11	H	SMK Sultan Ahmad Shah	Principal	Yes
12	I	SK Telanok	Administrative Asst. Principal	Yes
13	J	SK Telanok	Headmaster	Yes
14	K	SK Telanok	Frog Administrator	Yes
TOTAL: YES = 14 (100%), NO = 0 (0%)				
TOTAL PRACTITIONERS: PPD = 3, Schools = 11				

Frog Admin	Headmaster	Frog Coach	ICT Coordinator	Admin. Asst. Princ.	Principal	TOTAL
5	3	2	1	2	1	14

c) Can VLE Success Model be used as a guideline for Frog VLE implementation?

No	Practitioner	Dept	Post	Answer
1	L	PPDCH	Frog Coach (Champion School)	Yes
2	M	PPDCH	ICT Coordinator	Yes
3	N	PPDCH	Frog Coach (1BestariNet)	Yes
4	A	SK Brinchang	Frog Administrator	Yes
5	B	SK Menson	Frog Administrator	Yes
6	C	SK Menson	Headmaster	Yes
7	D	SK Lemoi	Headmaster	Yes
8	E	SK Lemoi	Administrative Asst. Principal	Yes
9	F	SK Lemoi	Frog Administrator	Yes
10	G	SMK Sultan Ahmad Shah	Frog Administrator	Yes
11	H	SMK Sultan Ahmad Shah	Principal	Yes
12	I	SK Telanok	Administrative Asst. Principal	Yes
13	J	SK Telanok	Headmaster	Yes
14	K	SK Telanok	Frog Administrator	Yes

TOTAL: YES = 14 (100%), NO = 0 (0%)						
TOTAL PRACTITIONERS: PPD = 3, Schools = 11						
Frog Admin	**Headmaster**	**Frog Coach**	**ICT Coordinator**	**Admin. Asst. Princ.**	**Principal**	**TOTAL**
5	3	2	1	2	1	14

d) Comments and suggestions (Open-ended)

Pract.	**Response**	**Code**
A	*Sesuai dijalankan di sekolah yang mempunyai kemudahan internet.* (Suitable to be implemented in the schools with internet facilities).	2
B	*Aktiviti seumpama ini amat sesuai dilaksanakan di sekolah yang mempunyai kemudahan internet*. (This kind of activity is very suitable to be implemented in the schools with the internet facilities).	2
C	School can't use all the time of VLE because line is limited in rural area. (School cannot use the VLE all the times of VLE because of the limited access in rural area)	2
D	The implementation strategy can help the teacher in teaching Frog VLE. It is good and suitable to use in school.	1,3
E	*Bersesuaian dengan keperluan sekolah dan dapat membantu guru.* (Meet the school's requirement and can assist the teachers).	3
F	*Baik.* (Good).	3
G	Frog VLE has been successfully conducted in many schools in Malaysia. Further research and enhanced VLE models can bring significant impact to the implementation of Frog VLE in malaysian schools.	3
H	*Sesuai dijadikan sebagai panduan di sekolah.* (Suitable to be used as guideline in school)	1,3
I	*Pelaksanaan boleh dilaksanakan di sekolah.* (Implementation can be implemented in schools).	1
J	Suitable for students and teachers (as a reference).	3
K	*Disokong. Sesuai dijadikan panduan di sekolah.* (Supported. Suitable to be used as a guideline in schools).	1,3
L	*Disokong. Amat sesuai dipraktikkan di sekolah kerana dibina berdasarkan kajian empirikal.* (Supported. It is very practical in schools because it is developed based on empirical study).	1,3
M	Suitable for school management in Frog VLE implementation in classroom.	1
N	*Boleh dijadikan panduan untuk pelaksanaan di sekolah.* (Can be a guideline for the implementation in schools).	1,3

Theme	**Code**	***f***	**%**
Suitable to be implemented.	1	7	37%
Suitable to be implemented if the school has the Internet connection.	2	3	16%
Positive impacts on implementation by providing guideline to teachers	3	9	47%
	Total	19	100%