

THE ROLE OF PSYCHOLOGICAL OWNERSHIP AND
THE TECHNOLOGY ACCEPTANCE MODEL IN
TEACHERS' CONTINUANCE INTENTION OF A VIRTUAL
LEARNING ENVIRONMENT

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**THE ROLE OF PSYCHOLOGICAL OWNERSHIP AND THE
TECHNOLOGY ACCEPTANCE MODEL IN TEACHERS'
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ENVIRONMENT**

By

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ABSTRACT

THE ROLE OF PSYCHOLOGICAL OWNERSHIP AND THE TECHNOLOGY ACCEPTANCE MODEL IN TEACHERS' CONTINUANCE INTENTION OF A VIRTUAL LEARNING ENVIRONMENT

Joanne Yim Sau Ching

The long-term viability and sustainability of any educational technology hinges on users' continuance in using the technology, especially in a voluntary use context. Drawing upon prior empirical support, this study seeks to unravel factors which affect continuance intention towards technology with the research streams of psychological ownership and the Technology Acceptance Model. The central premise of the study is that individuals develop psychological ownership when they use a particular technology, forming a psychological connection to it which can foster continuance intention by affecting their beliefs and attitude. This notion is examined in the context of a cloud-based virtual learning environment, among practicing teachers of public schools in Malaysia. Given that teachers can exercise volition over the usage of this VLE, it is important to examine their continuance towards the VLE, as it serves as a gateway for work management, teaching and learning, and communication.

A hypothesised model was developed to examine psychological ownership of a VLE with predictors of experienced control, knowledge, and

investment of the self in the VLE. In turn, psychological ownership is positioned as an external variable that influence continuance intention through perceived usefulness, perceived ease of use, and attitude towards using the VLE. Examination entails the direct and indirect effects between the constructs of the proposed model. Potential confounding effects from individual differences were controlled using the control variables of VLE experience, training, and teaching load. Employing a cross-sectional survey approach, data were collected using questionnaires distributed to teachers teaching in four states in northern Malaysia. The study translated established scales to measure the constructs using back-translation, and these scales were refined based on pre-tests and a pilot study. After data were cleaned, hypothetical relationships were examined with a total of 1068 responses using Partial Least Squares Structural Equation Modelling (PLS-SEM).

Results largely supported the model, explaining 67.7% of variance in continuance intention. Among the proposed antecedents of psychological ownership, investment of the self was the most salient predictor. Psychological ownership was also found to be a significant external variable which influenced perceived usefulness and perceived ease of use, these beliefs influenced attitude towards using a VLE, and subsequently continuance intention. Interestingly, perceived usefulness was not significant to continuance intention, while attitude was found to potentially fully mediate the relationship between perceived usefulness and continuance intention. In a world of proliferating online learning environments seeking user participation, this study offers an explanation of teachers' continuance intention by relating the

variables. These findings have important implications on theory, practice, and methods. In theory, the study combines the research streams of psychological ownership and the Technology Acceptance Model to validate theoretical propositions to explain teachers' sustainability behaviour towards a VLE. In practice, the study identifies salient factors pertinent to teachers' continuance intention which can benefit various stakeholders to bridge the gaps between education policy planning and implementation. In terms of methods, the study supports a cumulative practice of research by validating measures for the examination of psychological ownership in the VLE context.

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APPROVAL SHEET

This dissertation/thesis entitled “**THE ROLE OF PSYCHOLOGICAL OWNERSHIP AND THE TECHNOLOGY ACCEPTANCE MODEL IN TEACHERS’ CONTINUANCE INTENTION OF A VIRTUAL LEARNING ENVIRONMENT**” was prepared by JOANNE YIM SAU CHING and submitted as partial fulfillment of the requirements for the degree of Doctor of Philosophy (Social Science) at Universiti Tunku Abdul Rahman.

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SUBMISSION OF THESIS

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DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.

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LIST OF ABBREVIATIONS

CBSEM	Covariance-based SEM
CFA	Confirmatory Factor Analysis
CMB	Common Method Bias
CMS	Content Management System
CR	Composite Reliability
DTPB	Decomposed Theory of Planned Behaviour
ECT	Expectation - Confirmation Theory
EFA	Exploratory Factor Analysis
HTMT	Heterotrait-Monotrait ratio
IaaS	Infrastructure as a Service
ICT	Information Communication Technology
ICT	Information and Communication Technology
IS	Information System
ISCM	Information System Continuance Model
IT	Information Technology
LMS	Learning Management System
M	Mediator
MAR	Missing at Random
MCAR	Missing Completely at Random
MLE	Managed Learning Environment
MNAR	Missing Not at Random
MOOC	Massive Open Online Courses
MOE	Ministry of Education

Moodle	Modular Object-Oriented Dynamic Learning Environment
PaaS	Platform as a Service
PLS-SEM	Partial Least Squares Structural Equation Modelling
SaaS	Software as a Service
SPSS	Statistical Package for Social Science
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UNESCO	United Nations Educational Scientific Cultural Organization
UTAUT	Unified Theory of Acceptance and Use of Technology
VAR	Variance Accounted For
VIF	Variance Inflation Factor
VLE	Virtual Learning Environment
X	Exogenous variable
Y	Endogenous variable

CHAPTER 1

INTRODUCTION

1.1 Background Review

In Malaysia, the education system has long recognised the potential of Information Communication Technologies (ICT) in education, with this area receiving one of the most capital-intensive investments in the past two decades (Ministry of Education [MOE], 2013). This area of education will continue to be emphasised in the coming decades because ICT in education is positioned as one of the thrusts to scale up quality learning across schools in the country's signatory education reformation plan, the Malaysia Education Blueprint 2013-2025 (MOE, 2013).

The aforementioned reformation plan rolled out the 1BestariNet programme in 2012 to catapult technology-based teaching and learning in Malaysian public schools, with the main objective of transitioning the general public to a knowledge-based economy (MOE, 2017; Soon, 2014). The 1BestariNet programme spans over 13 years, with its first phase rolled-out from 2013 to 2015 that paved the foundation to support the programme in terms of equipping teachers with necessary competency and infrastructure sufficiency (MOE, 2013). Phase two commenced on 2016 to 2020 and aims to introduce ICT innovations to cascade best practices, while phase three which spans from 2021 to 2025 focuses on sustaining ICT innovations and intensifying system-wide usage (MOE, 2013). Through this programme,

Malaysia became the first country globally to connect the public school system which consisted of about 10,000 schools, 430,000 teachers, and 5 million pupils and their parents with 4G internet connection through a single cloud-based VLE (FrogAsia, 2018; MOE, 2018a).

Central to the 1BestariNet programme is the cloud-based Frog VLE platform, an online learning platform adopted to facilitate learning through cloud-based technology (Hew & Syed Abdul Kadir, 2016a). The Frog VLE component received the largest chunk of budget allocated for the 1BestariNet programme among other components such as broadband services to schools, data hosting, and network monitoring (MOE, 2017). This VLE is a web-based learning system which replicates learning in the real world, while integrating virtual equivalents of conventional education concepts such as the assignment of lessons and quizzes by teachers, submission of homework by students, online forum discussion, and analysis of student learning style reports (1BestariNet, 2012). Frog VLE is adopted as a form of blended learning in Malaysian schools not intended to substitute traditional classroom learning. Ten million user IDs were given to students, teachers, and parents to access and optimise learning through this platform, whereby teachers received access to the platform in 2013 (Cheok, Wong, Ayub, & Mahmud, 2017; Soon, 2014). It is imperative to investigate a project of such magnitude to optimise positive outcome and to ensure its success.

1.2 Problem Statement

One of the critical problems facing ICT in education in Malaysia is the unsatisfactory rate of usage of these facilities (Hew & Syed Abdul Kadir, 2016a). The country is one of the pioneers in Asia to have in place ICT strategies in its education development plans (UNESCO, 2013). Since the 1990's, ICT policies have been integrated in education as part of the development plan, such as Multimedia Super Corridor 1996, the Malaysian Smart School Roadmap 2005-2020, the Educational Development Master Plan 2006-2010, and the Education Strategic Plan 2011-2015 (UNESCO, 2013). Despite these plans and being a pioneer in integrating ICT in education, ICT adoption is less than positive with an MOE report indicating that about 80% of teachers use ICT for less than one hour weekly (MOE, 2013). Nonetheless, the MOE still targets for all public schools to integrate ICT in teaching and learning process, and to achieve the required standards of ICT utilisation, infrastructure facilities, capability, and applications (MOE, 2013).

With regards to the Frog VLE, the VLE initially received lukewarm application with only 5% usage at the first year of its launch (Auditor General Report, 2013). A year after its implementation, a national level survey indicated varying degrees of participation where teachers reported usage for different purposes: teaching and learning (65.2%), sending homework to students (47.5%), receiving assignments from students (32.9%), using virtualised resources (48.3%), developing VLE resources (77.6%), and updating of personal site (88.5%) (Soon, 2014). Local research has reported

that teachers' intention to continue using the VLE to be at a moderate level (Awang et al., 2018), while teacher interviews found a less optimistic outlook of the VLE usage (Cheok & Wong, 2016). Part of the reasons can be due to the lack of motivation in using the platform, exacerbated by teachers' beliefs that the platform is not easy to use, and not useful for specific subjects like Mathematics (Cheok et al., 2017). Against this backdrop, it is fundamental for the MOE to better understand teachers' beliefs and intention to continue using the platform. This is important as VLE usage is on voluntary basis and teachers have autonomy in determining the frequency and extent of integration of VLE into their classrooms.

The long-term viability and sustainability of any technology hinges on users' continuance in using the technology concerned (Bhattacharjee, 2001; Bhattacharjee & Lin, 2014; Roca, Chiu, & Martínez, 2006; Wu & Zhang, 2014). Where a technology has been introduced earlier, investigation should emphasise on examining users' continuance intention (Hong, Thong, & Tam, 2006; Tripathi, 2017). However, most research in e-learning has focused on initial adoption, with fewer studies which addressed post-adoption decisions (Rodríguez-Ardura & Meseguer-Artola, 2016). There is also a scarcity of empirical evidences in continuance intention from the perspective of developing countries as well as Southeast Asian countries, where Malaysia is located (Osah & Kyobe, 2015; Shaikh & Karjaluo, 2015).

In terms of existing evidence from the literature, local research, meta-analysis investigation, and review studies have noted that a majority of e-

learning studies has largely focused on the perspective of students, undergraduates and university instructors, and with little focus from the standpoint of practicing school teachers (Cheng & Yuen, 2018; Hew & Syed Abdul Kadir, 2016b; Nabavi, Taghavi-Fard, Hanafizadeh, & Taghva, 2016; Shaikh & Karjaluo, 2015; Sánchez-Prieto, Olmos-Migueláñez, & García-Peñalvo, 2017; Šumak, Heričko & Pušnik, 2011). Besides this, there is scarce examination of cloud-based VLE, because most studies had investigated the conventional grid-based VLEs which do not facilitate services such as scalability, unrestricted cloud storage, collaboration with multi-users, and omnipresent services (Hew & Syed Abdul Kadir, 2016c). Hence, findings from other contexts of technology, as well as different users like students, undergraduates, and university instructors may not be germane to the current study. Hence, there is a need for empirical evidence directed at cloud-based VLE from the teachers' perspective.

For any ICT tools to be implemented successfully, it needs to be first used by teachers or instructors who utilise them for instructional purposes (Rajaendram, 2017; Šumak et al., 2011). VLEs are designed to reproduce real-world learning with the virtual equivalents of traditional educational concepts, and these environments are capable of inducing users' subjective responses which can have bearings on VLE implementation (Rodríguez-Ardura & Meseguer-Artola, 2016). These subjective responses can also influence teachers' decisions about ICT, especially when they play a pivotal role in the integration of ICT technology in classrooms, making decisions on the type, frequency, and technology tools for such purposes, and exercising volition over

their intention and usage of the technology within their professional capacity (Teo, 2014). They are also front liners in applying technological knowledge for the successful pedagogical use of digital resources (Kong, Looi, Chan, & Huang, 2017). Therefore, a research to investigate teachers' intention to continue using Frog VLE is important, relevant, and timely, all the more so when the VLE is deployed nation-wide.

1.3 Theoretical Foundations

This work aims to investigate teachers' continuance intention towards a VLE. Research have demonstrated the influence of users' belief and attitudes in affecting their intention to continue using the particular technology (Bhattacharjee, 2001; Ho, 2010; Ifinedo, 2017; Lin, 2011; Rodríguez-Ardura & Meseguer-Artola, 2016; Shiue, Hsu, & Liang, 2017; Wu & Chen, 2017). These studies have attested to the sound application of the Technology Acceptance Model (Davis, 1986) in examining continuance intention. The parsimony of the model positions it well to integrate other external variables across numerous technological contexts to predict user behaviour (Chen, Li, & Li, 2011; Davis, Bagozzi, & Warshaw, 1989; Lee, Hsieh, & Chen, 2013; Ursavas, 2013; Venkatesh, 2000). Moreover, scholars have advocated the examination of models in continuance which are built upon existing ones to generate ideas to inform theory and improve the design of web-based learning environment (Dağhan & Akkoyunlu, 2016).

Following the above discussion, the Technology Acceptance Model (TAM) is employed as a base theory of the study. This theory was originally used to explain system usage with these key components: perceived usefulness, perceived ease of use, attitude towards using a particular technology, and behavioural intention (Davis et al., 1989). Perceived usefulness and perceived ease of use constitute users' beliefs about a particular technology being useful and easy to use (Davis et al., 1989), and they are commonly applied in continuance intention research (Cho, Cheng, & Lai, 2009; Ho, 2010; Hong et al., 2006; Lin, 2011; Lin, Chen, & Fang, 2011; Tripathi, 2017; Wu & Zhang, 2014). Attitude is directed at users' affective evaluation towards using a particular technology, which can influence individuals' continuance intention in e-learning (Ho, 2010; Kim, Chan, & Chan, 2007; Lin, 2011; Rodríguez-Ardura & Meseguer-Artola, 2016). Despite the importance of these factors, there is a need to move beyond traditional models of the TAM, to delve deeper into potential variables which can contribute to it (Marangunić & Granić, 2015).

The concept of psychological ownership is gradually becoming pertinent in human-technology interaction research (Klesel, Ndicu, & Niehaves, 2016). Within the technological domain, it is often conceptualised as a feeling of ownership towards a particular technology (Barki, Paré, & Sicotte, 2008). Such ownership effect has been found to closely related to perceived usefulness, perceived ease of use, attitude, and behavioural intention (Anderson & Agarwal, 2010; Barki et al., 2008; Lee & Chen, 2011; Lee & Suh, 2015; Karahanna, Xu, & Zhang, 2015; Paré, Sicotte, & Jacques, 2006). However, more exploration is needed to understand the complexity of the ownership

phenomenon especially with the rapid development of new technology (Klesel et al., 2016). Given the potential of psychological ownership with the TAM variables, the present study aims to combine the research streams of both theories to explain continuance intention. Hence, a theoretical framework for continuance intention is drawn from the TAM (specifically the constructs of perceived usefulness, perceived ease of use, and attitude) and the Theory of Psychological Ownership (specifically the constructs of experienced control, knowledge, investment of the self, and psychological ownership). This will enable the verification of existing theoretical accounts in both models, as well as the development of new relationships between ownership variables and the TAM.

1.4 Research Objectives and Research Questions

The chief purpose of this study is to predict teachers' continuance intention of a VLE with the theoretical accounts of the TAM and psychological ownership. Scholars have discussed the key experiences associated with the use of a technology which can bring about a sense of psychological ownership of that particular technology (Moon & Sanders, 2004). These key experiences which function as antecedents of psychological ownership include: the control of technology, the knowledge one has about the technology, and the investment of oneself into the technology (Lee & Chen, 2011; Zhao, Chen, & Wang, 2016). Transposing these relationships to the context of educational technology, this doctoral study hypothesised a research model which integrates aspects of psychological ownership and the TAM variables (perceived usefulness,

perceived ease of use, and attitude towards using VLE) to explain continuance intention. To have complete explanation of the model, the study hypothesises direct and indirect effects of the articulated mechanism between the constructs of the proposed model. Specifically, this work is underpinned by the following research objectives:

Research objectives

1. To examine the influence of experienced control, having knowledge about VLE, and investment of the self on psychological ownership of a VLE.
2. To examine the influence of psychological ownership of VLE on continuance intention based on the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using VLE).
3. To examine the influence of control variables (teaching load, VLE experience, and VLE training) on continuance intention.
4. To examine psychological ownership as a mediator of the influence of its antecedents (experienced control, knowledge, investment of the self) on perceived ease of use and perceived usefulness.
5. To examine the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using VLE) as mediators in the hypothesised model.

The following research questions are framed by the above research objectives:

- RQ1. Are there significant influences of experienced control, having knowledge about VLE, and investment of the self on psychological ownership of a VLE?
- RQ2. Are there significant influences of psychological ownership of VLE on continuance intention based on the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using a VLE)?
- RQ3. Are there significant influences of control variables (teaching load, VLE experience, and VLE training) on continuance intention?
- RQ4. Is psychological ownership a significant mediator between its antecedents (experienced control, knowledge, investment of the self) and perceived ease of use and perceived usefulness?
- RQ5. Are the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using VLE) significant mediators in the hypothesised model?

1.5 Research Hypotheses

In answering the research questions, a total of 27 hypotheses specific to these questions are formulated as below:

- RQ1. Are there significant influences of experienced control, having knowledge about VLE, and investment of the self on psychological ownership of a VLE?

Hypotheses	
H1	Experienced control has a significant influence on psychological ownership.

Hypotheses

- H2 Knowledge has a significant influence on psychological ownership.
- H3 Investment of the self has a significant influence on psychological ownership.
-

RQ2. Are there significant influences of psychological ownership of VLE on continuance intention based on the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using a VLE)?

Hypotheses

- H4 Psychological ownership has a significant influence on perceived usefulness.
- H5 Psychological ownership has a significant influence on perceived ease of use.
- H6 Perceived ease of use has a significant influence on perceived usefulness.
- H7 Perceived usefulness has a significant influence on attitude towards using VLE.
- H8 Perceived ease of use has a significant influence on attitude towards using VLE.
- H9 Perceived usefulness has a significant influence on continuance intention.
- H10 Attitude towards using VLE has a significant influence on continuance intention.
-

RQ3. Are there significant influences of control variables (teaching load, VLE experience, and VLE training) on continuance intention?

Hypotheses

- H11 Teaching load has a significant influence on continuance intention.
- H12 VLE experience has a significant influence on continuance intention.
- H13 VLE training has a significant influence on continuance intention.
-

RQ4. Is psychological ownership a significant mediator between its antecedents (experienced control, knowledge, investment of the self) and perceived ease of use and perceived usefulness?

Hypotheses

- H14 Psychological ownership mediates the relationship between experienced control and perceived usefulness.
 - H15 Psychological ownership mediates the relationship between knowledge and perceived usefulness.
 - H16 Psychological ownership mediates the relationship between investment of the self and perceived usefulness.
 - H17 Psychological ownership mediates the relationship between experienced control and perceived ease of use.
 - H18 Psychological ownership mediates the relationship between knowledge and perceived ease of use.
 - H19 Psychological ownership mediates the relationship between investment of the self and perceived ease of use.
-

RQ5. Are the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using VLE) significant mediators in the hypothesised model?

Hypotheses

- H20 Perceived usefulness mediates the relationship between psychological ownership and attitude towards using VLE.
 - H21 Perceived usefulness mediates the relationship between perceived ease of use and attitude towards using VLE.
 - H22 Perceived usefulness mediates the relationship between perceived ease of use and continuance intention.
 - H23 Perceived usefulness mediates the relationship between psychological ownership and continuance intention.
 - H24 Perceived ease of use mediates the relationship between psychological ownership and perceived usefulness.
-

Hypotheses	
H25	Perceived ease of use mediates the relationship between psychological ownership and attitude towards using VLE.
H26	Attitude towards using VLE mediates the relationship between perceived ease of use and continuance intention.
H27	Attitude towards using VLE mediates the relationship between perceived usefulness and continuance intention.

1.6 Scope of the Study

In line with the objectives of the study, a quantitative approach involving teacher respondents is required to test hypothetical relations and to explain continuance intention. As the Frog VLE is deployed nation-wide, it is essential to define a population to set the boundaries for generalisability of the research finding (Gay, Mills, & Airasian, 2012). As such, data were obtained from the secondary schools in the northern region of Malaysia which consisted of four states: Perlis, Kedah, Pulau Pinang, and Perak. As continuance intention is evaluated as a post-adoption construct, the sample of the study only considers teachers who had experience in using Frog VLE (Karahanna, Straub, & Chervany, 1999).

1.7 Significance of the Study

In a world of proliferating online learning environments which seeks participation from various users, examining continuance intention towards a VLE is a crucial matter. This study is significant because the investigation of teachers' experiences with a VLE, their beliefs, attitude towards the VLE, and continuance intention can assist in diagnosing issues, and determining salient

factors important for the continuity of the platform. Findings obtained can contribute to both theoretical development and practical implications for stakeholders including teachers, system developers, school leaders, and policy makers.

From a theoretical standpoint, the study demonstrates the applicability of the Theory of Psychological Ownership in affecting users' continuance intention in a cloud-based VLE. When individuals' identities are ingrained into an object of ownership, these objects will serve as a mean for self-continuity (Csikszentmihalyi & Rochberg-Halton, 1981). Hence, psychological ownership can foster an intrinsic motivation which energises and sustains human behaviour towards a particular object of ownership (Pierce & Jussila, 2011). By positioning Frog VLE as an object of ownership, the study explores and validates theoretical propositions to explain users' sustainability behaviour towards it through their beliefs and attitudes. By doing so, findings from the Malaysian context can also contribute to the limited knowledge base of continuance literature in the context of developing countries, as Malaysia is also a developing country (Osah & Kyobe, 2015).

Good theoretical contribution includes explanations for constructs that are generalizable as it provides insights to a wider class of phenomenon (Crane & Henriques, 2016). Hence, the study which aims to predict teachers' continuance intention to use Frog VLE through rigorous statistical analysis and generalizable research design can potentially provide a wider explanatory value. In this process, the study also validates the psychometric properties of the

scales used to measure the constructs of psychological ownership and user experiences which were not developed for the educational context.

In terms of practical significance, the study provides empirical explanation to teachers themselves in understanding the factors and mechanisms that affect their continuance intention. Findings will be significant to teachers, who are end users of the VLE and important stakeholders who play a central role in integrating the technology into education. Apart from this, the study identifies the salient experiences that give rise to the psychological ownership of Frog VLE. The findings are important to the Ministry of Education, policy makers, and system developers, to improve teachers' experiences with the VLE. Such improvements can encourage buy-in for the system which is necessary to increase adoption of the system. The sense of psychological ownership can influence teachers' beliefs about the VLE and their orientation towards change (Stein, Galliers, & Markus, 2013), thus affecting future use and change management for the VLE. Meanwhile, beliefs about a system are essential as they have bearings on subsequent behaviour, while at the same time can be amenable with strategic managerial manipulation through interventions such as system design and development programmes (Davis, 1993).

Lastly, this study may also of contribution to policy makers for improvement of teachers' e-learning development. For instance, the constructs of perceived ease of use taps into the efficacy dimension, while knowledge reflect the familiarity with the VLE, findings will shed some understanding of

how these factors can influence VLE adoption. Appropriate measures can be taken for e-learning development for teachers as well as trainee teachers to promote teachers' momentum in using this technology to enhance teaching and learning. Much capital investments and training incentives have been invested to encourage teachers' involvement in Frog VLE. Hence, identifying the salient factors that affect their continuance intention to use VLE can bridge the gaps between education policy planning and implementation.

1.8 Definition of Terms

To provide a clear interpretation of the concepts employed in the study, the variables are defined for conceptual clarity to offer a consistent understanding of the concepts employed throughout the thesis.

1.8.1 Experienced Control

Control in the context of ownership refers to the ability to use and control the use of an object (Rudmin & Berry, 1987). Experienced control refers to control that is experienced with a particular object, which brings about a feeling of possessiveness through continued functional control that is exercised over it (Brown, Pierce, & Crossley, 2014). In terms of internet sites, Moon and Sanders (2004) noted that this concept reflects the perceived level and perceived amount of control a person has over a particular site, when navigating through the site. Users are afforded substantial control of their navigation when visiting a website, and a reliable and secure virtual

environment can give users a sense of control while using the site (Lee & Chen, 2011). In terms of software usage, Agarwal and Karahanna (2000) describes control of a software as representing a user's views of being in-charge of how a software interacts. In this study, experienced control reflects the control and influence that teachers experience when visiting Frog VLE.

1.8.2 Knowledge

Based on the Theory of Psychological Ownership, interaction and intimate association with an object can breed one's familiarity with the object concerned (Pierce, Kostova, & Dirks, 2001), which in turn promotes its psychological ownership. Knowledge of an object can help develop association and enhance proximity between owner and objects (Beggan & Brown, 1994). In such context, knowledge refers to the breadth and depth of knowing a particular object (Brown et al., 2014). In organisational studies, it captures the extent to which employees are familiar with what goes on in their work, and have comprehensive understanding of their job (Pierce, Jussila, & Cummings, 2009). With regards to Internet sites, Moon and Sanders (2004) explained website knowledge in terms of the time association and amount of knowledge one has about the site, while Zhang, Argawal and Lucas (2011) described it as familiarity with site interface. The present study defines knowledge of VLE as the breadth and depth of knowledge a teacher has about Frog VLE, which foster familiarity and ownership toward the VLE.

1.8.3 Investment of the Self

According to Pierce et al. (2001), the investment of a person's time, energy, effort, and attention into an object facilitates the development of psychological ownership for the particular object. Self-investment reflects the personal investment of energy, time, imagination, and other aspects of the self into an object (Brown et al., 2014). In the organisational context, employees will develop ownership of their job as they expend their creative, mental, and physical energies into their work (Bullock, 2016). Positioning internet sites as an object of ownership, Moon and Sanders (2004) considered self-investment to include aspects of psychological and physical energy invested in a site. In this study, investment of the self refers to teachers' contribution of their time, ideas, and their personal aspects of into the VLE.

1.8.4 Psychological Ownership

Pierce, Kostova, and Dirks (2003) defined psychological ownership as a 'state in which individuals feel as though the target of ownership or a piece of that target is "theirs" ' (p. 86). Van Dyne and Pierce (2004) conceptualised the concept in the organisational context, and proposed that psychological ownership can be developed for targets such as the work itself, work tools or the organisation. In the technological context, Barki et al. (2008) called it the psychological ownership of information technology which is defined as the feeling of ownership an individual feel for an information technology or information system. Applying this concept in a virtual world, Lee and Chen

(2011) defined psychological ownership of a virtual world as a psychological phenomenon experienced by users in which the feelings of possessiveness are brought about by the virtual world. Klesel et al. (2016) described it as a sense of possessiveness and being psychologically tied to a target which has implications for technology adoption and use. In this study, Frog VLE is positioned as a target of ownership, and the psychological ownership of virtual learning environment is directed at a feeling of possessiveness and ownership toward a virtual learning environment.

1.8.5 Perceived Ease of Use

Perceived ease of use refers to the degree to which the prospective user expects the target system to be free of effort (Davis et al., 1989). This term follows from the definition of the word “ease” which enable a user to be free from difficulty, physical effort, mental effort, and learning effort when using a system (Davis, 1989). Teo (2011) described perceived ease of use in the educational technology context as the extent to which a teacher believes that using technology for teaching and learning would be free of effort. In the web-based learning context, it describes the degree a teacher believes such platforms can be effortlessly used (Wang & Wang, 2009). In this study, this variable is operationalised as the degree to which a teacher believes that using Frog VLE would be free of difficulty, physical effort, mental effort, and learning effort.

1.8.6 Perceived Usefulness

Davis et al. (1989) defined perceived usefulness as the extent to which an individual believes that using a particular system would improve his or her job performance. Ventakesh and Moris (2000) also submitted that perceived usefulness reflects an individual's belief of use - performance contingency. Consistent with Davis (1989), Teo (2011) referred perceived usefulness in the educational technology context (computer use) as the extent to which a teacher believes that using technology would improve his or her job performance. In the web-based learning context, perceived usefulness is directed at the extent to which teachers believe that using such systems can improve their teaching performance (Wang & Wang, 2009). As such, this study considers perceived usefulness as the degree to which a teacher believes that using Frog VLE would enhance his or her job performance.

1.8.7 Attitude Towards Using VLE

In a technology acceptance context, Davis et al. (1989) referred to it as positive affect towards using a system, while Taylor and Todd (1995) described attitude toward using a technology as feelings of favourableness or unfavourableness towards using the technology concerned. Teo (2011) operationalised attitude towards using in the educational technology context as the positive feelings about using technology. Attitude reflects an individual's disposition towards performing a behaviour (Teo, Zhou, & Noyes, 2016), and is determined by an individual's beliefs and affective evaluation of the

consequences of performing the behaviour (Teo, Lee, Chai, & Wong, 2009). As such, attitude towards using in the present study is operationalised as the degree of a teacher's positive feelings towards using Frog VLE.

1.8.8 Continuance Intention

Where a technology has been introduced, focus is placed on users' intention to continue using the technology concerned (Bhattacharjee, 2001; Hong et al., 2006; Roca, Chiu, & Martínez, 2006). In the context of Information System, continuance intention is considered as a post-adoption behaviour that reflects the continued usage of a particular IS (Limayem, Hirt, & Cheung (2007). Bhattacharjee (2001) operationalised continuance intention in information system as users' intention to continue using a particular IS. Liao (2008) refers continued use intention of e-learning as the extent a learner intends to adopt and increase the use of the e-learning in the future. In this study, continuance intention to use is referred as teachers' intention in continuing to use the Frog VLE.

1.8.9 Control Variables

Prior research has found that users' behavioural intention may be different across various personal characteristics (Cho et al., 2009; Venkatesh & Morris, 2000), and it is important to control the potential confounding effects of individual differences. Additionally, examining individual factors can also help explain users' behavioural intention and inform practice to assist in

implementation of VLE. This study investigates three user characteristics as control variables: teaching load, VLE experience, and VLE training. *Teaching load* refers to the weekly teaching hours of individual teachers. Local research has found that teachers' workload to be one of the barriers for teachers to use the Frog VLE, especially when they are bogged down with responsibilities that deter them from mastering the system (Awang et al., 2018; Cheok et al., 2017). *VLE experience* refers to the number of years of direct experience teachers have in using Frog VLE. Studies have shown that direct experience affect users' continuance intention when they make decisions in retrospect of their actual experience of using the particular system (Shao, 2018; Yang, Shao, Liu, & Liu, 2017). *VLE training* refers to the number of times of training that teachers received on Frog VLE. As teachers are not information technology experts, training can affect their capability of overcoming barriers in implementing effective technical VLE knowledge and pedagogical approaches (Cheok et al., 2017; Kong et al., 2017).

1.9 Organisation of the Thesis

This thesis consists of five chapters to achieve its study objectives outlined in Section 1.4. As noted in Chapter One, this chapter provides an overview of the VLE background, problems which motivated the study, a brief introduction to the theoretical framework, the scope and significance of the study, as well as the definitions of the variables investigated. Chapter Two is the review of literature on the core theories of the study – the TAM and psychological ownership. Existing studies, seminal studies as well as theoretical underpinnings will be discussed and

synthesised to conceptualise the constructs, develop the conceptual framework and hypothetical relations in the model.

Chapter Three presents the research philosophy, design, and methods to achieve the research objectives. This includes the permissions and ethical considerations, sample considerations, questionnaire development including translation processes, pre-test and pilot test, data collection, and analytical approaches and criteria to answer the research questions. Chapter Four continues in presenting the empirical assessment of the research model. Discussion starts with the results of pilot study, and proceeds to data screening processes, and descriptive findings of the variables and respondents' profile using IBM SPSS Statistics version 20 software. Next, inferential analysis was performed to assess the hypothesised research model by employing Structural Equation Modelling using SmartPLS 3.2.7. Lastly, Chapter Five discusses answers to the research questions, and possible inferences drawn from the findings. In doing so, it presents the implications for theory and practices elicited from the study. The chapter concludes with its limitations and future research which can remedy these restrictions.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This review of literature addresses areas of research related to psychological ownership, users' beliefs, attitude, and continuance intention. It includes relevant literature and discussion in the context of VLE which will provide the theoretical foundations for the development of the research model of this study. The review includes reading and examinations of technology acceptance theories, virtual learning environments, psychological ownership, education policies and development, and VLE training manuals. The search parameters included quantitative and qualitative research studies, books, journal articles, government documents, and current issues. Databases from the library system of Universiti Tunku Abdul Rahman and Murdoch University (where the researcher is an alumni) were used: PsycARTICLES, ScienceDirect, ACM Digital Library, JSTOR, SAGE Premier, EBSCOhost, IEEE, Educational Resources Information Center, Academic Complete and ProQuest Dissertations. Google scholar was used for additional Internet exploration and book searches.

This chapter starts with a review of the historical development of VLE and the VLE of interest in Section 2.2. Section 2.3 presents the theories pertinent to the study with discussions on development and the current status in these areas, identifying gaps in the literature that illuminates the aspects

relevant to the current context. Along the way, seminal studies and the current state of research are discussed together with the methodological approaches used by these studies. Section 2.4 then presents the study's conceptual framework, while Sections 2.5 and 2.6 discuss the blend of theoretical constructs investigated in the study which structure the proposed conceptual framework.

2.2 Development of Virtual Learning Environment

It is important to understand the genesis of virtual learning environment from the evolution of distance learning and e-learning. Virtual learning evolved as one of the different modes that facilitate distance learning (Moore, Camille, & Galyen, 2011). By the 1930's, television teaching programs were introduced, and into the 1950's, some colleges started to offer courses via television broadcast (Schlosser & Simonson, 2010). This gradually changes the traditional delivery of classroom instruction, as television broadcast of instructions began to dominate distance learning with the advancement of technology and development of satellites systems (Millet, 2012). Out of this evolvement of distance learning, electronic-learning (e-learning) began to proliferate (Liaw, 2008).

The genesis of virtual learning environments is also closely associated with e-learning because a VLE serves as an environment where e-learning takes place (Weller, 2007). E-learning has its roots in higher education institutions in the 1970s, when a system used by the scientific research

communities to communicate, the Electronic Information Exchange System, was developed in a research project named Virtual Classroom (Harasim, 2006). This development saw the commencement of the initial online graduate courses in University of Toronto in 1985, and first fully online bachelor degree programme in New Jersey Institute of Technology in 1986 (Harasim, 2006). In 1989, one of the key distance education providers, the Open University of the United Kingdom provided its first large-scale online courses. With the invention of the Internet in 1989, distance learning was made more accessible after the World Wide Web was launched in the public domain in 1992 (Harasim, 2006). Along with its development, the term “distance learning” has evolved to describe different forms of technology mediated learning such as online learning, e-learning, virtual learning, online collaborative learning, and web-based learning (Moore et al., 2011).

In defining a Virtual Learning Environment (VLE), earlier definition described it as computer-based environments that are relatively open systems which facilitate access to resources and allow interactions with other participants and instructors (Wilson, 1996). Presently, a VLE can be understood as a software system that pools together different tools to deliver content and facilitate learning experience in an online manner (Weller, 2007). VLE is also considered as an Information System (IS) that facilitate technology enhanced learning to provide the administration and support of different learning process, such as e-learning, online courses, digital libraries, learning-related search engines (Müller, 2012). Dillenbourg (2000) described VLEs as: designed information spaces; spaces co-created by students who are active

contributors; spaces transformed into a 'place' through educational interactions; informational and social spaces; environments not limited to distance learning; environments that integrate technologies and multiple pedagogical approaches; and spaces that overlap with physical environment. VLEs as computer mediated learning have proliferated along with technology, and education systems have started to place a greater emphasis on it with the intention that it could enhance student learning (MOE, 2013).

VLEs facilitate electronic learning (e-learning) via computer-mediated communication and is also generally known as Learning Management System (LMS), Content Management System (CMS), Managed Learning Environment (MLE), learning support system, or learning platform (Martin-Blas & Serrano-Fernández, 2009). In the United States, LMS and CMS are more commonly used, while in the United Kingdom and European countries the terms VLE and MLE are frequently used to describe a system that integrate a range of tools for the delivery of learning experience (Martin-Blas & Serrano-Fernández, 2009). It is thus apparent that the Frog VLE is referred to as a VLE as it originates from the United Kingdom (FrogAsia, 2013).

More recently, the development of improved technology saw the emergence of cloud-based virtual learning environment. Cloud-based computing involves expandable, on demand services and applications delivered over the internet, and the systems software and hardware provided by data centres that supply those services (Johnson, Adams Becker, Estrada & Freeman, 2014). This technology mainly involves three types of services: infrastructure

as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) (Tripathi, 2017). IaaS offers services at the Information Technology level where system administrators are provided with hardware resources such as server space, storage space, memory, central processing unit cycles, and network equipment (Velte, Velte, & Elsenpeter, 2010). These resources can be dynamically scaled according to application needs and organisations only need to pay for resources used. PaaS offers services at the developer level which include the design, building, and testing of applications using resources supplied from the Internet without the need of software installation (Park & Ryoo, 2013). Other services offered by PaaS include support of web development interfaces, and the construction of web services which are delivered to end-users (Velte et al., 2010). SaaS is applicable at the end user level, where applications are utilised online, made available by a cloud vendor, and this service is sold as a complete package for end-users (Park & Ryoo, 2013; Velte et al., 2010). With SaaS, services such as software applications are kept on a server and delivered over the internet to end users, instead of products which need to be installed into the computer (Tripathi, 2017). In the educational context of cloud-based computing, SaaS is more applicable as various services and functionalities such as cloud storage, Gmail, Google hangout, are made available to end users for learning and instruction purposes (Shiau & Chau, 2016). Cloud computing offers great potential in enabling wide-spread use of technology enhanced learning, and review studies had advocated that its examination in educational context be intensified (Baldassarre, Caivano, Dimauro, Gentile, & Visaggio, 2018; Panigrahi, Srivastava, & Sharma, 2018).

Users can become more efficient when they switch from traditional LMS service to cloud services, as the latter provides better collaborative tools while allowing users seamless access from different devices (Park & Ryoo, 2013). Cloud-based VLE is gradually gaining ground over grid computing-based VLE through its capabilities in facilitating both single user and multi-users collaborative study modes (Hew & Syed Abdul Kadir, 2016a). This is apparent as services offered by cloud-based VLE surpass traditional conventional grid-based LMS (Shiau & Chau, 2016), with benefits such as the ability to be “omnipresent” to the access of content, advantages of rapid deployment, capacity for infinite collaboration, connectivity of multi-users, and enables integration of powerful tools such as Google Apps and Khan Academy (Hew & Syed Abdul Kadir, 2016c; Park & Ryoo, 2013). Cloud-based VLEs also offer seamless access to information from anywhere and anytime through any digital device, and teaching resources uploaded can be saved, retrieved and shared on the cloud easily (Hew & Syed Abdul Kadir, 2016a; Stantchev, Colomo-Palacios, Soto-Acosta, & Misra, 2014).

2.2.1 Frog Virtual Learning Environment in Malaysia

The Malaysian government launched the 1BestariNet (1SmartNet) project in 2012 to establish Malaysia as a model of excellence in integrating web-based learning in schools (1BestariNet, 2012). Under this initiative, all 10,000 schools in Malaysia will be connected with the cloud-based Frog VLE supported by Internet access with internet speed that range between 2Mbps to 10Mbps in urban areas, and 1Mbps to 4Mbps in rural areas (FrogAsia, 2012).

The first phase of the 1BestariNet lasted from 2013 to 2015 focused on setting up infrastructures and equipping teachers with VLE competency (MOE, 2013). Teachers were trained through ‘train the trainers’ manner, with teachers training their colleagues after attending initial trainings session (Cheok & Wong, 2016). The second phase of implementation commenced from 2016 to 2020 focuses on reviewing best approaches to intervene specific schools which include under-enrolled or rural schools (MOE, 2013). The third phase which is scheduled to take place in year 2021 through to 2025 is directed at maintaining innovativeness, and system-wide usage. In this final phase, ICT usage among teachers and students will be intensified where it will be fully integrated throughout the curriculum and pedagogy of the education system. The MOE adopts this phased approach to ICT implementation, as it is deemed holistic in mapping educational goals to the best ICT practices identified throughout these phases (MOE, 2013).

The Frog VLE, a commercial virtual learning platform, is provided to the Malaysian MOE by a private company, FrogAsia Sdn Bhd (FrogAsia, 2018). This company is a joint venture effort between a Malaysian company with FrogTrade Ltd., a company based in the United Kingdom that has more than 15 years’ profile in supplying educational technology (“FrogTrade's giant leap into Malaysia”, 2012). This platform is currently used in 12,000 schools across 23 countries, with over 20 million users. In Malaysia, Frog VLE is deployed to all public schools, where the educational community of the entire nation is connected through it.

In Frog VLE, the FrogDrive is a central storage and the main application for storing and accessing resources that teachers have created or shared with them (FrogAsia, 2018b). Teachers have access to an array of applications in their FrogDrive such as Assignments (for assigning tasks to students), Booking Calendar (reservation of school rooms or other resources), Bookshelf (storage of digital books obtained from FrogStore), Calendar (personal organiser), Community (provide support, tips and resources for using Frog VLE), Departmental Sites (departmentalised according to subjects), Discover (search tool for contents from internet and My Library which is added from FrogStore), Email, Forums (discussion forums for teacher and students of the same school), FrogPlay (pre-built quizzes), FrogStore, Google Drive (cloud-based storage and sharing), Learning Styles Reports, Preferences (for setting of languages, background design and password), School documents (policies and handbooks), Sites (Learning sites built by teachers) and The Pond (ideas on how to optimise usage of VLE) (FrogAsia, 2018b).

One of the central and most important features to facilitate teaching and learning is the creation of learning sites in the Frog VLE (Soon, 2014). Teachers are encouraged to create sites which could be tagged with keywords to allow them to be categorised and located quickly. These sites are subject to the approval of the MOE with the requirement that contents have to be original with proper citing of referenced materials. Sites that are created by teachers or have had the ownership transferred to them are saved in the FrogDrive section of their account. Contents that are created by teachers in a cloud-based Frog

VLE add to the open educational resources which could be shared, reused, and adapted as learning designs for teaching (Campbell, 2015).

Teachers are encouraged to create not only academic sites related to school subjects, but also non-academic sites such as those related to co-curricular activities or other areas of interest. As creators, teachers control the access and editing permissions of sites created by them. They can share their sites with other teachers or other schools by sending their sites to the MOE repository (FrogAsia, 2018b). Teachers can upload and download sites to and from the MOE repository. Besides this repository, sites created by teachers can be made available in the FrogStore upon MOE's approval, so that other teachers may also utilise it as reference. To ensure the security of the learning sites, users (teachers or students) have to log-in to their respective Frog VLE.

Tools and templates are provided to aid teachers to build the learning sites. They could assign a name to a site, then personalise it with a pre-determined theme and icon from the templates available in the system. Alternatively, teachers may also upload their own material to be used as icons of the learning sites. The learning sites created could be enhanced by widgets such as those for text, media, notifications, embedding of websites, and even for file-drop (FrogAsia, 2018b). For instance, the media widget embeds materials such as photos, videos, and audio files into the learning site, while the file-drop widget allows students to submit their assignment into a learning site. Teachers have control over the learning sites with the "Rules" function that allow them to hide certain components from other users or to set access for a

certain period. For example, teachers could control students' access to assignment submissions on certain dates.

Besides this, teachers can use Frog VLE to assign and keep track of students' work and scores, or connect with other educators, while students can access learning materials, complete and submit their school work, and share ideas with their classmates. School administrators could also make the most of Frog VLE to organise their school activities and disseminate notices through the School Dashboard (FrogAsia, 2018b). One powerful feature that sets Frog VLE apart from others is its parental portal which allows parents' involvement in their children education (Kemp, 2012), to keep track of school events, notices, school calendar, and access to important documents (FrogAsia, 2018b). Each category of users is given a unique ID to access the VLE platform.

The school sites (School Dashboard) are available to teachers for administrative purposes, while My Dashboard serves as a "personal site" to teachers with its content controlled by the teacher who owns it, and could not be accessed by other users (FrogAsia, 2018b). Teachers can personalise their Dashboard by adding personal contents such as photos, videos, links to favourite websites, work calendar, and RSS Feeds.

Kemp (2012) compared Frog VLE with other VLEs used in the United Kingdom such as Moodle (Modular Object-Oriented Dynamic Learning Environment), Firefly, StudyWiz, and Uniservity, and found Frog VLE to be the most simple and flexible system that allow teachers to "create a page, throw

up some resources, add in some media” (p. 60) to quickly commence usage. This system is considered as an “all-in-one package” which is easy to use, promote good design skills, and supported by a powerful system called FrogBricks which facilitate users to create various types of resources and ideas. Kemp (2012) also opined that Frog VLE would enable almost any teacher to quickly create resources without having to undertake significant training.

Frog VLE is a media rich learning platform that emulate virtual equivalent of a real-life teaching and learning, and such VLE can induce users’ subjective responses which affect their behavioural intention (Rodríguez-Ardura & Meseguer-Artola, 2016). Hence, it is imperative that investigations need to be based on relevant theories to provide empirical evidences and build existing knowledge base.

2.3 Overview of Theories in Continuance Intention

Systematic reviews on continuance of technology (Nabavi et al., 2016; Shaikh & Karjaluoto, 2015) had noted a few dominant theories in continuance intention such as the IS Continuance Model (Bhattacharjee, 2001), Technology Acceptance Model (Davis, 1986), Theory of Reasoned Action (Fishbein & Ajzen, 1975), Theory of Planned Behaviour (Ajzen, 1985), and Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003). Scholars have noted that these theories can generally be classified as static-type models and process-type model (Lin & Ong, 2010). Static-type models such as the Technology Acceptance Model and the Theory of Planned

Behaviour tries to explain users' intention and behaviour based on forward-looking or prospective expectations about IT usage, while process-type model such as IS Continuance Model takes into account backward-looking or retrospective perceptions grounded in usage experience to explain users' intention (Lin & Ong, 2010; Premkumar & Bhattacharjee, 2008).

The *IS Continuance Model* (ISCM) was proposed by Bhattacharjee (2001) based on the Expectation-Confirmation Theory (ECT) (Oliver, 1980) and the Technology Acceptance Model (TAM) (Davis, 1986). The model combined the variables of ECT (satisfaction and confirmation) and the TAM (perceived usefulness) to explain continuance intention in online banking. Perceived usefulness represents expected benefits of technology use while confirmation refers to the congruence of users' expectation and actual performance of technology. These two aforementioned variables are predictors of satisfaction, which in turn predicts continuance intention. Satisfaction is similar to affective attitude in the TAM, but conceptualised as a post-adoption affect rather than pre-usage affect (Bhattacharjee, 2001). This theory postulates that when technology performance exceeds users' expectation, satisfaction arises and affects users' intention to continue in a particular technology.

ISCM relies on backward-looking and retrospection of prior usage experience, to confirm users' expectations toward technology, its usefulness, and satisfaction based on prior use (Lin & Ong, 2010). Scholars noted that the model is too dependent on cognitive reasoning to explain post-adoption decisions (Limayem et al., 2007). Scholars have also criticised the model for

overlooking the role of users' intrinsic motivation, by virtue that the model predicts the intrinsic variable of intention (Sørebø et al., 2009; Thong, Hong, & Tam, 2006). The original model explained 41% of variance in continuance intention (Bhattacharjee, 2001), and studies had tried to increase its explanatory power, by incorporating concepts such as perceived enjoyment, flow, self-efficacy, perceived privacy, and habit to examine continuance intention (Limayem et al., 2007; Lee, 2010; Susanto, Chang, & Ha, 2016; Thong et al., 2006).

The *Theory of Reasoned Action (TRA)* is rooted in social psychology, posits that outcome variable of behaviour is determined by intention, which is jointly predicted by the constructs of attitude towards behaviour and subjective norm (Fishbein & Ajzen, 1975). TRA assumes that individuals are rational and would consider the effects of their actions before they decide to engage (or not) in a particular behaviour under voluntary context (Ajzen & Fishbein, 1980). This also pose as a limitation as TRA cannot explain behaviours which are not consciously thought out such as habit or automaticity. The theory also becomes limited when intention changes, and therefore intention is required to correspond to behavioural criterion, with regards to action, target, time, and context (Ajzen, 1985; Sheppard, Hartwick, & Warshaw, 1988).

As the engagement of behaviour explained by TRA is applicable to a wide range of behavioural domains, Venkatesh and Davis (2003) incorporated it in their seminal work in technology adoption research. This longitudinal study examined voluntary and mandatory technology use contexts, and found

attitude in the TRA becoming more profound over three time waves in both contexts. However, subjective norm was found to be insignificant in all time waves in voluntary use context, and but significant when users need to comply with mandatory implementation (Venkatesh et al., 2003). This voluntary contextual finding was echoed in continuance research, where Liang and Yeh (2011) employed TRA to investigate adoption of mobile services in the context of school and workplace. The model accounted for 66.9% of variance in continuance intention, and attitude was found to be significant on continuance, while subjective norm was found to be insignificant in both contexts among non-students users. More recently, Bonsón, Escobar, and Ratkai (2014) investigated social media use with a model that explained 18% of variance in continuance intention. Subjective norm was conceptualised as social influence, and it was found insignificant to attitude and satisfaction. Such findings in continuance research supported theoretical arguments that others' opinion is only important during early stages of technology, and users may form own opinion which counter the initial ones during post-adoption phase (Karahanna et al., 1999; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh et al., 2003).

The *Theory of Planned Behaviour* (TPB) was developed as an extension of the TRA with the addition of perceived behavioural control, to account for situations where individuals do not have complete control over their behaviour such as in mandatory technology implementation (Ajzen, 1985). The outcome variable of behaviour is predicted by intention, which is jointly determined by attitude, subjective norm and perceived behavioural control

(five constructs). A later version of TPB called the Decomposed TPB (DTPB) was proposed by Taylor and Todd (1995a) in technology adoption research, where attitude, subjective norms, and perceived behavioural control was further predicted by another level of constructs. The DTPB which consisted of 13 constructs had better explanatory power (36%) of usage behavioural when compared to the original TAM (34%) and TPB (34%). DTPB is more beneficial than TPB and TAM as it looks into more factors which explain behaviour, however, the authors cautioned the application of the model when considering the trade-off between model complexity (13 constructs) and explanatory power (Taylor & Todd, 1995a).

In continuance intention research, the DTPB was found to explain 55% variance in continuance of instant messaging in workplace (Ajjan, Hartshorne, Cao, & Rodriguez, 2014). The study found attitude, colleagues/superior influence and behavioural control to be significant predictors of continuance, as the rich social context of instant messaging requires users to reciprocate to messages sent by superior and colleagues. More recently, Sawang, Sun and Salim (2014) applied the original TPB to investigate a virtual learning environment in a Chinese university. The model explained 61.8% of variance in intent to continue with most predictors being significant with the exception of perceived behavioural control, implying that individuals will still adopt technology despite the lack of control over it. Subjective norm was significant and authors suggested that this aligns with the Chinese culture of gaining face by adopting innovations ahead of peers especially in academic setting. Hence,

studies demonstrate that each factor in the model can have divergent effect in different technological context.

The *Unified Theory of Acceptance and Use of Technology* (UTAUT) is a comprehensive model that combined eight theories (TRA, TPB, TAM, combined TAM-TPB, Model of PC Utilisation, Motivational Model, Innovation Diffusion Theory, and Social Cognitive Theory) (Venkatesh, Morris, Davis, & Davis, 2003). The authors examined the commonalities of these eight models in a longitudinal study to predict intention and usage behaviour, and four constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) were proposed as direct determinant of intention and usage behaviour. Additionally, the authors theorised four moderating constructs of experience, voluntariness, age, and gender, and the original model accounted for 70% of variance in use intention.

In continuance research, Chiu and Wang (2008) adopted four constructs from UTAUT, together with another eight constructs from subjective task value to investigate continuance intention of web-based learning. They excluded moderating effects from the model, which managed to explain 60% of variance in continuance intention with intrinsic value being the most salient factor, while social influence was insignificant. Wu, Huang, and Hsu (2013) also employed the four main constructs of UTAUT, as well as trust, and satisfaction to predict continuance intention of online social network. Their model also did not include any moderating effects, and accounted for 67% of variance with benevolence trust being the most important factor. As

respondents comprise of members who joined a charitable online social network, benevolence trust reflects the importance of goodwill and having the best interest of the beneficiaries. These studies shown the variability of salient factors in different context of technology examined.

Despite its success in predicting a large portion of variance in users' intention, its multifaceted conceptualisation and resultant large numbers of independent variables (41 for intention and eight for usage behaviour) have been criticised to be exceedingly complex for application (Bagozzi, 2007, Van Raaij & Schepers, 2008). This is reflected with a systematic review of the originating article of UTAUT cited in databases of Thomson Scientific Web of Sciences®, whereby a majority (91%) of the 450 reviewed articles only mentioned the model in broad discussion, but did not use it (Williams, Rana, Dwivedi, & Lal, 2011).

The *Technology Acceptance Model* was originally developed to investigate the acceptance (pre-adoption) of a new technology (Davis et al., 1989), but systematic reviews had found it to be the top two theories applied in continuance intention research alongside IS Continuance Model (Nabavi et al., 2016; Shaikh & Karjaluoto, 2015). The model posits that system usage is predicted by intention which is predicted by attitude, while attitude is jointly predicted by beliefs of perceived usefulness and perceived ease of use (Davis et al., 1989). Where technology is investigated in the post-adoption phase, these constructs are conceptualised as post-adoption beliefs and attitude

evaluated base on hands-on experiences with technology (Karahanna et al., 1999).

Out of this model, there were further variations developed to understand technology usage. For instance, Venkatash and Davis (2000) developed the TAM 2 to further predict perceived usefulness with another level of five constructs, and two moderators. In 2008, the TAM 3 was introduced where this time perceived ease of use was further predicted by six antecedents with two moderators (Venkatesh & Bala, 2008). However, these later versions of the model were scarcely used in continuance intention studies (Nabavi et al., 2016).

In continuance intention research, the TAM constructs have been successfully applied in educational technology context (Fathali & Okada, 2018; Rodríguez-Ardura & Meseguer-Artola, 2014; Mohamed & Lamia, 2018; Wu & Zhang, 2014; Yang et al., 2017). The TAM is useful in examining continuance intention with better explanatory ability, as found by comparative research of competing models and multi-group invariance analyses (Cheng, Chen, & Yen, 2015; Hong et al., 2006; Premkumar & Bhattacharjee, 2008). The wide-spread application of this theory is attributed to its parsimonious structure that is able to provide adequate explanation and prediction within diverse users, contexts and technologies (Marangunić & Granić, 2015; Teo, 2009). In e-learning, the model is endorsed by meta-analysis research as a good model, because the effect sizes of purported causal relationships are very similar across different e-learning technologies and user types (Šumak et al., 2011). Such meta-analysis

enhanced the assumption of generalizability of theoretical account of the TAM in e-learning. As shown from previous discussions, different technological contexts can induce varied users' responses, hence the generalizability of an Information System theory is important both for research and for solving practical problems (Lee & Baskerville, 2003).

Parsimonious modelling is important when integrating theoretical frameworks (Tenenbaum & Filho, 2016). The current study employs the TAM to integrate psychological ownership in its research model, given its advantages in parsimony and the strength of its theoretical accounts (Plouffe, Hulland, & Vandenbosch, 2001; Šumak et al., 2011; Teo, 2009). More importantly, earlier studies shows empirical support of integrating psychological ownership with the TAM (Barki et al., 2008; Smith, Grant, & Ramirez, 2014; Wu, Liu, Liu, & Zhou, 2017; Zhao et al., 2016), and this study builds upon these empirical grounding to explain the phenomenon of interest in the study. The subsequent section discusses the TAM in detail.

2.4 Theories Related to the Study

The present study is anchored on the Technology Acceptance Model with the incorporation of the concept of psychological ownership. The following section discusses the relevance of this theory to the current study.

2.4.1 Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed mainly due to the concern that employees were not using the technology made available to them (Davis, 1989; Davis et al., 1989). It is originated from the TRA, to explain and predict influences to human behaviour (Ajzen & Fishbein, 1980; Davis et al., 1989). Central to TRA, attitude describes individuals' positive or negative feelings (evaluative affect) towards executing a particular behaviour, while subjective norm is brought about by their belief of whether people important to them think the behaviour should be executed (Fishbein & Ajzen, 1975). TRA is a general model to predict behaviour which is under volitional control, and research must first identify external variables in terms of the beliefs salient in affecting subjective norm and attitude toward behaviour (Davis et al., 1989). Figure 2.1 depicts the TRA model.

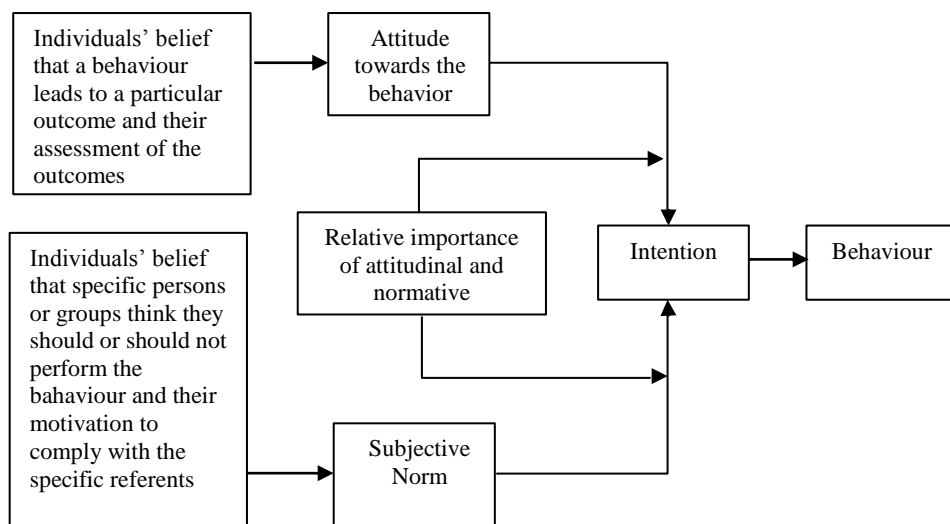


Figure 2.1: The Theory of Reasoned Action (Ajzen & Fishbein, 1980, p. 8)

Davis (1986) later adapted TRA and proposed the TAM to explain computer usage behaviour in his doctoral thesis at Massachusetts Institute of Technology. While TRA is more general, TAM is directed at behaviours associated with technology use with two key beliefs: perceived usefulness and perceived ease of use (Davis, 1989; Davis et al., 1989). The core assumption of the TAM is that system usage is predicted by attitude, which is jointly predicted by user beliefs which consisted of perceived usefulness and perceived ease of use. Perceived usefulness captures the extent to which individuals believe that a particular system will help them perform their job better, while perceived ease of use describes the degree to which individuals believe that usage of the particular system will be free of effort (Davis, 1989). Perceived ease of use was hypothesised to influence perceived usefulness, as a system which is not easy to use will probably be perceived as not useful. These two variables were positioned as antecedents of attitude toward using, which in turn determines actual system use (Davis et al., 1989).

Davis (1989) developed the scales to measure perceived usefulness and perceived ease of use in the seminal work which also validated these scales in a field study with 112 users and a laboratory study which involved 40 users. As a departure from TRA, behavioural intention was omitted from TAM. As time is needed to form intention, Davis (1986) justified that it would not be applicable to his research context because user motivation to use a new system was measured directly after demonstrating the system to them. Hence, the time is not sufficient for intention to develop prior to measurement. Figure 2.2 shows the original model proposed by Davis (1986):

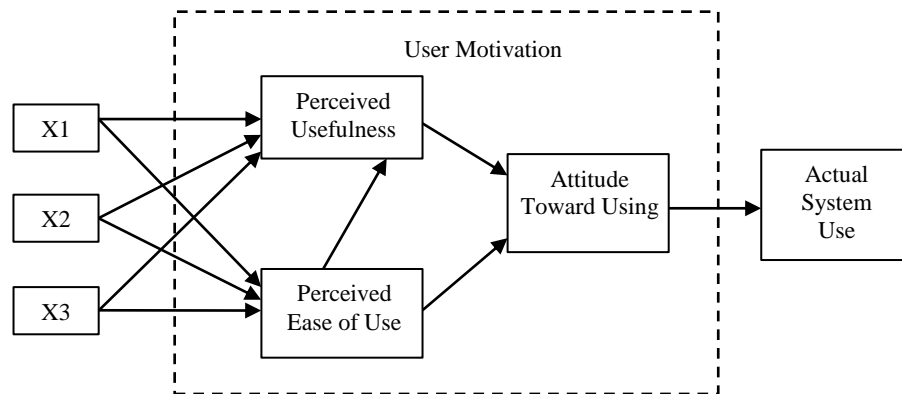


Figure 2.2: Original TAM proposed by Fred Davis (Davis, 1986, p. 24)

Later development of the model included behavioural intention as a new construct which would be influenced by perceived usefulness and became the key determinant of actual system use (Davis et al., 1989). This refined model was successfully tested in a longitudinal study with 107 users (Davis et al., 1989). It posits that behavioural intention is jointly predicted by attitude and perceived usefulness. The belief of usefulness was directly linked to behavioural intention, bypassing attitude. Davis et al. (1989) justified that intention of using technology can be formed based on beliefs of its usefulness, without relying on positive or negative affect towards it. For instance, a clerk intends to use a word processing technology regardless of his/her attitude towards it, as long as it is useful for him/her to finish work and go home early. Consistent with TRA, Davis et al. (1989) also included external variables in the model, to identify factors which can influence users' beliefs of perceived usefulness and perceived ease of use. The objective of examining external variables is to determine the chain of effects from these variables to the

outcome variable specified in the TAM (Teo, 2009). Davis (1986) had originally positioned system characteristics as external variables, but research had also examined other factors such as user characteristics, computer self-efficacy, nature of implementation, and training (Davis et al., 1989; Davis & Venkatesh, 1996). Figure 2.3 shows the refined model:

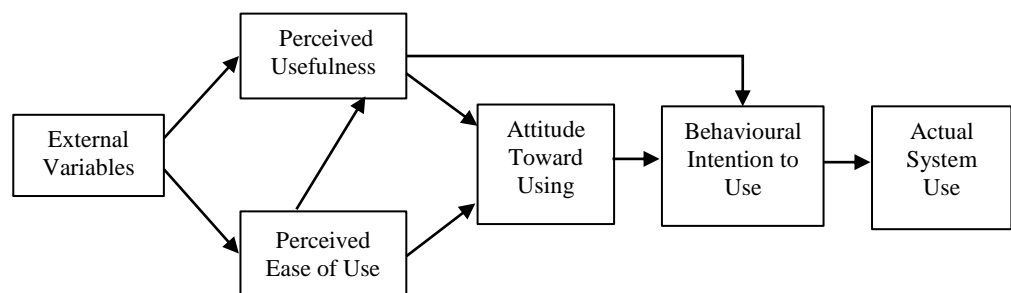


Figure 2.3: Theoretical Framework of Technology Acceptance Model

(Davis et al., 1989, p. 985)

The TAM had been found to be a parsimonious and theoretically justified model that is capable of explaining the interaction among users' beliefs, attitude, and intention towards using educational technologies (Teo, 2009; Mei, Brown, & Teo, 2018). Many studies had attested to TAM's parsimony, making it a good ground theory for studying factors that influence user decision on specific e-learning technology (Plouffe et al., 2001; Šumak et al., 2011). However, the model had been criticised as inadequate in explaining the motivations behind the assumed reasons for actions taken (Bagozzi, 2007). For instance, a user can agree that a particular system is useful and easy to use, which are favourable criteria for deciding to act (to use the system), but he/she may not have the desire to act or choose not to act. In other words, there is a

need to look at the motivations behind perceived usefulness and perceived ease of use. The current study inquires within this gap by proposing psychological ownership as an external factor, serves as a possible motivation that drives the actions behind these beliefs.

2.4.2 Investigation of Continuance Intention with the TAM

There are two outcome variables in the TAM: behavioural intention and actual system use. The study examined continuance intention instead of actual system use based on several reasons. As actual usage records of Frog VLE is not accessible to the researcher, reliance on self-reported usage can hinder the investigation of the relationship between behavioural intention and actual usage (Agudo-Peregrina, Hernández-García, & Pascual-Miguel, 2014; Sánchez-Prieto et al., 2016). There are two types system use: objective (actual use reports, log records, number of queries, and connect time); and subjective (frequency of use, value in decisions, extent of use, frequency of report, number of packages, and number of messages) (Straub, Limayem, & Karahanna-Evaristo, 1995). Where there is an absence of actual usage records, studies had relied on subjective self-reported measures. Research in educational technology noted that self-reported usage is less reliable as teachers may report in a socially desirable way, whereby they may report a higher level of usage as they consider it more acceptable (Teo, 2011; Sánchez-Prieto et al., 2016). This could pose a problem to the study especially with the impending issue of low ICT usage in Malaysia. Comparative studies of the two measures noted that self-reported data can suffer from criterion validity,

because comparative research found self-report data to correlate only moderately with actual user records (Boase & Ling, 2017). This is evident from meta-analysis of 73 studies which recommended actual usage over self-reported usage (Turner, Kitchenham, Brereton, Charters, & Budgen, 2010).

Additionally, intention is deemed as more progressive and predictive compared to actual use, which is more static and retrospective (Roca et al, 2006). Continuance intention is described as a series of individual decisions to continue using a particular technology, thereby reflecting its forward-looking nature (Limayem, et al., 2007). In this regard, the TAM is capable to explain continuance intention as a prospective construct directed at future use, to examine the forward-looking or expectations about IT usage (Cho, Cheng, & Hung, 2009).

In a systematic review of TAM studies from 1986 to 2013, Marangunić and Granić (2015) submitted that a deeper understanding of contributing factors to the model is required. Although research has advanced the understanding of the model with a variety of technology, the rapid and continuous development of new technologies such as cloud-based VLE opens new directions of research that can enhance understanding of the model. The current study proposes the concept of psychological ownership as an external variable which can work through to the TAM, to build up prior empirical evidences which demonstrated the convergence of these two research streams (Barki et al., 2008; Paré et al., 2006; Smith et al., 2014; Wu, Liu, Liu, & Zhou, 2017; Zhao et al., 2016). However, these studies did not investigate the TAM

in its totality, but mainly included perceived usefulness and perceived ease of use. Hence, it will be opportune to investigate the core TAM variables to explain continuance intention. The adapted model is shown in Figure 2.4.

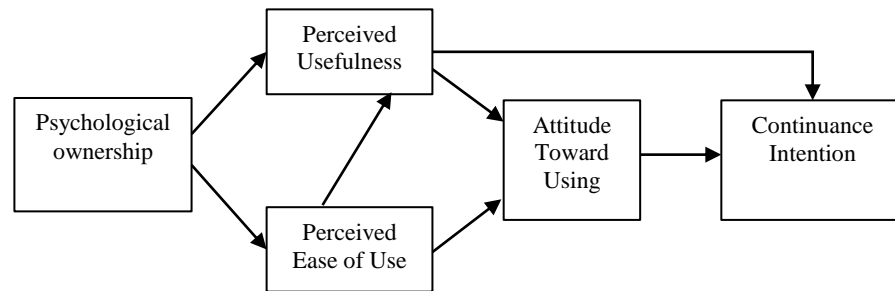


Figure 2.4: Technology Acceptance Model adapted in the current study

2.4.3 Theory of Psychological Ownership

Psychological ownership is an affective and cognitive state described as the feeling of possessiveness which results in a psychological connection with an object, in which individuals consider the target of ownership or a part of that target to be theirs. (Pierce et al., 2001; Pierce et al., 2003). Ownership is in the core of human beings, as people have an innate need to possess (Porteuos, 1976). As Sartre (1969) argued, “to have” own something is inseparable from to be someone, as people identify themselves with their belongings. Individuals can experience a connection between the self and different object of possessions, and these objects can become part of the extended self when they see themselves in it (Belk, 1988; Dittmar, 1989). In this vein, objects of ownership can be in tangible or intangible forms, without the existence of a legal ownership (Pierce et al., 2003; Van Dyne & Pierce, 2004).

Psychological ownership could manifest itself in a large variety of context. Early interest on ownership behaviour and motives have been observed from research areas of philosophy, politics, history, economics, and law (Furby, 1980). It is apparent that people will take better care of and nurture the possessions they own, and they will naturally strive to protect and improve the object which belongs to them. When individuals see part of themselves in an ownership target, the ownership effect can promote the emergence of a sense of responsibility, accountability, obligation, and to a greater extent the willingness to accept personal risks in the interests of an ownership target (Pierce & Jussila, 2011).

With its potential in influencing human motivation and behaviour, the concept has also been applied in the technological context, with various technologies as targets of ownership such as: online education (Buchem, Tur, & Hölterhof, 2014; Wu et al., 2017), information systems (Barki et al., 2008; Huang, Parolia, & Cheng, 2016; Smith et al., 2014), virtual worlds (Moon, Hossain, Sanders, Garrity, & Jo, 2013; Lee & Chen, 2011), work place devices (Klesel et al., 2016), and social media (Karahanna et al., 2015; Zhao et al., 2016). In the present study, the Frog VLE is examined as a target of ownership that can give rise to a sense of psychological ownership to teachers who use it.

There are two ways to understand psychological ownership: ‘Why’ it develops which refers to the motivation for its emergence, and ‘how’ it develops which directs at the antecedents that cause psychological ownership (Pierce et al., 2001; Pierce et al., 2003). On ‘why’ would it develop, the

literature noted that it emerges out of the motives to satisfy four human needs: efficacy and effectance, self-identity, to have a place, and stimulation (Pierce et al., 2001; Pierce et al., 2011). *Efficacy and effectance* reflect individuals' need for control to feel effective and competent, and objects of ownership serves as an instrument of control which satisfy this need. For instance, the functionalities in a VLE offers varying degree of control that can allow users to feel competent in operating the platform. Objects of ownership also serves as a symbol of identity as individual express their *self-identity* through things they possess (Pierce et al., 2001; Jussila et al., 2015). Possessions that is ingrained with self-identity serve as a mean of maintaining self-continuity, when the sense of self is embedded into these objects (Csikszentmihalyi & Rochberg-Halton, 1981). In the present study, it is possible for a VLE to reflect teachers' identity, as they orchestrate activities and personalise VLE content and design thereby increase preference fit. It is possible for psychological ownership to stimulate teachers' continuity behaviour towards the VLE when teachers' self-identity is embedded in it.

The third need, *having a place*, describes the need to have a space which can allow people to comfortably dwell (Pierce et al., 2001). For instance, a teacher may "dwell" in their VLE account, logging on frequently to access teaching materials, check their e-mails, create learning sites, or communicate with the VLE community. Lastly, *stimulation* refers to the arousal from objects that people own, this psychological experience determines whether people settle for their existing possessions or seek for new possessions (Pierce et al., 2001). Individuals have a need to be stimulated in terms of psychological

activation and arousal, and this can explain why new objects are being coveted as one's possession (Pierce & Jussila, 2011). A cloud-based VLE is capable to stimulate its users with its nature that provides interactive functionalities, seamless access to resources, different cloud services, and communication channels. Teachers are able to utilise various tools such as building of learning sites, gamification of lessons, and generating learning style reports.

In terms of 'how' psychological ownership develops, it is seen as antecedents which stems from three key experiences: (a) experienced control over an object, (b) knowing an object intimately, and (c) investment of the self in an object (Brown et al., 2014; Pierce, O'Driscoll, & Coghlan, 2004; Pierce & Jussila, 2011). These experiences are also described as routes to psychological ownership (Pierce et al., 2001). *Experienced control* describes a feeling of being in control over an object which is experienced through its usage (Brown et al., 2014; Rudmin & Berry, 1987). The amount of control individuals exercise over an object can result in feelings that it has become an extension of the self (Furby, 1978; McClelland, 1951), and this is especially profound through continued functional control exercised over an object to perform desired tasks (Brown et al., 2014). This can be experienced through technology, as the interactivity in technology allows varying degree of control which can facilitate the development of psychological ownership for it (Kirk & Gaskin, 2018). In a similar vein, the Frog VLE is a media rich platform which afford users varying degrees of interactivities (Hew & Syed Abdul Kadir, 2016c), and it is possible for psychological ownership to emerge through its usage.

Knowing an object intimately can be equated to the breadth and depth of knowledge about an object, which breeds familiarity and a sense of ownership toward it (Pierce et al., 2001). Individuals gain information and knowledge about an object by using it, and they can come to know it thoroughly with increased knowledge about the object. This mechanism is anchored on knowledge about an object can bring about a psychological connection between the self and the object concerned (Pierce & Jussila, 2011). Knowledge about an object enhance association as well as strengthen proximity between an object and its owner (Beggan & Brown, 1994). Such phenomenon can be possible when using a cloud-based VLE. As the platform is consisted of numerous tools and applications that run through the cloud, teachers need to have the necessary knowledge and skills to effectively use it. Familiarity naturally accrues with direct experiences of using the VLE, and may foster the emergence of psychological ownership.

The last determinant that precedes psychological ownership is *investment of the self* into an object, by which feelings of ownership is strengthened when individuals invest their energy, time, imagination and aspects of themselves into a target of ownership (Brown et al., 2014; Csikszentmihalyi & Rochberg-Halton, 1981). A similar mechanism is noted in IS research, whereby users believe that the system reflects themselves when they invest their energy, skills, and ideas into system design and development (Paré et al., 2006). It is apparent that teachers devote their time, effort, and ideas into the VLE, as they plan and orchestrate learning activities in the platform. As they master-mind these activities according to respective

preferences, the resultant contents in the VLE may closely reflect part of themselves.

From the initial review of the antecedents of psychological ownership, the present study proposes that teachers can experience these three key experiences, which can bring about the psychological ownership for the VLE concerned. The ownership effect can energise and sustain human behaviour towards a particular ownership target, as individuals strive to promote the continuity of their possessions when it is considered part of themselves (Pierce et al., 2003; Pierce & Jussila, 2011). With the rationale, it is reasonable to include psychological ownership to examine continuance of a VLE, as the ownership effect in teachers can play a role in affecting the continuity of the VLE. Hence, the study proposes the following theoretical framework in Figure 2.5 to examine the mechanism of the development of psychological ownership:

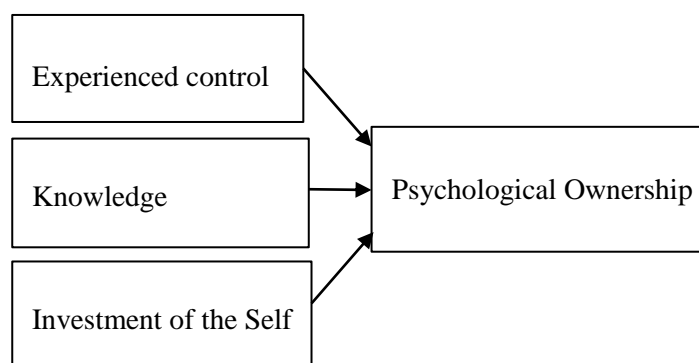


Figure 2.5: Theoretical Framework of Psychological Ownership

2.4.4 Previous studies which investigated Psychological Ownership with the TAM

In the technological context, psychological ownership has received attention as an important factor in affecting users (Klesel et al., 2016; Lee & Chen, 2011). As technology became ubiquitous in work or personal, modern lives, boundaries between humans, devices, and systems disappear when technology increasingly become an extended self of its users (Stein et al., 2013). Such phenomenon is aptly reflected by Turkle (2011), who discussed how people are ‘becoming’ their devices, being able to better function with it, but feeling incomplete without it.

Technology operates at the command and manipulation of its users, and it is common for users to encounter the three key experiences that precede psychological ownership: experienced control, acquiring knowledge, and investment of the self (Chen, Zhao, & Wang, 2016; Kim, Kim, Jeon, Jun, & Kim, 2016; Lee & Suh, 2015; Sinclair & Tinson, 2017). Psychological ownership which is developed over time can offer a lens through which the ownership effect exerts influences on users’ beliefs, and evaluations about technology which can subsequently affect their attitude and intention towards the technology concerned (Karahanna et al., 2015). The potential of these effects has been examined in various context by researchers who incorporates psychological ownership into the TAM (Zhao et al., 2016).

Paré et al. (2006) pioneered one of the earliest studies which incorporated psychological ownership and the TAM that included user participation to investigate a clinical information system among 91 physicians. Step-wise linear regression was used to analyse the relationships in the extended model. User participation was found to significantly affect psychological ownership, which in turn significantly affected perceived ease of use and perceived usefulness. Sequentially, these beliefs significantly influence physicians' attitude towards the system, and system use. The research model explained 55% of variance in system use. Even though the study excluded behavioural intention which is part of the TAM, these findings provided preliminary empirical support for the incorporation of the concept of psychological ownership with the TAM (Paré et al., 2006).

Barki et al. (2008) also incorporated psychological ownership with the TAM to investigate a clinical information system with 91 physician respondents. These researchers investigated a model of system use with user participation, psychological ownership of IT, perceived usefulness, and perceived ease of use. Using Structural Equation Modelling, psychological ownership of IT was found to mediate the influence of user participation on perceived usefulness and perceived ease of use, explaining 64% of variance in system use. This study accentuated the mediating potential of psychological ownership with Sobel's test, which found it to partially mediated the relationship between user participation and perceived ease of use, and fully mediated the relationship between user participation and perceived usefulness.

The authors suggested that psychological ownership of IT would be a useful construct in technology acceptance research.

Recently, Klesel et al. (2016) adapted and extended Barki's et al. (2008) framework with a grounded theory approach that involved the interview of 20 industry experts. This research was conducted in the context of 'bring your own' technological devices to be used at the workplace. Among the causes of psychological ownership which emerged, the authors identified investment of the self and control to be important to the sense of ownership (Klesel et al., 2016). Their interviews also revealed that PO can foster technology use and exception handling which is the ability to overcome the technical issues of technology. This study prompted the authors to recommend future research to include different constructs to test their applicability in other technological contexts.

Wu et al. (2017) employed a modified TAM that applied beliefs of easiness and usefulness, within the context of education virtual community that involved 326 students, teachers, and parents. This study employed SEM to establish that users' willingness to share knowledge is significantly predicted by psychological ownership, perceived usefulness, and perceived ease of use. Additionally, significant mediating effects were found for the interactions between psychological ownership, knowledge sharing willingness, and knowledge sharing behaviour. The study suggested that users with stronger emotional attachment, and consider themselves as part of the virtual community are more willing to share knowledge with other members.

Moreover, knowledge sharing can be promoted through the interactions between willingness to share and psychological ownership.

Smith et al. (2014) affirmed the validity of the TAM to examine intention to use a new health information technology with the constructs of resistance to change, psychological ownership, perceived usefulness, and perceived ease of use. Data obtained from 75 physicians were analysed with PLS-SEM, and results showed that these constructs were significant in explaining 63% of variance in intention to use. The study also demonstrated the potential of psychological ownership as a mediator, with a significant partial mediation effect on the impact of resistance behaviour on perceived usefulness. The study suggested future research to continue the examination of these effects by exploring different system designs, and the potential mediating role of psychological ownership can be explored with other user factors.

The tenets of psychological ownership were also found to hold true in the post-adoption context of users' continuous use. Zhao et al. (2016) investigated continuous use among 791 users of the social media platform, LINE, predicted by psychological ownership, perceived ease of use, and perceived usefulness. The study found the experiences of control, knowledge about a target (conceptualised as perceived familiarity), and self-investment to be significant in resulting psychological ownership, which in turn influenced continued use. The model explained 70% of variance in continued use, and highlighted the critical role played by psychological ownership in affecting users' long-term commitment. The authors suggested that future research

should be carried in other contexts of culture and technology adoption. Lastly, the relevance of psychological ownership in cultivating long-term allegiance of technology was also supported by another study of 350 social media users, where continuance was significantly influenced by psychological ownership which was predicted by control, familiarity, self-investment, and social influence (Chen et al., 2016).

As shown from previous studies, psychological ownership aligns well with the TAM in explaining behaviour related to particular technology as a target of ownership. However, these studies did not investigate the TAM and Theory of Psychological Ownership in their entirety, but incorporated some constructs from these theories. Psychological ownership can be context-specific in reflecting individuals' current position in regard to the context of investigation (Mayhew, Ashkanasy, Bramble, & Gardner, 2007; Pierce et al., 1991; Van Dyne & Pierce, 2004), and scholars have called for more empirical studies to understand it in different contexts and for particular types of ownership targets (Pierce et al., 2003; Pierce & Jussila, 2011). The current study therefore responds to this call to incorporate psychological ownership to predict continuance intention. Hence, the present study integrates a complete TAM (with perceived usefulness, perceived ease of use and attitude towards using) with theoretical concepts of psychological ownership to advance understanding of the mechanism which can influence continuance intention.

2.5 Conceptual Model

Drawing from the evidence of prior studies, the hypothesised model of the current study consisted of eight core constructs from the Theory of Psychological Ownership and the TAM: experienced control, knowledge, investment of the self, psychological ownership, perceived usefulness, perceived ease of use, attitude towards using VLE, and continuance intention. This model is conceived on the premise that teachers who experience control over a VLE, has good knowledge about it, and have invested themselves into a VLE, will tend to develop psychological ownership for the VLE. The psychological ownership developed will influence their beliefs of perceived usefulness and ease of use, which jointly affect attitude towards using VLE and subsequently the intention to continue using the platform. Figure 2.6 illustrates the conceptual model of the study.

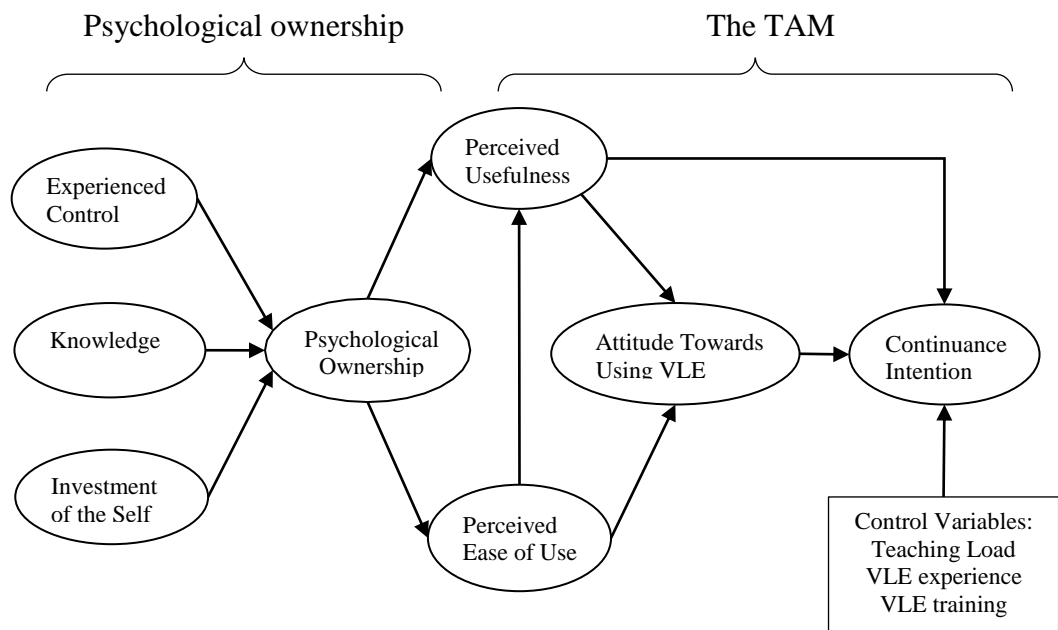


Figure 2.6: Conceptual Model of the Study

2.6 Variables of the Study and Suggested Hypotheses

This section discusses the variables of the study and reviews existing literature to elaborate their relevance to the development of the study's hypotheses.

2.6.1 Experienced Control

The control exercised over an object is a primary characteristic of ownership (Pierce et al., 2001). McClelland (1951) suggests that control bolsters the linkage between possessions and the self, and describes control akin to the parts of the body, where objects that can be controlled are considered as part of the self. Prelinger (1959) conducted one of the earliest tests of this proposition, where 160 items were card-sorted for subjects to rate between the dimensions of self and non-self. Results supported Prelinger's (1959) hypothesis that items which can be controlled, such as body parts, were perceived as part of the self. This tenet also holds true in a later study by Furby (1978) that explored the dimensions of possessions involving 270 participants of various age groups, where control was found to be the most salient feature of possession.

Objects that are within the sphere of control will be considered as part of the self, whereas objects that are outside the sphere of control are not regarded as part of the self (Belk, 1988). The feeling of possessiveness for an object is reinforced with perpetual functional control that is exercised over an

object (Brown et al., 2014; Csikszentmihalyi & Rochberg-Halton, 1981). With perpetual control of an object, individuals experience a feeling of efficacy and pleasure for 'being the cause' in the manipulation of their environment (Pierce et al., 2003).

Similarly, technology is built and operates on human control of its functionalities, and the varying degrees of control offer by technology can bring about a sense of ownership of it. Lee and Chen (2011) provided evidence from the context of a virtual world, Second Life, where control of the platform significantly influenced the psychological ownership of objects in the virtual world. These authors posited that users experienced control through the interactivity that allowed them to manipulate the virtual objects in the platform. Buchem (2012) conducted her study on personal learning environment and found that psychological ownership is significantly linked to control over elements such as access, content, design, and planning of the platform. From the context of massive multi-players online games, Moon et al. (2013) provided evidence that control significantly influenced psychological ownership of games character. Through the control exerted over the avatars, players exercised their strategies to win their games, developing ownership for the game character.

From research in media platform, Zhao et al. (2016) revealed that control exercised over LINE platform promotes the psychological ownership of it. Users experience control of the platform through the manipulation of the functionalities and processes such as sharing of information and managing the

contents within the platform. Based on this reasoning, Chen et al. (2016) also found significant influence of control in fostering psychological ownership among social media users. Apart from the discretion that can be exercised over functionalities, research had also emphasised the voluntary context of technology use which allow users to exert their autonomy and hence promote psychological ownership for the technology concerned (Lee & Suh, 2015). Table 2.1 shows some recent studies that examined control and psychological ownership.

Table 2.1 Prior Studies that examined Experienced Control and Psychological Ownership

Study	Context	Respondents
Brown et al. (2014)	Job-based	Salesperson
Buchem et al. (2014)	Personal learning environment	Students
Chen et al. (2016)	Social media (LINE)	Users
Huang et al. (2016)	IS security	Data entry employees
Kim et al. (2016)	Virtual community	Users
Lee and Suh (2015)	Virtual communities	Users
Lee and Chen (2011)	Virtual world (Second Life)	Users
Moon et al. (2013)	Online role-playing games	Game players
Sinclair and Tinson (2017)	Music streaming application	Users
Zheng, Xu, Zhang, and Wang (2018)	Crowd funding technology	Sponsors

Study	Context	Respondents
Brown et al. (2014)	Job-based	Salesperson
Zhao et al. (2016)	Social media (LINE)	Users

The present study conceptualises experienced control as the influence that teachers experience when using the virtual learning environment for instruction purposes. This conceptualisation is in line with Agarwal and Karahanna (2000) who described control of a software as representing a user's experience of being influential in how a software interacts. In terms of internet sites, Moon and Sanders (2004) noted that this concept reflects the perceived level and amount of control a person has over a particular site when navigating through the site. Webster, Trevino, and Ryan, (1993) emphasised the ability of the technology to adapt to users' feedback as a key to the feeling of control.

Users can experience more control with non-routinized technology use compared to technology which involved automation (Pierce et al., 2004). Tasks which are non-routine and complex call for more discretion and exploration compared to standardised tasks which are repetitive and offered less opportunity for discretion (Brown et al., 2014). A similar dynamic may occur in cloud-based VLE, as teachers determine various non-routine tasks, for work management, teaching and learning, and personal organisation in the platform. These interactive activities which involve customisation and personalisation can turn the product of one's labour into a reflection and extension of the self (Brown et al., 2014). Hence, the current study hypothesises the following relationship between experienced control and psychological ownership:

H1: Experienced control has a significant influence on psychological ownership.

2.6.2 Knowledge

The experience of coming to intimately know an object is developed through the process of active association that fosters intimacy between an owner and object (Pierce et al. 2001; Beggan & Brown 1994). Individuals come to know an object through the process of usage and association with an object, and it can be thoroughly known with increased information about it (Pierce et al., 2003). With the connection developed, individuals tend to prefer their own possessions even there exists a similar kind, by virtue of them knowing the possessions better (Rudmin & Berry). Knowing something inside-out creates a fusion of the self and the object, and this reinforced individuals' connection until they became "one" with the object (Pierce & Jussila, 2011).

The breadth and depth of knowing a target of ownership breeds one's familiarity with it, and such knowledge can strengthen the association and psychological proximity between owners and targets of ownership (Beggan & Brown, 1994; Pierce et al., 2001). Pierce and Jussila (2011) illustrated how a stranger turn into one's best friend, developed through a process which involve the active association between individuals and getting to know each other deeper, to the extent that a stranger can be considered as "my best friend". Brown et al. (2014) empirically tested the influence of work knowledge on psychological ownership for one's job, and results supported the theoretical

proposition that knowledge about job tasks is a significant antecedent of psychological ownership of the job itself.

In the technological context, Zhao et al. (2016) and Chen et al. (2016) applied the Theory of Psychological Ownership within the social media context, and conceptualised knowledge as familiarity developed through interaction with the platform. The results of both studies lent support to the notion that familiarity with social media platforms significantly influenced the development of psychological ownership of it. Kim et al. (2016) found that users who create online materials and share them in online communities develop psychological ownership for these materials through knowledge about their own creations. As creators know best about their creations, psychological ownership might be strengthened when other users enquire information about their shared materials such as smartphone themes, videos, and digital pictures. The importance of being a creator in order to have thorough knowledge about an object is important. This is reflected in Huang et al. (2016) research where frontline employees who enter secondary data into a database did not develop psychological ownership for the information entered in a routine manner, as they did not create the data.

In contrast to the context of Huang et al. (2016), teachers in the present study exercise discretion over their VLE and orchestrate activities within the platform. Their participation is non-routine, as they create or manage content for various purposes, such as work management (e.g., cloud storage, email, and link to school dashboard), instruction (e.g., virtualised resources, assignment of

school work, and creation of sites), administration (e.g., application for school transfer and promotion) and communication (e.g., forums, and link to ministry departments). Teachers acquire knowledge in carrying out these tasks, and become familiar and acquainted with the platform. Table 2.2 shows some of the studies which demonstrated the association of knowledge about a target of ownership and psychological ownership.

Table 2.2: Prior Studies that examined Knowledge and Psychological Ownership

Study	Context	Respondents
Brown et al. (2014)	Job-based	Salesman
Chen et al. (2016)	Social media (LINE)	Users
Kim et al. (2016)	Virtual community	Users
Lee and Suh (2015)	Virtual communities	Users
Lee and Chen (2011)	Virtual world	Users
Sinclair and Tinson (2017)	Music streaming application	Users
Zhao et al. (2016)	Social media	Users
Zheng et al. (2018)	Crowd funding technology	Sponsors

In this study, having knowledge is equated to knowledge about VLE, conceptualised as the breadth of knowledge teachers possess about the VLE that foster familiarity with the VLE. A cloud-based VLE is an innovative learning environment, where users are afforded multiple applications to build

and manage their VLE contents (Shiau & Chau, 2016). Users need to be equipped with the necessary knowledge to use the applications and software that run through the cloud to effectively operate within the platform. With this, they acquire knowledge about the platform and come to know it better. Based on the preceding discussions, the following relationship is hypothesised:

H2: Knowledge has a significant influence on psychological ownership.

2.6.3 Investment of the Self

The idea that investing oneself into an object can promote a sense of ownership of it was evoked from the thinking of Locke (1690) (as cited in Pierce et al., 2001), who discussed ownership of property from the context of the Bible. Even though the Bible postulates that the earth is given to the dominance of men, Locke (1690) suggested that ownership of untitled parcels of the land comes through the labour of individuals when they till the ground, cultivate, improve the land. Ownership emerge as people ‘own’ their labour, because the resulting products and creations embody the outcome of their labour. On a similar note, Csikszentmihalyi and Rochberg-Halton (1981) discussed that ownership come from the investment of individuals’ psychic energy, such as attention, time, effort, or skills contributed to a particular target of ownership. Objects which existence depend on human construction is more susceptible to become connected to the self as a result of the invested energy which flows from the self.

In this vein, Pierce et al. (2003) reasoned that the most powerful way by which people invest themselves into an object is to create it or to build it, through their time, effort, and energy, until the resultant object represents an appendage of themselves. This proposition was affirmed by Brown et al. (2014), who found psychological ownership for the job itself to be largely impacted by the psychic energy invested by employees into their job. In the technological context, Sinclair and Tinson (2017) revealed that psychological ownership can be developed for intangible objects like music streaming apps, when users invest their time and effort in organising playlists, sharing music, and personalising these apps. It was reasoned that these apps can manifest as an extended self of its users, as users express their identity through the music contain in it.

From the social media context, psychological ownership for social media platform was found to be significantly influenced by users' investment of their time, attention, energy, and effort into their social media account (Chen et al., 2016; Zhao et al., 2016). Interestingly, both aforementioned studies found investment of the self to have the largest effect on psychological ownership, among its three theorised antecedents. Social media platforms offer various applications such as games, messaging services, and posting of contents, to attract users to spend more time and invest much of themselves in the platform. In turn, these investments were instrumental in giving rise to a sense of possessiveness towards the platform. The profound influence of investment of the self on psychological ownership is also evident from research of virtual world, which found it to be the strongest factor that affected

psychological ownership (Lee & Chen, 2011). This research indicated that ownership is fostered when users invested efforts, time, and energy to “live” in their virtual spaces, interact with other users, and engage in activities hosted by the virtual world. Table 2.3 presents some of the referenced work which examined investment of self and psychological ownership.

Table 2.3: Prior Studies that examined Investment of the Self and Psychological Ownership

Study	Context	Respondents
Brown et al. (2014)	Job-based PO	Salesman
Chen et al. (2016)	Social media (LINE)	Users
Huang et al. (2016)	IS Security	Data entry employees
Kim et al. (2016)	Virtual community	Users
Klesel et al. (2016)	Technological gadgets at work	Employees
Lee and Chen (2011)	Virtual world	Users
Lee and Suh (2015)	Virtual communities	Users
Sinclair and Tinson (2017)	Music streaming application	App owners
Zhao et al. (2016)	Social media	Users
Zheng et al. (2018)	Crowd funding technology	Sponsor

Investment of the self is conceptualised as the contribution of personal aspects such as ideas, talents, and time to operate the VLE. A cloud-based VLE being equipped with an array of functionalities demands different levels of

investment from teachers, as required by the different tasks for instruction planning, collaboration, personalisation of spaces, and create contents. It is thus hypothesised that investment of the self into the VLE significantly promotes psychological ownership towards the VLE.

H3: Investment of the self has a significant influence on psychological ownership.

2.6.4 Psychological Ownership

The present research investigates Frog VLE as a potential target of ownership among teachers who use it, and psychological ownership is conceptualised as a sense of ownership felt for the VLE, whereby teachers consider it to be “theirs”. As noted earlier, psychological ownership has been applied to various disciplines, yet, its investigation in the educational context is scarce (Hietanen, Koiranen, & Ruismäki, 2017). One of these studies were conducted in the context of personal learning environment, where learners develop psychological ownership for the platform through control which was exercised over intangible elements such as access right, design, content, and planning (Buchem, 2012). The study highlighted that psychological ownership is significantly linked to the capability of making decisions within the platform through these intangible elements (Buchem, 2012). From the context of teaching, Hietanen et al. (2017) conducted an intervention study which found that music teachers’ ownership of teaching is enhanced when they are allowed to decide the manner that musical instrument is played, facilitated by the control over their teaching, having knowledge, and investment of the self into

the music lesson. Similarly, this occurrence is possible in the present study, as teachers make decisions about their VLE, and possess autonomy and volitional control over its usage.

In the work place, the possible targets of ownership may encompass objects such as one's work space, the tools used at work, the work that one does, and technological devices (Brown et al., 2014; Pierce & Jussila, 2011; Klesel et al., 2016). Csikszentmihalyi and Rochberg-Halton (1981) posited that individuals tend to become 'one' with tools of their trade, as human existence is sustained by their productive effort assisted by these tools. In view of the emerging reliance on e-learning to facilitate educational activities, a VLE can become an essential tool for the teaching profession (Rodríguez-Ardura & Meseguer-Artola, 2016). For instance, the VLE may contain materials important to their teaching such as learning content, syllabuses, teaching slides, exercises, quizzes, and reference materials. These materials can be re-used over time and over years which increase its importance to teachers.

Psychological ownership can influence perceived usefulness and perceived ease of use with its important role in object evaluation, in that individuals evaluate and perceive owned objects more favourably (Barki et al., 2008; Beggan, 1992; Shu & Peck, 2011). Experimental studies had also supported the positive effect of psychological ownership upon the evaluation of an object (Brasel & Gips, 2014; Peck & Shu, 2009). According to the self-enhancement concept, individuals are motivated to improve their self-image

and therefore might judge an object positively when it is considered as part of the self (Beggan, 1992; Huang, Wang, & Shi, 2009).

In the technological context, the work of Barki et al. (2008) and Paré et al. (2006) provided seminal insights into this effect with evidence that psychological ownership for a clinical IS was a significant antecedent of perceived usefulness and perceived ease of use. Respondents in these studies had developed psychological ownership for the system when they participated in its design and development, which led to an increased valuation of the system with regards to its usefulness and ease of use. This is resounded in a more recent study of hospital IS, where psychological ownership for the IS significantly influenced the belief of usefulness of the system (Smith et al., 2014). From the educational context, Garrett (2011) has established the interaction of ownership and ease of use in e-portfolio adoption. The author had made these experiences deliberate features by developing a software for e-portfolio, and gauged the interactions between variables through survey, interviews, and usage logs. Table 2.4 shows the prior work which investigated psychological ownership, perceived usefulness, and perceived ease of use.

Table 2.4: Prior Studies that examined Psychological Ownership, Perceived Usefulness, and Perceived Ease of Use

Study	Context	Respondents
Barki et al. (2008)	Clinical IS	Physicians
Garrett (2011)	E-portfolio	Students

Study	Context	Respondents
Paré et al. (2006)	Clinical IS	Physicians
Smith et al. (2014)	Hospital information system	Users
Wu et al. (2017)	Education virtual community	Students, teachers, and parents
Zhao et al., (2016)	Social media (LINE)	Users

Research in the post-adoption context had advocated the incorporation of psychological ownership with the TAM to take advantage of the cognitive and affective state that the construct can capture (Zhao et al., 2016). This is because users have already developed a “relationship” with a particular technology through prior experiences with it (Pierce et al., 2001). Parallel to this, both perceived usefulness and perceived ease of use in this study are also formed based on prior experiences with the VLE. Hence, psychological ownership can serve as an important factor behind the formation of these beliefs. Building upon previous empirical evidences, the current study hypothesised that psychological ownership for a VLE will significantly influence the VLE’s perceived usefulness and perceived ease of use.

H4: Psychological ownership has a significant influence on perceived usefulness.

H5: Psychological ownership has a significant influence on perceived ease of use.

2.6.5 Perceived Ease of Use

Perceived ease of use in this context is the belief of a user that using a particular system will be free of effort (Davis, 1989). Effort is imperative in this concept as it is a resource that people allocate to various activities which they are responsible for (Radner & Rothchild, 1975). The efforts included in conceptualising this construct include physical effort, mental effort, and effort exerted in learning to operate a technology (Davis, 1989). Within e-learning context, Wang and Wang (2009) suggested that it captures the extent that a teacher believes such platforms can be used effortlessly. Hence, the study conceptualised it as a teacher's belief that using Frog VLE would be free of difficulty, physical effort, mental effort, and learning effort.

In the post-adoption context, this construct has received mixed opinions. Karahanna et al. (1999) in their seminal study compared the pre-adoption and post-adoption stages of users' beliefs on Windows operating system, perceived ease of use was found to be only significant in affecting attitude at the pre-adoption phase. This had led to some scholars to discount this construct in continuance intention research with the argument that ease of use may no longer be important over time as users gain experience with the system (Bhattacharjee, 2001; Bhattacharjee & Lin, 2014; Cai, Yang, Gong, Macleod, & Zhu, 2018; Susanto et al., 2016). Longitudinal studies of LMS continuance also reported mixed results, with perceived ease of use becoming more significant over time among school students (Cheng & Yuen, 2018), but not significant among university students (Sun & Jeyaraj, 2013). This support a

meta-analysis that found that perceived ease of use to be varied across user types, different technologies, and sample sizes (King & He, 2006).

Despite some inconsistency of perceived ease of use in continuance research, its importance was accentuated by a critical review which involved 64 studies on e-learning continuance (McGill et al., 2014). The TAM posits that perceived ease of use is a key determinant of perceived usefulness, as individuals alter their choice strategy to use technology in response to task complexity, and a particular technology will be more likely to be perceived as useful if it eases the effort required to use it (Davis et al., 1989). Based on this rationale, some studies on continuance intention have found empirical support for perceived ease of use influence on perceived usefulness. Hence, the study includes this key component of the TAM to test its applicability in cloud-based context. Table 2.5 shows some of these studies:

Table 2.5: Prior Studies that examined Perceived Ease of Use and Perceived Usefulness

Study	Context	Respondents
Bhattacharjee and Lin (2014)	Primary work system for insurance agents	Insurance agents
Chang, Liang, Yan, and Tseng (2013)	Mobile learning	Teacher trainees
Cho et al. (2009)	E-learning	University students
Ho (2010)	Online e-learning platform	The public
Huang (2016)	Cloud service (Google doc)	University students
Joo, So, & Kim (2018)	MOOC (Massive Open Online Courses)	University students

Study	Context	Respondents
Lee (2010)	Web-based learning	University students
Lin et al. (2011)	E-learning course	University students
Lu (2014)	M-commerce	University students
Rodríguez-Ardura and Meseguer-Artola (2016)	E-learning	Students of virtual classrooms
Shiue et al. (2017)	Game based learning	School students
Tripathi (2017)	Cloud computing in firms	Managers of firms
Wu and Chen (2017)	MOOC	Members of MOOC
Wu and Zhang (2014)	E-Learning 2.0	Company employees
Yang et al. (2017)	MOOC platform, icourse.com	Members of MOOC

Additionally, perceived ease of use is also posited to directly influence attitude as it reflects the intrinsic motivation aspect where users develop positive attitude towards the use of technology when they find it simple to use and hassle free (Davis et al., 1989; Teo & Zhou, 2014). Perceived ease of use exerts influence over attitude towards using via the mechanism of self-efficacy and instrumentality. When a technology is easy to use, it facilitates users' sense of competence and enforces the belief that using it can lead to their desired outcome (Davis et al., 1989). This give rise to an intrinsic motivation which drives the influence of perceived ease of use on attitude towards using, which is demonstrated by studies in continuance research. Table 2.6 shows some existing studies which supported this relationship.

In the present study, a cloud-based VLE is an innovative technology which consists of various software applications and services that run through the cloud (Shiau & Chau, 2016). Cloud computing is an innovative and dynamic type of technology that offers access to unlimited on-demand resources and it is continuously updated with different subscribed applications which run through the cloud (Shiau & Chau, 2016; Stantchev et al, 2014). Such dynamic context entails users to exert effort in familiarising themselves when applying the features to their work, and thus ease of use is considered in the present study. Teachers must be skilled at using the array of tools available to operate the platform effectively, and the lack of ICT skills can be a barrier to using the VLE. A recent local research had noted that teachers still lack in ICT competency and need continuous training in using the Frog VLE (Cheok et al., 2017). In keeping with these observations, it is necessary to include perceived ease of use in the research model as it taps into the efficacy dimension (Davis, 1989).

Table 2.6: Prior Studies that examined Perceived Ease of Use and Attitude

Towards Using		
Study	Context	user type
Ho (2010)	Online e-learning platform	The public
Huang (2016)	Cloud service (Google doc)	University students
Ifinedo (2017)	Blog use for learning	University students
Lee (2010)	Web-based learning	University students
Lin et al. (2011)	E-learning course	University students

Study	Context	user type
Ooi et al. (2018)	Mobile learning	University students
Rodríguez-Ardura and Meseguer-Artola (2016)	E-learning	Students of virtual classrooms
Shiue et al. (2017)	Game based learning	School students
Wu and Chen (2017)	MOOC	Members of MOOC
Wu and Zhang (2014)	E-Learning 2.0	Company employees

In view of the empirical evidences from the literature and to preserve the conceptualisation of the TAM, the following hypotheses are proposed:

H6: Perceived ease of use has a significant influence on perceived usefulness.

H7: Perceived ease of use has a significant influence on attitude towards using.

2.6.6 Perceived Usefulness

Perceived usefulness is one of the core constructs in the original TAM and subsequent revisions of the model, and also a major construct in IS continuance investigation (Bhattacharjee, 2001; Panigrahi et al., 2018). Davis et al. (1989) defined perceived usefulness as the extent to which an individual believes that using a particular technology would improve his or her job performance. This term follows from the word “useful”, defined as the ability of being used advantageously, and beneficial to bring about a positive effect to the use – performance dynamics in a particular technology (Davis, 1989).

The effect of usefulness on job performance is fundamental to understand perceived usefulness, as it reflects users' conviction that using a particular system can enhance their work performance, a motivational force in users to achieve their goals or purpose (Davis et al., 1989; Lin, 2011). Perceived usefulness is understood as a cognitive belief, and the formation of users' attitudes and intentions is based largely on such cognitive appraisal of how a technology can benefit their performance (Davis et al., 1989; Kim et al., 2007). Performance in this context also includes minimising the time used to perform the job which results in better efficiency and accuracy (Teo et al., 2009). In the context of web-based learning, perceived usefulness is directed at the extent to which teachers believe that using such systems can improve their work performance (Teo, 2011; Wang & Wang, 2009). Based on this, perceived usefulness in the present study is conceptualised as teachers' belief in the value of the Frog VLE for improvement of their job performance.

Fishbein and Ajzen (1975) postulated a close relationship between beliefs and attitude. Karahanna et al. (1999) noted that perceived usefulness is a consistent key determinant of attitude in the acceptance and post-adoption (continuance) phases of technology use. In continuance research where technology had been introduced earlier, perceived usefulness reflects the post-consumption belief of usefulness based on actual usage experience and thus represents the realised utility of the system (Bhattacharjee, 2001; Premkumar & Bhattacharjee, 2008). In alignment with this context, the nature of perceived usefulness in the present study is also considered ex-post, derived after the post-acceptance phase from teachers' actual hands-on experience with the VLE.

As perceived usefulness is a key motivator of technology acceptance, it is also a key determinant on its subsequent continuance intention (Bhattacharjee, 2001; Panigrahi et al., 2018). Based on this, studies in continuance research had demonstrated that perceived usefulness is a significant antecedent to users' attitude towards using technology. Table 2.7 shows the relevant studies conducted.

Table 2.7: Prior Studies that examined Perceived Usefulness and Attitude Towards Using

Study	Context	Respondents
Ho (2010)	Online e-learning platform	The public
Huang (2016)	Cloud service (Google doc)	University students
Ifinedo (2017)	Learning blogs	University students
Kim et al. (2007)	Mobile internet	The public and university students
Lee (2010)	Web-based learning	University students
Lin (2011)	E-learning course	University students
Lin et al. (2011)	E-learning course	University students
Mohamed and Lamia (2018)	Flipped classroom	University students
Ooi et al. (2018)	Mobile learning	University students
Rodríguez-Ardura and Meseguer-Artola (2016)	E-learning	Students of virtual classrooms
Shiue et al. (2017)	Game-based learning	School students
Wu and Chen (2017)	MOOC	Members of MOOC

Study	Context	Respondents
Wu and Zhang (2014)	E-Learning 2.0 in organisation	Company employees

Existing literature has also shown that perceived usefulness is an important factor for continuance intention. These studies often describe perceived usefulness as a realised conviction of the benefits of a particular technology which can influence users' decision to continue using it. Table 2.8 shows some of the studies in the e-learning context which supported this proposition.

Table 2.8: Prior Studies that examined Perceived Usefulness and Continuance Intention

Study	E-learning technology	Respondents
Alraimi, Zo, and Ciganek (2015)	MOOC (Coursera, edX, Udacity)	MOOC users from various countries
Basnet, Doleck, and Lemay (2018)	Online homework assignments assessment system (Kattis)	University students
Bhattacharjee (2001)	Online banking	Users
Bhattacharjee and Lin (2014)	Primary work system for insurance agents	Insurance agents
Chang et al. (2013)	Mobile learning	Teacher trainees
Cho et al. (2009)	E-learning	University students
Ho (2010)	Online e-learning platform	The public
Huang (2016)	Cloud service (Google doc)	University students
Kim and Malhotra (2005)	Academic portal which can be personalized	University students
Kim et al. (2007)	Mobile internet	The public, university

Study	E-learning technology	Respondents
Lin et al. (2011)	E-learning online course -	students University students
Lu (2014)	M-commerce	University students
Shiue et al. (2017)	Game based learning	School students
Sjørebø, Halvari, Gulli, & Kristiansen, (2009)	E-learning courses	University instructors
Susanto et al. (2016)	Smartphone banking services	Smartphone users
Tripathi (2017)	Cloud computing	Managers of firms
Wu and Chen (2017)	MOOC	Members of MOOC
Wu and Zhang (2014)	E-Learning 2.0	Company employees
Yang et al. (2017)	MOOC platform, icourse.com	Members of MOOC

Based on this, the study predicts that teachers' belief of usefulness will influence their attitude towards using the VLE and also their intention to continue using it. Therefore, the following are hypothesised:

H8: Perceived usefulness has a significant influence on attitude towards using.

H9: Perceived usefulness has a significant influence on continuance intention.

2.6.7 Attitude Towards Using VLE

Davis et al. (1989) conceptualised attitude as individuals' disposition towards performing a particular behaviour, while Taylor and Todd (1995) described it as feelings of favourableness or unfavourableness towards using a

particular technology. Triandis (1980) had advocated precision in defining attitude by separating the affective and cognitive components of the concept. It is important to distinguish these components in information system research in order to evaluate their relative influence (Thompson, Higgins, & Howell, 1991). While the cognitive component refers to beliefs, the affective component denotes the favourable and unfavourable paradigm (Thompson et al., 1991). Research which linked attitude to behaviour had described it in terms of an affect component directed at feelings felt toward an object, an action, or an event (Triandis, 1980; Ajzen & Fishbein, 1977).

In TAM where attitude towards using a technology is link to behavioural intention, Davis et al. (1989) operationalised attitude based on the affect dimension which focused on individuals' positive or negative feelings about performing a particular behaviour. This is operationalised according to TRA from which TAM was mooted, where attitude was also conceptualised as a positive or negative affect about carrying out a particular behaviour (Fishbein & Ajzen, 1975). Affection is important in shaping intention, because when individuals' emotions conflict with their intentions, the emotion can disrupt mental processes and requires an adjustment of goal priorities (Scheier & Carver, 1982). In this vein, affect plays an important role as attitude measures individuals' attitude towards performing the behaviour with respect to an object (technology), and not attitude towards the object per se (Davis, 1986). Consistent with this notion, studies of continuance intention in e-learning and educational technologies have conceptualised attitude as an affective component that represent users' feeling towards using a technology (Ho, 2010;

Huang, 2016; Ifinedo, 2017; Lee, 2010, Mohamed & Lamia, 2018; Rodríguez-Ardura & Meseguer-Artola, 2016). Hence, the present study considers attitude towards using as an evaluative affect towards using the Frog VLE.

Attitude is jointly formed by the strength of the beliefs of perceived usefulness and perceived ease of use (Davis et al., 1989). Originally in the TAM, attitude was included in the initial model as a mediator between users' belief of and perceived usefulness and behavioural intention (Davis et al., 1989). Nevertheless, later iteration of the TAM had excluded attitude from the model, largely due to the reason that it was found to have only partial mediating effect on behavioural intention, contrary to its purported role as a full mediator (Davis, 1989; Venkatesh & Davis, 1996). Also, attitude was removed when it was not significantly link to system usage (Thompson et al., 1991).

The notion that leaving attitude out of the TAM would result in a more parsimonious model was inconclusive. Ursavas (2013) compared two models of TAM (one with attitude and another without attitude), and their results demonstrated that attitude did not contribute to the overall variance of system use but played a significant role in predicting behavioural intention. The study concluded that attitude is an important factor to determine intention especially where technology use is voluntary. More recently, Lopez-Bonilla and Lopez-Bonilla (2017) also compared models of the TAM (one with attitude and another without attitude) to explain the discrepancy of attitude as a mediator. These authors attributed the discrepancy to differences in Structural Equation

Modelling (SEM) employed to analyse the data. Their results implied that attitude should be excluded when using covariance-based SEM, and to be included with partial least squares SEM (PLS-SEM). It was also recommended that attitude be included where technology use is voluntary, rather than mandatory (Lopez-Bonilla & Lopez-Bonilla, 2017, Ursavas, 2013; Venkatesh et al., 2003).

Within the e-learning milieu, continuance intention is consistently predicted by attitude towards using, affirming the TAM capability in explaining “belief – attitude – intention” mechanism (Lee & Chang, 2011; Lin, 2001; Zhao et al., 2016). Post-adoption attitude is derived from direct experiences of technology use, and it is more readily retrievable from users’ memory which enables them to evaluate the technology more confidently and clearly (Karahanna et al., 1999). Studies in e-learning have consistently affirmed attitude towards use to be a significant predictor of continuance intention. Table 2.9 shows these studies which supported the relationship between attitude and continuance intention. These studies had also mostly defined attitude as a positive affect or favourable feeling towards using their designated technologies.

Table 2.9: Prior Studies that examined Attitude Towards Using and Continuance Intention

Study	Context	Participants
Ho (2010)	Online e-learning platform	The public

Study	Context	Participants
Huang (2016)	Cloud service (Google doc)	University students
Ifinedo (2017)	Blog use for learning	University students
Kim et al. (2007)	Mobile internet	The public and university students
Lee (2010)	Web-based learning	University students
Lin (2011)	E-learning online course	University students
Lin et al. (2011)	E-learning online course	University students
Mohamed and Lamia (2018)	Flipped classroom	University students
Rodríguez-Ardura and Meseguer-Artola (2016)	E-learning platform	Students of virtual classrooms
Shiue et al. (2017)	Game-based learning	School students
Wu and Chen (2017)	MOOC	MOOC participants
Wu and Zhang (2014)	E-Learning 2.0	Company employees

In line with the strands of preceding research, the present study included attitude in the proposed research model for several reasons. Firstly, it allows for further confirmation as advocated by Popper (1972), that researchers need to keep guard of scientific theories through continuous confirmation. Secondly, the inclusion is consistent with the voluntary use of Frog VLE within a high-autonomy and volitional context, and attitudinal evaluation could assume an increasingly vital role in teachers' intention (Zhao et al., 2016). Lastly, including attitude can better fulfil the study objective to explain

continuance intention, as SEM-PLS would be employed to analyse data and Lopez-Bonilla and Lopez-Bonilla (2017) suggested the inclusion of attitude when this method is employed. Most importantly, attitude examined at the post-adoption context is found to have a stronger influence on continuance intention, as direct usage experiences enable users to evaluate the technology more clearly with confidence (Karahanna et al., 1999; Wu & Zhang, 2014). Hence, the following hypothesis is proposed:

H10: Attitude towards using has a significant influence on continuance intention.

2.6.8 Continuance Intention

Continuance arises after the initial acceptance of a particular technology, and it is considered as an intentional behaviour resulted from individuals' deliberate decisions (Bhattacharjee & Lin, 2014). Some literature has referred continuance intention with regards to the context it was investigated, in terms of IS continuance (Limayem et al., 2007), information technology continuance intention (Premkumar & Bhattacharjee, 2008), e-learning continuance intention (Lin, 2011), or intention to continue using (Ifinedo, 2017). Despite these conceptualisations, continuance intention in IS research is commonly regarded as a decision for continuance which occurs after the initial acceptance decision (Kim et al., 2007). This concept is used to reflect continuance intention which reflects the post-adoption mental state that reflect individuals' decision to repeat their behaviour (Lu, 2014; Nabavi et al., 2016). Continuance intention is directed at gauging experienced users'

intention to continue using a particular technology and is regarded as having a progressive nature, because it is formed by a series of individuals' decisions rather than a one-off occurrence (Hong et al., 2006; Limayem et al., 2007). The present study conceptualises continuance intention as teachers' intention in continuing to use Frog VLE.

Due to the progressive nature of continuance, scholars had called for its emphasis because it is critical for the long-term viability and success of any technology (Bhattacharjee & Lin, 2014; Dağhan & Akkoyunlu, 2016; Lu, 2014; Wu & Zhang, 2014). The review of literature has found that the TAM is effective in revealing the determinants of users' intention during the post-adoption phases of different technological contexts (Lu, 2014). Hong et al. (2006) provided early evidence that supported the investigation of continuance intention using the TAM. Subsequent empirical investigations in e-learning have found continuance intention to be directly affected by attitude towards using (Rodríguez-Ardura & Meseguer-Artola, 2016; Shiue et al., 2017; Wu & Chen, 2017; Wu & Zhang, 2014), and perceived usefulness (Huang, 2016; Ifinedo, 2017; Tripathi, 2017; Yang et al. 2017; Wu & Zhang, 2014). Looking from the cost-benefit paradigm perspective of behavioural decision making, perceived usefulness is closely related to subjective decision making which will influence individuals in deciding whether using a technology is beneficial for their job performance (Davis, 1989). In this vein, positive belief about a technology's usefulness fosters the intention to continue using it, considering the benefits it offers to improve job performance.

While there is no universal theory of continuance intention, a recent systematic review of 191 articles from indexed journals has found that research was mostly guided by the IS Continuance Model, the TAM, Theory of Reasoned Action, Theory of Planned Behaviour, and IS Success Model (Nabavi et al., 2016). The present study used the TAM as its theoretical base, because previous studies had supported the integration of psychological ownership in this particular model (Barki et al., 2008; Wu et al., 2017; Zhao et al., 2016). Moreover, scholars have called for the inclusion of users' psychological aspects in continuance research, because psychological motivation that emerge after users' initial acceptance can influence users' subsequent decisions in continued use (Bhattacharjee, 2001). Hence, as discussed in the preceding sections, the present study's hypotheses are articulated to capture the possible influences between psychological ownership, perceived usefulness, perceived ease of use, and attitude towards using VLE to explain continuance intention.

2.6.9 Control Variables

Previous research had noted that users' behavioural intention can differ across personal characteristics (Venkatesh & Morris, 2000). Individual differences may have confounding effects on human-technology interaction, and it is necessary to control these effects. Based on empirical basis, the study included individual differences identified by studies of educational technologies that can have potential effect on influencing users' beliefs and intention in technology adoption. These factors include teachers' workload

(Awang et al., 2018; Cheok et al., 2017; Yeop, Mohd Yaakob, Wong, Don, & Zain), experience related to a particular system (Cho et al., 2009; Lin, 2011; Shao, 2018; Wang & Wang, 2009; Yang et al., 2017; Yeop et al., 2019), and training received on a particular system (Cheok et al., 2017; Cho et al., 2009; (Yeop, Mohd Yaakob, Wong, Don, & Zain). The study investigates teachers' teaching load, VLE experience, and VLE training as control variables, as this would be beneficial to validate its effect in the current context. Hence the following hypotheses are proposed:

H11: Teaching load has a significant influence on continuance intention.

H12: VLE experience has a significant influence on continuance intention.

H13: VLE training has a significant influence on continuance intention.

2.7 Mediating Variables in the Conceptual Framework

The literature suggested that mediation can exist when two criteria are fulfilled: 1) significant influence of an independent variable on a mediator, and 2) significant influence of a mediator on a dependant variable (MacKinnon, 2008). Hence, the present study investigates the potential mediating effects present in the proposed research model, based on the relationships hypothesised earlier in the preceding sections that form the basis of relationships between independent variable – mediator – dependant variable. The following sections discuss the potential mediators which may intervene between constructs of the proposed model.

2.7.1 Mediating Role of Psychological Ownership

Psychological ownership was found to be a consistent mediator between various predictor variables and user evaluation (Brasel & Gips, 2014; Shu & Peck, 2011). While earlier discussion had informed about the direct effects of psychological ownership and its determinants (experienced control, knowledge, and investment of self), research has also asserted that psychological ownership serves the mediating role between various user-related factors and users' behaviour. For instance, Barki et al. (2008) tested three mediators on the influence of user participation experience on perceived usefulness and perceived ease of use. Among the mediators of psychological ownership, cognitive absorption, and user involvement, psychological ownership was found to be the most significant mediator. Psychological ownership serves as an important link between user factors and belief, as it fully mediated the effect of user participation on perceived usefulness relationship, while partially mediated the effect of user participation on perceived ease of use (Barki et al., 2008).

Aligned with the aforementioned studies, other researchers (Kirk & Swain, 2015; Moon et al., 2013; Smith et al., 2014) have found the potential role of psychological ownership as mediator of its antecedents and users' beliefs. From the context of virtual world, Lee and Chen (2011) reported the significance of psychological ownership as a mediator between its antecedents (control, knowing about, and investment of the self) and intention to visit a virtual world. Specifically, psychological ownership was a full mediator of

control, and a partial mediator of investment of the self. Furthermore, Smith et al. (2014) found the potential of psychological ownership in buffering resistance behaviours on perceived usefulness of a new health IS system, with significant partial mediation between resistance to change and perceived usefulness. Moon et al. (2013) found partial mediation of psychological ownership between control and customer e-loyalty.

In the present study, teachers experience the antecedents which result in psychological ownership by controlling the VLE implementation and contents, acquiring knowledge about the VLE, and invest themselves in it. Teachers determine relevant activities and valuable contents in the VLE, this advantageous role can make the VLE useful and easier to use because of increase preference fit which captures their intended outcome. In this vein, psychological ownership may act as a mediator that transmit the impact of participatory experiences onto beliefs of usefulness and ease of use; the more teachers feel they own the VLE, the more likely they think that the VLE is easy to operate and useful. Hence, based on this rationale and support of existing evidences, the study investigates its mediating effect between its antecedents (experienced control, knowledge about VLE, and investment of the self), perceived usefulness, and perceived ease of use. This can affirm the substance of the construct to provide a better understanding of the mechanism between these constructs. Hence, the following hypotheses are formulated:

H14: Psychological ownership mediates the relationship between experienced control and perceived usefulness.

H15: Psychological ownership mediates the relationship between knowledge and perceived usefulness.

H16: Psychological ownership mediates the relationship between investment of the self and perceived usefulness.

H17: Psychological ownership mediates the relationship between experienced control and perceived ease of use.

H18: Psychological ownership mediates the relationship between knowledge and perceived ease of use.

H19: Psychological ownership mediates the relationship between investment of the self and perceived ease of use.

2.7.2 Mediating Role of Perceived Usefulness

To have better understanding of the TAM's robustness, the present work also examines one of the TAM's core proposition of the mediation of perceived usefulness of external variables (Venkatesh, 2000). Aligned with the theorised research model, perceived usefulness mediates the influence of psychological ownership (external variable) on attitude and continuance intention. Prior studies demonstrated that psychological ownership has significant positive effect on perceived usefulness (Barki et al., 2008; Paré et al., 2006; Smith et al., 2014), as it is apparent that individuals will like and value possessions which are useful to them. Additionally, studies in the e-learning context had largely supported perceived usefulness's significance on attitude and continuance intention (Kim et al., 2007; Ho, 2010; Shiue et al., 2017; Wu & Zhang, 2014; Wu & Chen, 2017). As discussed earlier,

psychological ownership could influence teachers' belief about a VLE's usefulness when the platform is considered to be theirs. When teachers perceived the platform to be beneficial and useful to improve their work, they may develop positive attitude towards using it, and continue to use it. Hence, the following hypotheses are formulated to test the mediation of perceived usefulness on the external variables of psychological ownership.

H20: Perceived usefulness mediates the relationship between psychological ownership and attitude towards using VLE.

H21: Perceived usefulness mediates the relationship between psychological ownership and continuance intention.

H22: Perceived usefulness mediates the relationship between psychological ownership and continuance intention.

H23: Perceived usefulness mediates the relationship between psychological ownership and continuance intention.

2.7.3 Mediating Role of Perceived Ease of Use

The TAM posits that perceived ease of use mediates the effect of external variables on users' intention (Venkatesh, 2000). The external variable of the present study, psychological ownership, is formed after teachers' direct experiences of using a VLE. With increased direct experiences, teachers may adjust their belief in the ease of use from a general view to become more system specific (Venkatesh, 2000). Hence, increased sense of ownership can foster higher perceived ease of use (Barki et al., 2008; Paré et al., 2006), as it is reasonable that individuals may perceive their own possession to be easier to

operate than non-possession. Bearing this in mind, perceived ease of use has been found to be a significant determinant of attitude towards use and perceived usefulness (Lee, 2010; Lin et al., 2011; Wu & Zhang, 2014; Rodríguez-Ardura & Meseguer-Artola, 2016; Huang, 2016; Shiue et al., 2017), hence perceived ease of use may transmit psychological ownership's impact on these two variables. However, the mediating role of perceived ease of use needs further verification as some studies found this construct to be unimportant to continuance research (Joo, Kim, Kim, 2016; Tripathi, 2017). Hence, it is opportune to propose the following hypotheses:

H24: Perceived ease of use mediates the relationship between psychological ownership and perceived usefulness.

H25: Perceived ease of use mediates the relationship between psychological ownership and attitude towards using VLE.

2.7.4 Mediating Role of Attitude Towards Using VLE

The TAM postulates that attitude captures the impact of beliefs on intention, and intervenes the belief-intention link (Davis et al., 1989). However, this construct is often excluded from the TAM due to its inability to fully absorb the impact of perceived usefulness and perceived ease of use (Davis et al., 1989; Venkatesh & Davis, 1996), and its insignificance to intention (Wang & Wang, 2009). The present study chooses to examine this construct as a mediating variable, in keeping with the observations from the evidences of continuance research in various online learning environments such as e-learning 2.0, MOOC, and Blackboard Learn. These studies have demonstrated

the significance of attitude to transmit influences on continuance intention from perceived usefulness and perceived ease of use (Lee, 2010; Huang, 2016; Lin et al., 2014; Wu & Chen, 2017; Wu & Zhang, 2014). These research have shown that post-consumption perceived ease of use allows users to realise the usability of a system, and is pertinent in affecting their attitude and subsequently continuance intention. The indirect effect of perceived ease of use on continuance intention is also possible within a cloud-based VLE, because a VLE which is easy to operate reduces effort which need to be exerted, and thereby encourages continuous use. On the other hand, perceived usefulness can also indirectly influence continuance intention via attitude. Because the post-adoption context of the present study allows teachers to make a stronger opinion about the usefulness of a VLE realised through their use experiences. Hence, it is beneficial to examine these indirect mechanisms in the current study to corroborate existing empirical results. With this, the last two hypotheses are proposed:

H26: Attitude towards using VLE mediates the relationship between perceived ease of use and continuance intention.

H27: Attitude towards using VLE mediates the relationship between perceived usefulness and continuance intention.

2.8 Summary

This chapter offered the overview of the historical development of VLE, and characteristics of the VLE of interest in the present study. It also offered an overview of theories of psychological ownership and the TAM, and illuminated the seminal and current studies which are related to this study. The

review of literature noted that existing studies had incorporated psychological ownership with the TAM in other technological contexts, but there is scarce investigation within the milieu of educational technology. Prior studies had also suggested a convergence of findings which support the integration of psychological ownership and the TAM, but these studies only incorporated some concepts and not the entirety of these two theories. Hence, a conceptual model consisted of eight variables was hypothesised to answer the research questions. The chapter moved on to discuss these variables, with evidences and rationale articulated from a mixture of local and international literature to justify the relationships hypothesised between them. The following chapter will describe the methodological approaches and procedures employed to test the formulated hypotheses.

CHAPTER 3

RESEARCH METHODS

3.1 Introduction

This study aims to explain and predict teachers' continuance intention to use a VLE by incorporating the Theory of Psychological Ownership in a TAM framework. This chapter is organised into sections to present the methodological procedures undertaken to achieve the study's objectives. Section 3.2 discusses the philosophical position of the study where a positivist paradigm was adopted with a quantitative survey method. Section 3.3 justifies the research design of the study, while Section 3.4 outlines the procedures undertaken to develop the research instrument. These procedures include generation of measurement items, back translation of instrument from English Language to the Malay Language, pre-test of questionnaire, and piloting of the final questionnaire. Section 3.5 proceeds to explain the sampling of teacher respondents and also data collection procedures. Lastly, Section 3.6 discusses the data analysis plan, the analysis techniques with SEM, and the various assessments to validate research findings.

3.2 Research Philosophy

Research philosophy is essential to position the bearings of a research as it sets the motivation, intent, and expectations undertaken by the study. It

shapes the belief of the nature of the knowledge, determines the methodology, and defines the criteria for validity (MacNaughton, Rolfe, & Siraj-Blatchford, 2001). The notion of research philosophies traced its early roots to Kuhn (1962) who espoused the important functions of research paradigms in supplying the tools necessary to find solutions to problems. Scholars have referred to philosophy in research as “research paradigm” (Mackenzie & Knipe, 2006), “world view” (Creswell, 2014), or in terms of “epistemology and ontology” (Crotty, 1998). Amidst these varied terms given, they are often described as a set of beliefs or collection of assumptions that orientate thinking and research (Bryman, 2012).

Guba and Lincoln (1994) classified these research philosophies in terms of ontology, epistemology, and methodology. Ontology is concerned with the nature of reality and raises questions whether social entities should be taken as objective entities which have a reality exclusive to individuals (Bryman, 2012). There are two aspects to the ontology assumption – objectivism and subjectivism. Objectivism assumes the stance that social phenomena are presented as external factors that are not within individuals’ influence (Bryman, 2012). Subjectivism holds that social phenomena are shaped from the beliefs and actions of individuals (Saunders, Lewis, & Thornhill, 2012).

Epistemology is concerned with how knowledge can be acquired, and what constitutes acceptable knowledge in a particular field of study (Saunders et al., 2012). For social science research, Lincoln, Lynham, and Guba (2011) offered five basic paradigms for consideration of epistemological approach in

their discussion of social science research: positivism, post-positivism, critical theory, constructivism, and participatory.

3.2.1 Philosophical Foundation of the Study

The primary objective of this study is to explain and predict teachers' continuance intention to use a VLE with the constructs of: experienced control, investment of the self into VLE, knowledge about VLE, psychological ownership of VLE, perceived usefulness, perceived ease of use, and attitude towards using VLE. Investigations entail the testing of direct and indirect effects between these constructs as proposed by the research model. To fulfil the research objective, the positivist philosophy was employed in the research. Positivist studies are based on a priori of pre-determined relationships, hypotheses testing, and quantifiable measures of variables which involve statistical analysis to draw inferences about a particular phenomenon from a targeted sample of a stated population (Saunders et al., 2012). There exists a body of literature, existing theories, and known variables to support the investigation of the present study, and this approach will allow a better understanding of these phenomena in the Malaysian context.

The positivist paradigm advocates research which is undertaken as best possible in a value-free manner (Saunders et al., 2012), with the thought that reality is apprehendable and considered as a one-way examination where both researcher and researched phenomenon are mutually exclusive and without influence on each other (Guba & Lincoln, 1994). It holds the position that the

social world can be examined in the same way as the natural world, and that causal explanations can be provided with explanations (Mertens, 2005). It is mostly aligned in quantitative method of data collection and analysis (Mackenzie & Knipe, 2006).

Adopting the positivist approach with structured quantitative methods has the advantage to facilitate the replication of the present study's propositions and hypotheses (Saunders et al., 2012). Replicability is a crucial criterion in social research for the validation of findings and theory testing (Bryman, 2012). In this vein, quantitative investigation which involve verification of hypotheses can provide quantifiable reliability and validity. The objective measures used in quantitative research can also provide empirical evidences to findings, avoiding issues of speculation and bias which may occur in an interpretive approach (Wicks & Freeman, 1998).

As such, an objective standpoint is taken in this study by examining the effect of user experiences, psychological ownership, as well as TAM variables on continuance intention in using VLE. This approach is applied by gathering the constructs in a research model and identifying relationships among these constructs which is supported by the literature and relevant theoretical foundations. These relationships are analysed quantitatively. Valid and reliable results obtained can provide meaningful interpretations of data with generalisable findings (Creswell, 2014). For these aforementioned reasons, the study adopted a positivist and objectivist assumption with a quantitative strategy to achieve its research objectives.

3.3 Research Design

A research design is an overall strategy to conduct a study which indicates the basic structure of the research. The present study adopted a cross-sectional survey field study. A survey research is usually a quantitative method which entails the collection of data to analyse and test hypotheses to understand individuals' opinion on a particular issue (Gay et al., 2012; (Malhotra & Grover, 1998). In positivist research, surveys are useful as they offer a mean of working from observations to theory validation by allowing objective data to be tested and interpreted numerically, through the examination of relationships between variables (Creswell, 2014). Data obtained from survey research can be analysed in different manner, such as reporting of descriptive statistics, analysis of paths through regression analysis, as well as multivariate analysis technique of SEM.

Cross-sectional surveys are effective in giving a snapshot of current behaviours, beliefs, and attitude in a population (Gay et al., 2012). They can be applied to large sample sizes, are cost efficient, convenient for respondents, quicker to administer, and has minimal researcher effect, hence can reduce social desirability bias (Bryman, 2012; Creswell, 2014). With random sampling, responses can be generalised to others from the population investigated (Creswell, 2014). Despite these advantages, there are some drawbacks of employing cross-sectional survey research such as its reliance on self-reported data where the truthfulness of responses cannot be determined and issues of non-response which cause low response rate (Bryman, 2012). Bearing this in

mind, the study took precautionary measures such as assurance of respondents' anonymity and pre-test of questionnaire to encourage meaningful response that closely characterise the respondents (Gay et al., 2012). To enhance response in the survey, the questionnaire was translated to the Malay Language because it is the official language used in public schools (Harkness & Schoua-Glusberg, 1998). The next section presents the procedures undertaken to develop the research instrument.

3.4 Survey Instrument Development

The current study slightly adapted a combination of existing validated scales based on extensive review of literature. To ensure the quality of the instrument, the study adapted the framework outlined by Churchill (1979) in Figure 3.1 for the development of better research instrument. Malhotra and Grover (1998) later discussed this framework by suggesting additional procedures such as content validation through panel of experts, as well as pre-test of instruments. As the current study entails the translation of questionnaire from English Language into the Malay Language, the translation is incorporated into the procedures before the pre-test and pilot test of instruments. This inclusion is in line with the sequence of translation suggested by Sousa and Rojjanasrirat (2010), so as to further assess the content, conceptual, and semantic equivalency of the translated instruments, and improve the questionnaire items for easy comprehension by the targeted population. Figure 3.1 shows the adapted procedure in finalising the questionnaire.

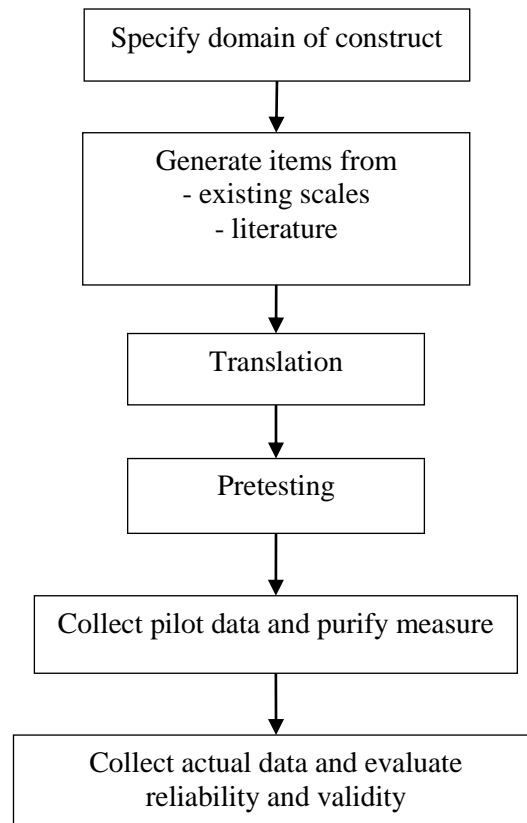


Figure 3.1: Procedure for development of research instrument adapted from Churchill (1979)

3.4.1 Specification of Domain

The first step involved the specification of research domain, which entailed “delineating what is included in the definition and what is excluded” (Churchill, 1979, p. 67). Being specific is paramount for clarity in what is to be measured. Hence, the literature is scrutinised as strong theoretical foundations were consulted to specify the domain of the constructs to ensure they are well conceptualised. The body of literature on psychological ownership, the TAM and continuance intention in technology were extensively reviewed.

At the second step that involved items generation, the study adapted validated scales wherever possible from the literature in order to support a cumulative practice of research (Malhotra & Grover, 1998). Hence, scales utilised in the current study were adapted from studies on information system and psychological ownership, and as far as possible, validated in the contexts of educational technology. Items for the TAM variables of perceived usefulness, perceived ease of use, attitude towards use, and continuance intention had earlier been used in the Malaysian educational context and were found to be reliable (Moses, Wong, Bakar, & Mahmud, 2013; Ramayah, Ling, Taghizadeh, & Rahman, 2016; Teo et al., 2009). However, items for experienced control, investment of the self, knowledge, and psychological ownership have not been applied to the Malaysian context. Multi-item measures were used as recommended by Churchill (1979) because they can help in defining the construct's domain. These items are measured based on a 7-option Likert scale with anchors ranging from 1 (strongly disagree) to 7 (strongly agree), with a middle category of 4 (neither agree nor disagree). Such use of Likert scale offers symmetry of options with a middle category. This is important because the symmetry and equidistance of a Likert scale allows for the approximation of an interval-level measurement, so that the corresponding variables can be analysed later using SEM (Hair, Hult, Ringle, & Sarstedt, 2017). The items generated formed the reflective measurement of the present study's constructs: experienced control, investment of the self, knowledge, psychological ownership, perceived usefulness, perceived ease of use, attitude towards use, and continuance intention.

Permissions to adopt, adapt and translate the scales were sought and obtained from the respective authors via electronic mail, or through a particular journal's Copyright Clearance Centre (Appendix A). All scales were available in the public domain. A panel of three subject matter experts from Universiti Putra Malaysia, Universiti Sains Malaysia, and Tunku Abdul Rahman University College were invited to verify that the adapted items in the questionnaire represent the intended construct to be measured. These experts verify the content validity to ensure that the items are tied to the concepts and theoretical assumptions. To do so, they were provided with a write-up about the present study that consisted of its research objectives and hypotheses, theoretical framework, research model, conceptualisation of constructs, research design, source of original items, and adapted items. Table 3.1 shows the items used as measures of the study.

Table 3.1: Sources of Scales Adapted for the Study

Variables	Items	Referenced Sources
Experienced control	7	Brown et al. (2014) Webster et al. (1993)
Knowledge	7	Brown et al. (2014) Zhang et al. (2011)
Investment of the self	6	Brown et al. (2014) Zhao et al. (2016)
Psychological ownership	6	Barki et al. (2008)
Perceived usefulness	8	Davis (1989) Wang and Wang (2009)
Perceived ease of use	8	Davis (1989) Wang and Wang (2009)
Attitude towards use	6	Loyd and Gressard (1984)

		Thompson et al. (1991)
Continuance intention	5	Bhattacharjee (2001) Lin (2011)
Total items	53	

3.4.2 Generation of Items Used in Measures

Items for experienced control were slightly adapted from Brown et al. (2014) and Webster et al. (1993). Brown et al. (2014) provided the first empirical examination of the three key experiences (experienced control, investment of the self, and intimate knowing) that became the routes for the emergence of psychological ownership. This aforementioned research positioned the job itself to be the target of ownership, where these experiences significantly influence job-based psychological ownership. Adapting the items to the present study, Frog VLE is positioned as the target of ownership to reflect the control which users experience when using the platform. In addition, items were also adapted from Webster et al. (1993) which measure control exercised over software through the various choices of functionalities available. In this vein, these items measure the control experienced by users when they navigate through the Frog VLE using the various functionalities available, wherein a reliable and secure virtual environment and supportive navigation features would give users a feeling of being in control. Hence, these items were adapted to reflect the influence and control that a teacher experiences when using Frog VLE. As shown in Table 3.2, all items were measured reflectively, positive worded, and thus scored in the same direction.

Table 3.2: Items Used to Measure Experienced Control

Scale reference	Original Items	Adapted items
Brown et al. (2014)	To what extent do you have influence over the things that affect you on the job?	EC1. I have influence over the things that affect my Frog VLE account.
	To what extent do you have influence over the tasks or parts of tasks that you will do?	EC2. I have influence over the tasks that I perform in my Frog VLE.
	To what extent do you influence job-related decisions that will affect you?	EC3. I influence decisions made on my Frog VLE.
	To what extent do you set your own work deadlines?	EC4. I set my own deadlines in my Frog VLE.
	To what extent do you control the pace and scheduling of the work that you do?	EC5. I control the scheduling of the tasks that involve Frog VLE.
Webster et al. (1993)	I felt in control over my interaction with Lotus 1-2-3.	EC6. I felt in control of the interaction in the Frog VLE.
	When using the Lotus 1-2-3 I feel in control.	EC7. I feel in control when using the Frog VLE

Items for knowledge were adapted from Brown et al. (2014) and Zhang et al. (2011). As noted earlier, Brown et al. (2014) examined job-based psychological ownership, and their items measured individuals' knowledge about their job, and reflected the breadth and depth of information they have towards their work. Items were adapted from this scale to measure teachers' knowledge about Frog VLE. Additionally, items were also adapted from Zhang et al. (2011) measures which originally measured website knowledge. The present study adapted these items to measure knowledge about Frog VLE, which is accumulated through visits and familiarity with the platform. Hence, a total of seven positive worded items were used to reflect the breadth and depth

of understanding a teacher has about Frog VLE. Table 3.3 shows the reflective items of the scale.

Table 3.3: Items Used to Measure Knowledge

Scale reference	Original Items	Adapted items
Brown et al. (2014)	I am intimately familiar with what is going on with regard to my job.	K1. I am intimately familiar with what is going on with regard to my Frog VLE account.
	I have a depth of knowledge which relates to the job.	K2. I have a depth of knowledge which relates to Frog VLE.
	I have a comprehensive understanding of the work that I am asked to do.	K3. I have a comprehensive understanding of the functions in Frog VLE.
	I have a broad understanding of this job.	K4. I have a broad understanding of Frog VLE.
Zhang et al. (2011)	I always know where I can find the information I am looking for at Amazon.com's website.	K5. I always know where I can find the information I am looking for in Frog VLE.
	I visit Amazon.com very often.	K6. I visit Frog VLE very often.
	I have been to Amazon.com many times.	K7. I have visited Frog VLE many times.

Items for investment of the self into VLE were taken from Brown et al. (2014) and Zhao et al. (2016) to portray teachers' personal investment of their effort, time, energy, attention, and intellect into Frog VLE. Brown et al. (2014) items which originally measured individuals' investment into their job were adapted to reflect self-investment into Frog VLE. Zhao et al. (2016) conceptualised self-investment in terms of users' time spent participating in a social media platform. These authors had referenced Lee and Chen (2011) who measured self-investment in terms of number of visits to a virtual world. For conceptual and measurement clarity, the present study referenced the adapted

items of Zhao et al. (2016) and considered the investment of time instead of number of visits to Frog VLE. There are measurement issues associated with self-report of actual technology use, as it may influence teachers to answer in a socially desirable manner (Teo, 2011). With this, Table 3.4 presents the seven reflective items used in the scale with all items being positively worded, thus scored in the same direction.

Table 3.4: Items Used to Measure Investment of the Self

Scale reference	Original Items	Adapted items
Brown et al. (2014)	I have invested a major part of “myself” into this job.	IN1. I have invested a major part of “myself” into Frog VLE.
	I have invested many of my ideas into this job.	IN2. I have invested many of my ideas into Frog VLE.
	I have invested a number of my talents into this job.	IN3. I have invested a number of my talents into Frog VLE.
	I have invested a significant amount of my life into this job.	IN4. I have invested a significant amount of my time into Frog VLE.
Zhao et al. (2016)	I often chat with friend using LINE.	IN5. I often perform work using Frog VLE.
	I often use LINE to know current status of friends	IN6. I often use Frog VLE for teaching and learning purposes.

With regards to psychological ownership, Barki et al. (2008) had earlier paved the measurement of psychological ownership in the technological context, with a six-itemed scale used in the context of information technology system. Items in the scale describe the feelings of ownership elicited through the usage of the system and psychological attachment to ideas embedded within the design of the system (Barki et al., 2008). This scale is adapted as a VLE can also be considered as an information system for the administration of

teaching and learning. As shown in Table 3.5, there were six items which reflectively measure teachers' psychological ownership towards the Frog VLE.

Table 3.5: Items Used to Measure Psychological Ownership

Scale reference	Original Items	Adapted items
Barki et al. (2008)	I personally invested a lot in the implementation of the new system in my clinic.	PO1. I personally invested a lot (time, ideas, energy etc.) in the implementation of the Frog VLE.
	When I think about it, I see a part of myself in the new system.	PO2. I can see a part of my teaching in the Frog VLE.
	I feel the new system belongs to all the doctors in my clinic.	PO3. I feel the Frog VLE belongs to all the teachers.
	I feel a high level of ownership toward the new system.	PO4. I feel a high level of ownership toward the Frog VLE.
	I see myself as a champion of the new system in my clinic.	PO5. I see myself as a supporter of the Frog VLE in my school.
	I configured the functionalities of the new system to better align it with my medical practice.	PO6. I organised the content of the Frog VLE to better align it with my teaching practice.

Items from the original scale of perceived usefulness were considered to measure individuals' belief that using a particular technology would improve their work performance (Davis, 1989). Perceived usefulness together with perceived ease of use are the core constructs in TAM, and a recent meta-analysis has found the originally validated scales had high reliability coefficients in utilitarian contexts (Hess, McNab, & Basoglu, 2014). Hence, the study adapted items from Davis (1989) perceived usefulness scale to gauge teachers' belief about the usefulness of Frog VLE. Items from the study of Wang and Wang (2009) were also referenced because they were used

specifically in the educational context to gauge teachers' perceived usefulness of a web-based learning system. Table 3.6 shows the eight items proposed to reflectively measure perceived usefulness.

Table 3.6: Items Used to Measure Perceived Usefulness

Scale reference	Original Items	Adapted items
Davis (1989)	Work more quickly	PU1. Frog VLE enables me to accomplish tasks more quickly.
	Job performance	PU2. Using Frog VLE improves my job performance.
	Increase productivity	PU3. Using Frog VLE increases my job productivity.
	Effectiveness	PU4. Using Frog VLE improves my work effectiveness.
	Makes job easier	PU5. Using Frog VLE makes my job easier.
	Useful	PU6. I find Frog VLE useful to my job.
Wang and Wang (2009)	Using web-based learning system enhances my interactions with the students.	PU7. Using Frog VLE enhances my interactions with the students.
	Using web-based learning system increases the reuse rate of the course materials	PU8. Using Frog VLE increases the reuse rate of the teaching and learning materials.

For the same reasons mentioned in generating items for perceived usefulness, original items development for perceived ease of use were also adapted from Davis (1989) together with items by Wang and Wang (2009) who measured teachers' perceived ease of use of web-based learning. Items were adapted to reflect teachers' belief about the ease of using Frog VLE in executing their work. Table 3.7 shows the proposed scale which consisted of eight items to reflectively measure perceived ease of use.

Table 3.7: Items Used to Measure Perceived Ease of Use

Scale reference	Original Items	Adapted items
Davis (1989)	Easy to learn	PEU1. It is easy for me to learn to use Frog VLE.
	Controllable	PEU2. I find it easy to get Frog VLE to do what I want it to do.
	Clear and understandable	PEU3. It is easy for me to understand how to use Frog VLE.
	Flexible	PEU4. The Frog VLE is flexible to work with.
	Easy to use	PEU5. Frog VLE is easy to use.
	Easy to become skilful	PEU6. It is easy for me to become skilful at using Frog VLE.
Wang and Wang (2009)	I find it easy to get WBLs to do what I want it to do corresponding to the ways I teach.	PEU7. I find it easy to use Frog VLE to carry out my lesson plan.
	It is easy for me to recover from errors encountered while using WBLs.	PEU8. It is easy for me to recover from errors encountered while using Frog VLE.

To measure attitude towards using VLE, the TAM is referenced where Davis et al. (1989) operationalised attitude based on the affect dimension which focused on individuals' positive or negative feelings about performing a particular behaviour. The present study also operationalised attitude in terms of teachers' affective evaluation in using Frog VLE. Hence, items were adapted from Loyd and Gressard (1986), Thompson et al. (1991), and Teo (2009), as they reflect the feelings or affective element in performing a particular behaviour related to technology. Teo (2009) had earlier adapted the item AT6 from Thompson (1991), and the study referenced this phrase adapted by Teo

(2009). As shown in Table 3.8 the final scale consisted of six items which reflectively measure teachers' attitude towards using Frog VLE.

Table 3.8: Items Used to Measure Attitude Towards Using VLE

Scale reference	Original Items	Adapted items
Loyd and Gressard (1986)	Once I start to work with the computer, I would find it hard to stop.	ATT1. Once I start using Frog VLE for teaching, I find it hard to stop.
	I think working with computer would be enjoyable and stimulating.	ATT2. I find using Frog VLE to be enjoyable.
	I would like working with computers.	ATT3. I like using Frog VLE.
Thompson et al. (1991)	PCs make work more interesting.	ATT4. Frog VLE makes work more interesting.
	Working with a PC is fun.	ATT5. Working with Frog VLE is fun.
Teo (2009)	I look forward to those aspects of my job that require me to use computers.	ATT6. I look forward to those aspects of my job that require me to use Frog VLE.

Items to measure continuance intention were adapted from Bhattacharjee (2001) who extended his scale from Mathieson (1991). Bhattacharjee (2001) who investigated online banking offered one of the earliest conceptualisations of continuance intention in information system. Besides, another two items were also adapted from Lin (2011) who examined continuance intention in using e-learning. With this, a total of five items were slightly adapted to measure teachers' intention to continue using Frog VLE. Table 3.9 shows the items proposed to measure continuance intention reflectively.

Table 3.9: Items Used to Measure Continuance Intention

Scale reference	Original Items	Adapted items
Bhattacharjee (2001)	I will use the e-learning system on a regular basis in the future.	CI1. I will use the Frog VLE on a regular basis in the future.
	I will strongly recommend others to use it.	CI2. I will strongly recommend others to use Frog VLE.
	I will frequently use the e-learning system in the future.	CI3. I will frequently use Frog VLE system in the future.
Lin, 2011	I will continue using the e-learning service for study.	CI4. I will continue using the Frog VLE for instructional purposes.
	I intend to continue using the e-learning service for life-long learning.	CI5. I intend to continue using the Frog VLE for life-long learning.

3.4.3 Translation of Research Instrument

The items in the scales which is in the source language of English Language were translated to Malay Language. The Malaysian MOE requires all questionnaires distributed in public schools to be in the Malay Language. The translation will enhance comprehension of the questionnaire as the Malay Language is the official language used by governmental departments.

There are various methods for translation such as back translation, bilingual techniques, committee approach and pre-test (Brislin, Lonner, & Thondike, 1973). Among these methods, the back-translation method is highly recommended by researchers of cross-cultural research (Brislin, 1970; Yu, Lee, & Woo, 2004). Besides being a translation technique, back translation can also

serve the purpose of assessing the quality of translation (Harkness & Schoua-Glusberg, 1998). To enhance quality of translated questionnaire, Brislin (1970) suggested to incorporate the decentering approach into the back translation process. As such, this study employed the back translation method and incorporated the decentering approach along the process to enhance translation quality and equivalence of the original and translated questionnaire. Decentering refers to the process where both original and translated versions of questionnaire are referenced and checked at the same time, in a manner which neither of the languages becomes the centre of dominance (Brislin, 1970).

Three bilingual translators who are proficient in both English Language and Malay Language (bilingual) were involved in the translation. The translators are qualified faculty members who were attached to the Department of Languages in a local university. The first translator translated the questionnaire in its original source language (English text 1) to Malay Language (Malay text 1). The translated text (Malay text 1) is then translated back to English (English text 2) by the second translator who served as the back translator, who had not read the original text. With this, two versions of the questionnaires were produced: Malay text and back-translated English text. The third translator reviewed the original text and back-translated English text to evaluate the accuracy of translation. This is when the decentering process took place where concepts which are not identical in the two English versions of the questionnaire were discussed among all three translators. Revisions were made to both English and Malay version of the questionnaire after the translators agreed on the most linguistically suitable translated words or

phrases. This served as equivalence check to produce the final version of the Malay Language instrument. The instrument was then subjected to pre-test, pilot test, and assessment of its psychometric properties (Sousa & Rojjanasrirat, 2010).

3.4.4 Pre-test of Questionnaire

Brislin (1970) recommended pre-test after translation of instrument to gauge the quality of the questionnaire. In order to identify issues related to questionnaire design, Burns and Bush (2014) suggested to involve five to 10 respondents in pre-testing a research instrument. Hence, the study recruited five teachers who are using Frog VLE and employed the debriefing approach in pre-testing the final questionnaire (Hunt, Sparkman, & Wilcox, 1982). With this approach, teachers filled in the translated questionnaire on separate occasions, after which the researcher asked them about potential problems such as words and phrases which are ambiguous and not commonly used among teachers.

Teachers had commented that the use of “invest” in the items’ wording to be inappropriate, as the Malay Language equivalent of invest is usually directed at monetary investment. All five teachers suggested to change this word in the item’s wording to reflect the contributions of personal aspects to the VLE. Hence, four items measuring investment of the self and psychological ownership were amended. There was also confusion which caused by an item measuring knowledge, “I am intimately familiar with what is going on with

regard to my Frog VLE account”. Teachers suggested to remove the word “intimate” as the Malay Language of intimate usually reflect relationship proximity. Lastly, three out of five teachers had advised to remove one of the items measuring continuance intention, “I intend to continue using the Frog VLE for life-long learning”. This item may confuse teachers because they may think that Frog VLE is still relevant to them after their retirement, whereas it is only applicable during their teaching tenure. With this, there is a total of 52 items in the final questionnaire (Appendix B). Table 3.10 summarises the changes made to the items after considerations given for teachers’ suggestions.

Table 3.10: Changes Made to Questionnaire Items after Pre-test

Variable	Original item	Suggested changes
Investment of the self	I2. I have invested many of my ideas into Frog VLE. <i>Saya telah melabur banyak idea dalam Frog VLE.</i>	I2. I have contributed many of my ideas into Frog VLE. <i>Saya telah menyumbang banyak idea saya dalam Frog VLE.</i>
	I3. I have invested a number of my talents into Frog VLE. <i>Saya telah melabur bakat saya dalam Frog VLE.</i>	I3. I have contributed a number of my talents into Frog VLE. <i>Saya telah menyumbang bakat saya dalam Frog VLE.</i>
	I4. I have invested a significant amount of my time into Frog VLE. <i>Saya telah melabur banyak masa dalam Frog VLE.</i>	I4. I have spent a significant amount of my time into Frog VLE. <i>Saya telah meluang sejumlah besar masa saya dalam Frog VLE.</i>
Psychological Ownership	PO1. I personally invested a lot (time, ideas, energy etc.) in the implementation of the Frog VLE. <i>Saya telah banyak melabur banyak (masa, idea, tenaga) dalam pelaksanaan Frog VLE.</i>	PO1. I personally contributed a lot (time, ideas, energy etc.) in the implementation of the Frog VLE. <i>Saya menghabiskan banyak (masa, idea, tenaga) dalam pelaksanaan Frog VLE.</i>
Knowledge	K1. I am intimately familiar with what is going on with	K1. I am very familiar with what is going on with regard

Variable	Original item	Suggested changes
	regard to my Frog VLE account. <i>Saya intim dengan perkara yang sedang berlaku dengan akaun Frog VLE saya.</i>	to my Frog VLE account. <i>Saya amat biasa dengan perkara yang sedang berlaku dengan akaun Frog VLE saya.</i>
Continuance Intention	CI5. I intend to continue using the Frog VLE for life-long learning.	Item removed.

3.4.5 Pilot Study

Pilot tests are small-scale trial studies which are useful to anticipate problems or issues which will arise during full-scale studies (Gay et al., 2012). Hence, the study employed actual planned procedures to administer the questionnaire in carrying out the pilot study. Permissions to distribute questionnaires were obtained from the principals of these schools, and a total of 67 teachers from three schools completed the questionnaires. Respondents understood the items, and there were minimal changes as the translated questionnaire had earlier gone through the decentering process as well as pre-test procedures. The suggestions received after the pilot test pertained to the spacing of the items, and to change the item on unit of measurement that asked about teaching workload to number of hours instead of number of lessons taught. This is because duration of lessons can vary between 30 or 40 minutes depending on the subject taught. In assessing the internal consistency of the scales measuring the respective constructs, the Cronbach's alpha values of these scales were obtained with IBM SPSS Version 20. The results of the pilot study are presented in Chapter Four.

3.5 Sampling and Data Collection

Population is described as a universe of units which can consist of the entire group of people, organisations, or sub-units within organisations (Bryman, 2012). In the current study's context, the Frog VLE is available to about 500,000 teachers who are teaching in public primary and secondary schools in Malaysia (Hew & Syed Abdul Kadir, 2016a). Realistically, it is necessary to define a population to set the boundaries for generalisability of the research finding (Gay et al., 2012). As such, the study targets the northern region of Malaysia which consisted of four states: Perlis, Kedah, Pulau Pinang, and Perak. The northern region has the largest percentage of schools (23.1%) compared to other regions within Malaysia (MOE, 2018a), and collecting data from this region can provide a good representation of teachers in Malaysia (Awang et al., 2018). Table 3.11 shows the number of schools located across the regions in Malaysia. The schools in these states make up the sampling frame, while individual teachers are the unit of analysis of the study.

Table 3.11 Number of Schools according to Regions in Malaysia

No.	Region	Number of Schools	Percentage (%)
1	Northern	2,353	23.1
2	Central	1,287	12.6
3	East Coast	1,836	18.0
4	Southern	1,976	19.4
5	Sabah	1,294	12.6
6	Sarawak	1,455	14.3
	TOTAL	10,201	100.0

A sample is a subset of the target population from which results that are obtained could be generalised to the population concerned (Sekaran, 2003). It is imperative to have an optimal sample size to minimise the likelihood of error when generalising findings to the population (Gay et al., 2012). As the study employed multivariate analysis, and Hair, Black, Babin, and Anderson (2014) stressed the importance of a large sample size to provide sufficient statistical power for such tests. The power of a statistical test refers to the probability of not missing an effect when an effect is in existence, or the probability of correctly rejecting a null hypothesis, at a particular alpha level (Cohen, 1988). Cohen (1988) recommended the desired power of at least 80%, to ensure sample is adequate to detect a difference. Inadequate power may result in failure to detect a difference when there is actually one. Hence, scholars have also suggested that power be set at 90%, so as to minimise such errors (Kadam & Bhalerao, 2010). As the study entails testing of mediation analysis, sufficiency of sample is also needed to detect the indirect effects proposed (Fritz & MacKinnon, 2007). To ensure an optimal sample size, an a priori power analysis was carried out with G*Power 3.1.2 software (Faul, Erdfelder, Buchner, & Lang, 2009). With a desired power of 90%, significance of .05 alpha level to detect effect size (f^2) of .02, the software suggested a sample size of 830.

3.5.1 Sampling Procedure

A good sample in quantitative study is representative of the population from which it is drawn (Gay et al., 2012). The study employed proportional

stratified sampling to ensure teachers in four states are represented in the study sample in the same proportion in which they exist (Sekaran, 2003). In order to identify the proportion to be stratified, the population is divided into four sub-samples known as strata (Cochran, 1977; Gay et al., 2012). The strata were classified according to the four states where respondents originate. Table 3.12 shows the identified strata, teacher population in the strata, the sampling fractions of the strata, and the required sample size from each strata.

Table 3.12: Sample Selection with Proportional Stratified Sampling

No	Strata (States)	Teacher population	Sampling fractions in Strata	Sample size in Strata
1	Kedah	11,964	31.6%	262
2	Perak	15,882	42.0%	349
3	Perlis	1,770	4.7%	39
4	Pulau Pinang	8,212	21.7%	180
	TOTAL	37,828	100%	830

The population is proportionally stratified according to the states of Perlis, Kedah, Pulau Pinang, and Perak, and respondents were selected with the assistance of a random table (RAND Corporation, 2001). Seven tables were available, and the day of the week determined the table to be used. For instance, if the day for selection of respondents falls on a Tuesday, table two will be used for random selection. An arbitrary point is selected by dropping an ink pen onto the particular table. Numbers were recorded starting from the arbitrary point to the end of the column, and then to the subsequent columns. These numbers represent the schools listed within each state. These schools

were contacted to ascertain their teacher population, and the numbers of teachers were added up to the desired targeted sample size.

Bartlett, Kotrlik and Higgins (2001) recommended oversampling to reach the targeted sample size in social science research. Based on observation of local studies that involve teachers as respondents, the return rate of questionnaire ranged from 54% (Chee, 2008) to 60% (Yim & Moses, 2016). In anticipation of these response rates, 1500 questionnaires were distributed.

3.5.2 Data Collection

There are generally two types of survey studies: cross-sectional and longitudinal (Saunders et al., 2012). Cross sectional research involves the collection of data at one point in time to collect quantitative data of variables, which are then examined to detect patterns of association (Bryman, 2012). Longitudinal research is carried out to collect data at two or more points in time to investigate changes in dependant variables (Sekaran, 2003). The present adopts the cross-sectional approach, as it does not aim to measure changes and development of the dependant variables, and there is no involvement of manipulation of the constructs which required a longer time frame. Moreover, cross-sectional can provide insights relatively fast compared to longitudinal studies (Gay et al., 2012). The time efficiency in data collection in cross sectional research is suitable for the contractual nature of the services of the VLE investigated, the Frog VLE. The initial contract for its services had lasted for 30 months, and the subsequent renewal was requested to be reviewed

by the Malaysian Public Accounts Committee as the system has yet to achieve its purported objectives and benefits (Aziz, 2016). Observing the contractual nature of the VLE, a longitudinal strategy may not be suitable, hence a cross-sectional approach is adopted to provide the snapshot of current behaviours, beliefs, and attitudes of the research respondents.

Before data collection, ethical approval was obtained from the Universiti Tunku Abdul Rahman Ethical Review Committee to conduct the research (Appendix C). Procedurally, the study safeguarded the anonymity of teacher respondents and participating schools. An information sheet is included as cover page of the questionnaire to convey the purpose of the study, respondents' right to withdraw from the study, and the voluntary nature of the survey. As such, no pressure is imposed on respondents to complete the survey.

The MOE requires the application of permission before conducting research in public schools. Hence, permissions were applied for and obtained from departments in different organisational levels: Division of Education Policies Research and Planning at the federal level (Appendix D), State Education Department at the state level (Appendix E), School District Offices at the district level (Appendix F). It was noted that there were differences in practice among the state education department. While the Perak state required permissions to be obtained from various school districts, the state of Perlis, Pulau Pinang, and Kedah only required permission from the State Education Department. With this, questionnaires were hand-delivered to the schools in Perak, Pulau Pinang, and some parts of Kedah. It was observed that these

principals would task a teacher from the ICT department, a senior assistant, or a school clerk to be the contact person to co-ordinate collection of completed questionnaires. Due to the constraint of distance, questionnaires were posted to Perlis and some parts of Kedah, with a self-addressed pre-paid enveloped for each school to return the completed questionnaires. It was observed that some principals would only be willing to accept a certain quantity of questionnaires to be distributed to their teachers. For instance, a particular school with 87 teachers had accepted only 25 questionnaires to be given to the teachers. In such situation, another school within the state would be selected using the random table and included in the study, so as to achieve the targeted sample size. The collection period lasted from 10 October 2017 to 15 January 2018. With 1500 questionnaires distributed, 1154 were returned. Table 3.13 shows the questionnaire returned according to the respective states. With this, the return rate of distributed questionnaires was 76.9%.

Table 3.13: Number of Questionnaires Distributed and Returned

State	Distributed	Returned
Kedah	474	284
Perak	630	525
Perlis	70	43
Pulau Pinang	326	302
Total	1500	1154

3.6 Data Analysis Plan

The present study employed descriptive analysis and inferential statistics to analyse data collected. Descriptive statistics were obtained from Statistical Package for Social Science (SPSS) Version 20 to give an overview of respondents' profile. SPSS was also used in data preparation in terms of analysing missing data, response patterns, outliers, normality, linearity, homoscedasticity, and multicollinearity. Inferential statistics were obtained with Structural Equation Modelling (SEM).

SEM is a second-generation multivariate data analysis procedure that can simultaneously explain a set of relationships between one or more exogenous variables, and one or more endogenous variables (Tabachnick & Fidell, 2013). It has better advantages over first generation techniques such as multiple regression, principal component analysis or factor analysis (Chin, 1998). It extends the first-generation techniques with advantages such as: (i) analyse relationships between multiple exogenous and endogenous variables, (ii) analyse latent variables which represent unobserved theoretical concepts, (iii) account for measurement errors of observed variables, and (iv) testing of a priori measurement and theoretical concepts against empirical data (Chin, 1998).

There are two types of SEM, namely covariance-based SEM (CBSEM) and variance-based SEM such as partial least squares SEM (PLS-SEM) (Hair et al., 2017). Both are second generation regression techniques. CBSEM is

primarily employed to confirm or reject theories, by examining how well the covariance matrix of the collected data is estimated by a proposed theoretical model (Hair et al., 2017). In other words, CBSEM is used to verify how well a particular proposed theoretical model fit the research data. It is important for structural model to achieve threshold of goodness of fit criteria for example chi-square, comparative fit index, and root mean square error of approximation (Tabachnick & Fidell, 2013). This approach follows a set of underlying assumptions such as multivariate normality and minimum sample size to confirm structural relationships (Chin, 1998). When these assumptions are violated, results will be highly inaccurate (Hair, Ringle, & Sarstedt, 2011). One of the disadvantages of CBSEM is that sometimes a model may not converge and produces un-interpretable outcome, which results the model being modified and the theory re-interpreted (Chin, 1998; Henseler, Ringle, & Sinkovics, 2009).

In contrast, variance-based techniques such as PLS-SEM is prediction oriented as it focuses on maximising the accounted variance of a particular endogenous variable (Hair et al. 2017). PLS-SEM is suitable for development of theories in predicting and explaining target constructs (Chin, 1998; Hair et al., 2017). The study employed PLS-SEM to analyse data as it is suitable to fulfil the main objective to predict teachers' continuance intention with a combination of two theories. Unlike CBSEM, this approach is not used for confirming theories, hence its main objectives are not to test which different models fits the data better (Sosik, Kahai, & Piovoso, 2009). As the theoretical model of the present study incorporates the Theory of Psychological

Ownership with the TAM, this method is appropriate to explore its applicability and for development of the theory (Chin, 1998; Hair et al., 2017). With this approach, the current study can explore the proposed theoretical model, and at the same time maximising the variance explained in teachers' continuance intention in using Frog VLE (Hair et al., 2017). As such, the SmartPLS Version 3.2.7 software (Ringle, Wende, & Will, 2005) was employed for data analysis. This is a non-parametric software that does not required to fulfilled assumption of data normality. Even though the software is mostly associated with small sample sizes, studies have employed it successfully in samples as large as 13,000 (Bravo, Cordts, Schulze, & Spiller, 2013). Methodological development on PLS-SEM is rapidly emerging, and recent systematic examination and overview studies had noted that it works very well with large samples, and the reviewed articles had in average large sample sizes (Ali, Rasoolimanesh, Sarstedt, Ringle, & Ryu, 2018; Hair, Risher, Sarstedt, & Christian, 2019). Additionally, the Stone-Geisser's Q^2 available in the software is useful to assess the predictive relevance of the path model of each endogenous variable respectively.

There are mainly two stages to evaluate the research model in SEM, also known as the two-step approach: measurement model evaluation and structural model evaluation (Anderson & Gerbing, 1988). The evaluation of measurement model verifies the measurement theory which proposed how to measure the construct of the study, it also serves as Confirmatory Factor Analysis to confirm the dimensionality of the variables (Ramayah, Cheah, Chuah, Ting, & Memon, 2016). The measurement model is evaluated in terms

of internal consistency reliability, convergent validity, and discriminant validity. On the other hand, the evaluation of structural model verifies the structural theory which proposes how the constructs are related and assesses how well the empirical data support the theoretical proposition of the present study. Analysis to assess the structural model includes path coefficients, mediation effects, coefficient of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). With this, Table 3.14 outlines the multiple analyses undertaken by this study.

Table 3.14: Data Analysis Plan of the Present Study

Assessment	Purpose	Analysis test/ Name of index	Criteria	Reference
Missing data	To decide whether missing value should be removed by evaluating the pattern of missing data.	Little's MCAR test	$p > .05$	Little (1988)
Response patterns	To identify and remove cases with the same option throughout the questionnaire	Standard deviation of 0	Cases with "straight-line" response need to be removed	Hair et al. (2017)
Outliers	To identify and remove outliers	Mahalanobis distance (D^2)	$p < .001$	Kline (2011)
Normality - univariate	To assess whether distribution of scores is normally distributed at item level.	Kolmogorov-Smirnov test Shapiro-Wilk test	$p > .05$ indicates normality	Shapiro & Wilk (1965)
Normality - multivariate	To assess whether distribution of scores from two or more items combined is normally distributed and linear.	Mardia's Coefficient (multivariate skewness and kurtosis)	$p > .05$ for multivariate skewness and kurtosis indicates normality	Mardia (1970)

Assessment	Purpose	Analysis test/ Name of index	Criteria	Reference
Linearity	To ensure that there are linear relationships between variables	Scatterplots	Data points scatter around a straight line	Hair, Black et al. (2014)
Homoscedasticity	To ensure variability in scores between variables to be similar	Scatterplots	Data points scatter to form a cigar shape	Pallant (2016)
Multicollinearity	Collinearity – To evaluate the extent that the predictors variables are highly correlated among each other.	Variance Inflation Factor, Correlation coefficient	VIF < 5 Correlation < .90	Hair et al. (2017) Tabachnick & Fidell (2013)
Descriptive statistics	Profiling of respondents according to demographic information	Frequency count, mean, standard deviation	Not applicable	
Common method bias	To ensure that variance is not attributed by measurement method.	Harman's single factor test using unrotated exploratory factor analysis	Non-presence of a single factor. One general factor account for substantial variance	Podsakoff & Organ (1986)
Non-response bias	To evaluate sample representation where there is no difference between early and late responses.	Levene test for equality of variance	$p \geq .05$ indicates no difference	Armstrong & Overton (1977)
Measurement Model Validation				
Internal consistency	To ensure internal consistency reliability of the construct measured	Composite reliability	Value above .60 to .70 for exploratory research	Hair et al. (2017)
		Cronbach's alpha	Minimum .70	Nunnally (1978)
Convergent validity	To evaluate the extent to which an indicator reflects the convergence of a construct in comparison to	Average variance extracted	Value $\geq .50$	Fornell & Larcker (1981)

Assessment	Purpose	Analysis test/ Name of index	Criteria	Reference
	indicators measuring other constructs.			
	To evaluate the extent to which an indicator is consistent with what it intends to measure	Indicator reliability	Outer loading of indicators > .708	Hair et al. (2017)
			Significance of outer loading t-value > 1.96	Hair et al. (2017)
Discriminant validity	Indicator level: To assess the extent to which a construct is distinct from other constructs	Cross loadings	Indicator outer loadings assigned to a construct > loadings on all other constructs	Hair et al. (2017)
	To assess the extent to which a construct is distinct from other constructs	Heterotrait-Monotrait ratio (HTMT)	HTMT < .85 OR HTMT < .90	Kline (2011) OR Gold et al. (2001)
Structural model validation				
Structural Model Path coefficients	To evaluate the significance of structural paths in the hypothesised direction between exogenous and endogenous variables	Path Coefficient using bootstrapping procedure at 95% confidence interval	t-value > 1.96	Hair et al. (2017)
Mediation analysis	Significance of direct and indirect effect	Bootstrapping of Indirect effect and Direct effect at 95% confidence interval	Full mediation: Indirect effect (significant) Direct effect (not significant) Partial mediation: Indirect effect (significant) Direct effect (significant) No mediation: Indirect effect (not significant) Direct effect (not significant)	Preacher and Hayes (2008) Zhao, Lynch and Chen (2010)
			t-value > 1.96	

Assessment	Purpose	Analysis test/ Name of index	Criteria	Reference
Coefficient of determination (R^2)	To measure of how much variability is accounted for by the exogenous observed variables on the endogenous variables	Coefficient of determination	.26 Substantial .13 Moderate .02 weak	Cohen (1988)
Effect size f^2	A measure to evaluate the relative impact of a predictor on an endogenous variable.	f^2	.35 – Substantial .15 – Moderate .02 - Weak	Cohen (1988)
Predictive relevance Q^2	To evaluate the predictive relevance of the path model.	Stone and Geisser's Q^2 with blind folding	Values which are larger than 0 indicates exogenous variables have predictive relevance over endogenous variables.	Hair et al. (2017)
Effect size q^2	A measure to evaluate the relative impact of predictive relevance Q^2	q^2	.35 – Large .15 – Medium .02 - Small	Hair et al. (2017)

3.7 Summary

This chapter outlined research paradigm, design, and methods taken to carry out the present study. The present study adopted positivist approach and quantitative survey research to accomplish its research objectives. A survey instrument was developed from established scales and translated from English to the Malay Language. The instrument was subjected to a pre-test and a pilot test, where teachers' input was incorporated into the design. The sampling frame of the study includes secondary school teacher respondents from the

Malaysian northern states of Perlis, Pulau Pinang, Perak, and Kedah. Proportional stratified sampling was employed to determine the sample of the present study, and data collection was carried out with self-administered questionnaires. A total of 1154 questionnaires were collected, and data collected were subjected to screening at the next stage of research, to be documented in the next chapter. Lastly, the data analysis plan of the study was explained where SPSS Version 20 and SmartPLS Version 3.2.7 were used for analysis.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter is organised into sections to document the statistical analyses performed in testing the proposed research model. Section 4.2 presents the results of pilot study which tested the internal consistency of the instrument before collection of actual data. Section 4.3 outlines the procedures undertaken to prepare data for analysis in terms of missing data, data screening for response patterns, and outliers. With the final set of screened data, Section 4.4 discusses the assessment of statistical assumptions with regards to normality, linearity, homoscedasticity, and multicollinearity. Section 4.5 and 4.6 documents the descriptive statistics of the constructs and demographic profile of the respondents, while section 4.7 and 4.8 outlines the assessment of common method and non-response bias. With this, section 4.9 discusses the validation of the measurement model with verification of internal consistency reliability, convergent validity, and discriminant validity. Section 4.10 continues to evaluate how well the theoretical proposition of the present study is supported with the data collected by examining the key results of path coefficients, indirect effects, coefficient of determination, effect size and predictive relevance of the study's research model.

4.2 Pilot Study

As discussed in Chapter 3, a pilot test was conducted in September 2017 with 67 respondents where minor modifications were made based on the comments received from respondents. As shown in Table 4.1, the Cronbach's alpha of scales that measured the constructs ranged from .893 to .971, and satisfied the requirement for reliability with coefficient of .70 and above (Nunnally, 1967).

Table 4.1: Cronbach's Alpha Values Obtained from Pilot Study

Constructs	Items	Cronbach's Alpha
Attitude towards using VLE	6	.956
Continuance intention	4	.959
Experienced control	7	.928
Investment of the self	6	.954
Knowledge	7	.934
Perceived ease of use	8	.971
Psychological ownership	6	.893
Perceived usefulness	8	.970

4.3 Data Preparation

Data from a total of 1154 questionnaires were screened in terms of missing values, response patterns, outliers, collinearity, and multivariate normality, linearity and homoscedasticity (Kline, 2011). SPSS 20 and Microsoft Excel were employed for these procedures.

4.3.1 Missing Data Assessment and Treatment

Missing data is common in survey research, as respondents fail to answer one or more items presented in the questionnaire. There are two main ways to assess missing data before deciding on the procedures for its treatment: the extent and the pattern of missing data (Hair, Black et al., 2014). Tabachnick and Fidell (2013) noted that the pattern of missing data is more important than its extent, and there are three types of patterns: missing completely at random (MCAR), missing at random (MAR), and missing not at random (MNAR). With MCAR, missing data is distributed unpredictably, while in MAR, missing data distribution is predictable. In MNAR, the absence of data is related to the construct and can result in biased results (Tabachnick & Fidell, 2013). Missing data in the present study were diagnosed with Missing Value Analysis. Results obtained from Expectation Maximisation analysis indicated that Little's MCAR test is insignificant $p = .248$ with Chi-Square = 1374.825, DF = 1340. This implied that the observed pattern in the study did not differ from a random pattern, hence, MCAR was inferred.

In terms of the extent of missing value, the percentage of missing value ranged from .00 to .60 at item level as shown in Appendix G. This extent of missing value is reasonable as they are below the threshold of 5% (Hair et al., 2017). Since missing value is less than 5%, and pattern of missing data is characterised as MCAR, Tabachnick and Fidell (2013) noted that nearly any procedure for treating missing data will yield similar results. In such situation, deletion is a good approach where missing data appear in a random manner

(Tabachnick & Fidell, 2013). Hence, 38 cases with missing values were removed, reducing the sample size to 1116.

4.3.2 Response Patterns

Responses were screened in terms of consistency and respondents' engagement in answering the questionnaire items. Only respondents who had used Frog VLE qualify to complete the questionnaire, and there are two items which help to ensure this. The first question asked respondents whether they have used Frog VLE, while another question requested them to indicate how many years they have used the VLE. Cases which do not fulfil these prescribed criteria or gave contradictory responses were removed. Besides, questionnaires with the same Likert option (straight line responses) were also removed (Hair et al., 2017). This was done by removing cases with standard deviation of zero across all responses. With this, 17 cases did not meet the prescribed criteria to complete the questionnaire, and 20 cases had "straight line" responses. The sample size reduced from 1116 to 1079.

4.3.3 Outliers

Mahalanobis distance (D^2) statistics is used to detect outliers. A value of D^2 with p -values of less than .001 ($p < .001$) indicate that the case is an outlier (Kline, 2011). With SPSS 20, the scores for Mahalanobis Distance were computed with regression, which were used to compute p -values for chi-square cumulative distribution. Results revealed 11 outliers with p -values of less

than .001 (Tabachnick & Fidell, 2013). These outliers were removed and resulted in the final sample of 1068.

4.4 Multivariate Assumptions

The data screening procedures were followed with assessment of multivariate assumptions. There are some statistical assumptions which underlie multivariate procedures, and the present study examined the assumptions of normality, linearity, homoscedasticity, and multicollinearity (Hair, Black et al., 2014; Tabachnick & Fidell, 2013).

4.4.1 Normality Assessment

Normality of data was evaluated with Kolmogorov-Smirnov (K-S) and Shapiro-Wilk test (Shapiro & Wilk, 1965), while Multivariate normality was evaluated with Mardia's coefficient (Mardia, 1970). Table 4.2 shows the *p*-values for K-S and Shapiro-Wilk test were significant, indicating that distribution of scores violated normality assumption. The significance of K-S assessment can be the result of large sample sizes (Pallant, 2016), hence, distribution of data is also assessed in terms of multivariate skewness and kurtosis as suggested by Hair et al. (2017).

Table 4.2: Normality Assessment

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ATT	.082	1068	.000	.976	1068	.000
CI	.083	1068	.000	.983	1068	.000
EC	.096	1068	.000	.959	1068	.000
IN	.056	1068	.000	.989	1068	.000
K	.059	1068	.000	.986	1068	.000
PEU	.047	1068	.000	.995	1068	.000
PO	.080	1068	.000	.976	1068	.000
PU	.063	1068	.000	.990	1068	.000

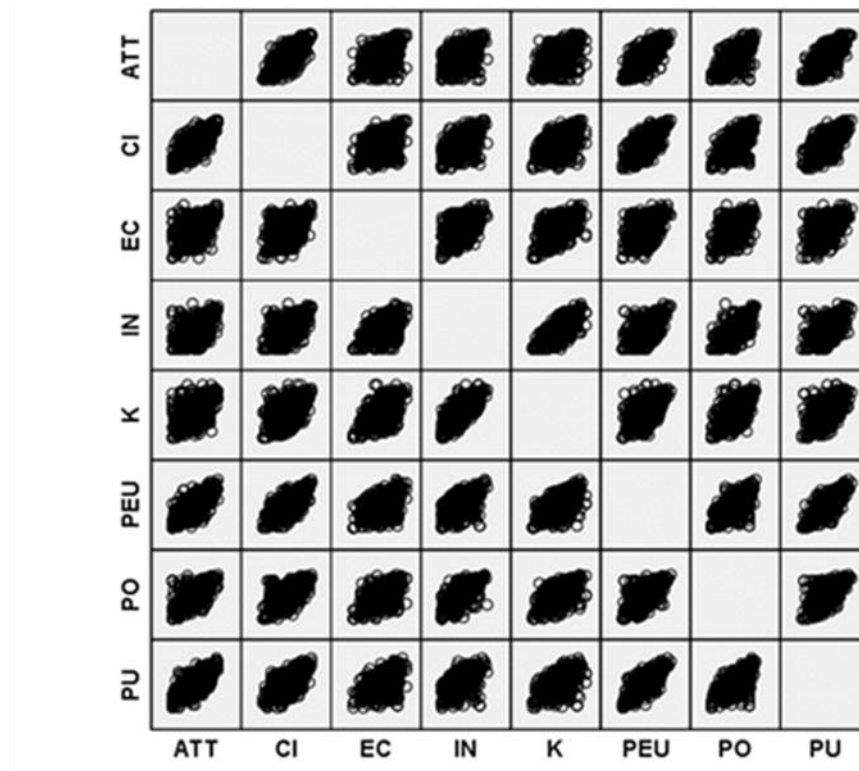
Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness

Mardia (1970) coefficient was obtained with a software accessible from the internet at <https://webpower.psychstat.org>. The latent variables scores of constructs were uploaded to the website, where non-significance of Mardia's multivariate skewness and kurtosis indicate data normality. Results in Appendix H shows that assumption of multivariate normality was violated as indicated by the significance of Mardia's coefficient for skewness ($b = 6.233, p < .001$) and Mardia's coefficient kurtosis ($b = 112.930, p < .001$). This would not be a concern to the study as PLS-SEM does not require distributional assumptions, and data were analysed with the non-parametric software of SmartPLS with bootstrapping of 5000 sub-samples (Hair et al., 2017).

4.4.2 Linearity Assessment

With linearity, a straight-line relationship is assumed between two constructs. Linearity can be inspected with bivariate scatterplots, where data points form an oval shape (Tabachnick & Fidell, 2013). As shown in a

scatterplot matrix in Figure 4.1, there is no evidence of non-linearity or curvilinear relationship as demonstrated by the scatterplots which are oval in shape. Hence, assumption of linearity is fulfilled.



Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness

Figure 4.1: Matrix of Bivariate Scatterplots

4.4.3 Homoscedasticity Assessment

Homoscedasticity assumes that endogenous variables have an equal variance across the exogenous variables. This can be inspected with scatterplots of standardised residuals of the endogenous variables in the research model. Homoscedasticity is demonstrated where standardized

residuals are scattered along a straight line, and a cigar shape is observed along the straight line drawn between the scatterplots (Pallant, 2016). As shown in Appendix I, the scatterplots of standardised residuals exhibited equal dispersion along a straight line, indicating that relationship between variables are homoscedastic (Hair, Black et al., 2014).

4.4.4 Multicollinearity Assessment

Multicollinearity between constructs may be a threat to the estimation of path coefficients and statistical significance of the constructs as predictors of the dependant variables. The strong correlation between constructs can limit the contribution of independent variables as predictors of the dependant variables. The present study inspected Variance Inflation Factor and Spearman's rho correlations to detect multicollinearity issues.

In diagnosing collinearity, Variance Inflation Factor (VIF) and bivariate correlation were inspected. VIF can be derived from tolerance, where tolerance indicates how much of variability of a particular independent variable is unique and not explained by other variables (Pallant, 2016). When tolerance become smaller, a particular variable is more likely to be predicted by other independent variables in the model (collinearity) (Hair, Black, et al., 2014). This can lead to misleading results because high collinearity between variables indicates that they are measuring similar thing. Pallant (2016) suggested that the presence of multicollinearity is evident if tolerance is less than .10. On the other hand, VIF is the inverse of tolerance which is obtained with the formula

$VIF = \frac{1}{Tolerance}$. Based on this, Pallant (2016) suggested that VIF values above 10 indicates the presence of multicollinearity. Additionally, Hair et al. (2017) suggested more stringent quality criteria of VIF being 5.0 or more to indicated collinearity problems. As shown in Table 4.3, VIF values obtained from SmartPLS demonstrated that multicollinearity will not be a problem with the highest VIF of 3.700.

Table 4.3: Variance Inflation Factor values

Constructs	ATT	CI	EC	IN	K	PEU	PO	PU
ATT		3.700						
CI								
EC							2.855	
IN							3.307	
K							3.062	
PEU	2.578							2.236
PO							2.320	2.789
PU	2.460	2.817						

Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness

Besides this, the presence of vertical multicollinearity was also tested with bivariate correlation employing Spearman’s rho correlations, as data were not normally distributed. High correlations of more than .80 (Hair, Black et al., 2014) or .90 (Tabachnick & Fidell, 2013) would indicate multicollinearity issues. Table 4.4 displays the correlation matrix of the constructs, where the highest correlation coefficient was .789. Hence, multicollinearity will not pose a problem during data analysis and interpretation of results.

Table 4.4: Spearman's rho Correlation Coefficient

	ATT	CI	EC	IN	K	PEU	PO	PU
ATT	-							
CI	.768**	-						
EC	.508**	.496**	-					
IN	.621**	.606**	.550**	-				
K	.594**	.574**	.613**	.789**	-			
PEU	.762**	.762**	.535**	.665**	.652**	-		
PO	.716**	.667**	.568**	.721**	.672**	.698**	-	
PU	.756**	.714**	.534**	.665**	.609**	.770**	.696**	-

** Correlation is significant at the $p < .01$ level (2-tailed).

With this, the assumptions of multicollinearity, linearity, and homoscedasticity were satisfied with the exception of the assumption of normal distribution. This violation of normality would not pose a problem as the present study employed PLS-SEM approach in data analysis using the non-parametric analysis software SmartPLS 3.2.7 with bootstrapping procedures. The study employed bootstrapping of 5000 resamples as this is considered a sufficiently large subsample number (Hair et al., 2017).

4.5 Descriptive Analysis of Constructs

Table 4.5 shows the descriptive statistics of the construct in terms of minimum value, maximum value, mean and standard deviation. All constructs were measured with a seven-point Likert scale anchored between 1 which represented “strongly disagree”, and 7 which represented “strongly agree”. Among the constructs, experienced control has the highest mean (M) of 4.55 with a standard deviation (SD) of 1.13, followed by psychological ownership (M = 4.33, SD = 1.10), attitude towards using VLE (M = 4.25, SD = 1.22),

knowledge (M = 4.11, SD = 1.15), continuance intention (M = 4.10, SD = 1.10), PU (M = 4.07, SD = 1.05), perceived ease of use (M = 3.83, SD = .94), and lastly investment of the self (M = 3.68, SD = 1.20). The M values were mostly centred on four, with the SD values around one. According to the “three-sigma rule of thumb”, such SD values indicated that about 68% of the data set fell within one SD from the mean.

Table 4.5: Descriptive Statistics of Constructs

Constructs	N	Minimum	Maximum	Mean	Std. Deviation
ATT	1068	1.00	7.00	4.25	1.22
CI	1068	1.00	6.75	4.10	1.10
EC	1068	1.00	7.00	4.55	1.13
IN	1068	1.00	7.00	3.68	1.20
K	1068	1.00	7.00	4.11	1.15
PEU	1068	1.00	6.50	3.83	.94
PO	1068	1.00	6.83	4.33	1.10
PU	1068	1.00	6.88	4.07	1.05

Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness

4.6 Respondents' Profile

Table 4.6 shows the demographic information which include gender, education level, age, teaching experience, experience in using Frog VLE, and number of training received. The respondents included 828 female teachers and 240 male teachers. The large proportion of female teachers is reflective of the population of Malaysian teachers. Among them, 75 of them have a diploma, 884 possess a Bachelor degree, and 109 have post-graduate qualification. These teachers' ages varied from 23 to 60 years old with a mean age of 41.06

years old ($SD = 8.21$). Their teaching experience ranged from nine months to 41 years with a mean of 15.72 years ($SD = 8.28$). They reported an average of 16.84 hours ($SD = 6.39$) of weekly teaching load that ranged from one hour to 36 hours. All of them had experience in using Frog VLE that ranged from one year to 7 years, with an average of 3.00 years ($SD = 1.40$). With regards to the training of Frog VLE, the training received varied from none to 18 times, with the mean being 3.42 ($SD = 2.63$).

Table 4.6: Respondents' Profile

Demographic factors	Frequency	Percentage (%)
Gender		
Female	828	77.50
Male	240	22.50
Education Level		
Diploma	75	7.00
Bachelor Degree	884	82.80
Post-graduate	109	10.20
Use of VLE?		
Yes	1068	100
No	0	0
Training		
Received training	994	93.10
Did not receive training	74	6.90
	Mean	Standard Deviation
Age	41.06	8.21
Teaching experience	15.72	8.28
Teaching load (weekly)	16.84	6.39
VLE experience	3.00	1.40
VLE training received	3.42	2.63

4.7 Common Method Bias Assessment

Common Method Bias (CMB) is caused by variance that is attributed to the measurement method, rather than to the constructs the measures are supposed to represent (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). If

common method variance is sufficiently high, it can bias results by inflating relationships among constructs, causing incorrect inferences drawn from these relationships (Bagozzi, Yi, & Phillips, 1991). The study used survey questionnaires that measure independent and dependent variables at the same time, thus CMB can be a threat to measurement validity. Scholars have suggested two ways to control for method biases: the careful design of the study procedures and statistical diagnosis after data is collected (Podsakoff, MacKenzie, & Podsakoff, 2012; Williams, Hartman, & Cavazotte, 2010).

To address the issues of CMB, some procedural remedies were taken in the instrument design and research process. The study eliminated ambiguity in the questionnaire (Podsakoff et al., 2003), with rigorous procedures of pre-tests, back-translation and the decentering process which involved translators, language experts and teachers. Items in the questionnaire were presented without being separated with sub-titles, to prevent the effect of consistency motif where respondents recognise underlying constructs because this may influence them to deliberately adjust their answers in a consistent manner (Podsakoff et al., 2003). Socially desirable responses were reduced with a participant information sheet to assure respondents' anonymity, and that there were no wrong or right answers to the questionnaire (Podsakoff et al., 2003; Podsakoff et al., 2012). To reduce respondents' evaluation apprehension, they were also informed that data will be analysed in aggregate forms and will not identify them personally (Podsakoff et al., 2003; Podsakoff et al., 2012).

Besides procedural remedies, statistical tests were carried out to test for CMB. As discussed earlier in Section 4.1.1, the full collinearity test had suggested that CMB would not be of concern as VIF values of all variables were below 3.3 (Kock, 2015). Besides this, Harman's one factor test was employed with all items entered into unrotated exploratory factor analysis in SPSS. CMB is present if a sole factor accounts for a majority of the covariance (Podsakoff et al, 2003). As observed from the analysis in Appendix J, the general factor accounted for 47.86 of variance, indicating CMB would not be an issue as it is below 50% of variance (Keil, Depledge, & Rai, 2007). In addition, the correlations between construct were inspected in Table 4.4, because high correlations of .90 usually indicates the presence of common method variance (Bagozzi et al., 1991). As shown earlier in the correlation matrix between constructs in Table 4.4, the highest correlation was .789 between investment of self and knowledge. Hence, CMB would not cause serious problem in this study. Additionally, the study is directed at investigating a VLE, and not particular individuals or organisations which respondents can be emotionally associated with. Hence, the social sensitivity in the study will be reduced.

4.8 Non-response Bias Assessment

Non-response bias is one of the major concerns for survey research, as it may compromise the validity of the results. Miller and Smith (1983) suggested that such bias can be tested by comparing early and late respondents, with late respondents being considered as non-respondents. This procedure

provides one of the strongest evidences of non-response bias (Collier & Bienstock, 2007). With this, Mann-Whitney U test was conducted to compare early and late respondents. Respondents who responded within one month after the receipt of questionnaires were considered as early respondents, while responses received after the one-month deadline has passed were treated as late respondents. Table 4.7 shows that Mann-Whitney U Test revealed no significant differences between early and late respondents across all constructs, indicating that there were no differences in variances for early and late participants. As such, the concern for non-response in the current study was alleviated.

Table 4.7: Mann-Whitney U Test

Constructs	ATT	CI	EC	IN	K	PEU	PO	PU
Mann-Whitney U	129165	128640	132537	129338	132022	137079	128637	129516
Z-score	-1.621	-1.73	-0.938	-1.586	-1.042	-.018	-1.728	-1.549
Sig. (2-tailed)	.105	.084	.348	.113	.297	.985	.084	.121

Note: Significant at $p < .05$

4.9 Measurement Model Validation

Assessment of the measurement model is carried out as Confirmatory Factor Analysis (CFA) to test the measurement theory of the present study (Ramayah, Cheah, Chuah, Ting, & Memon, 2016). The validation of the measurement model confirms the dimensionality of the variables and assess whether they systematically and logically represent the constructs in the

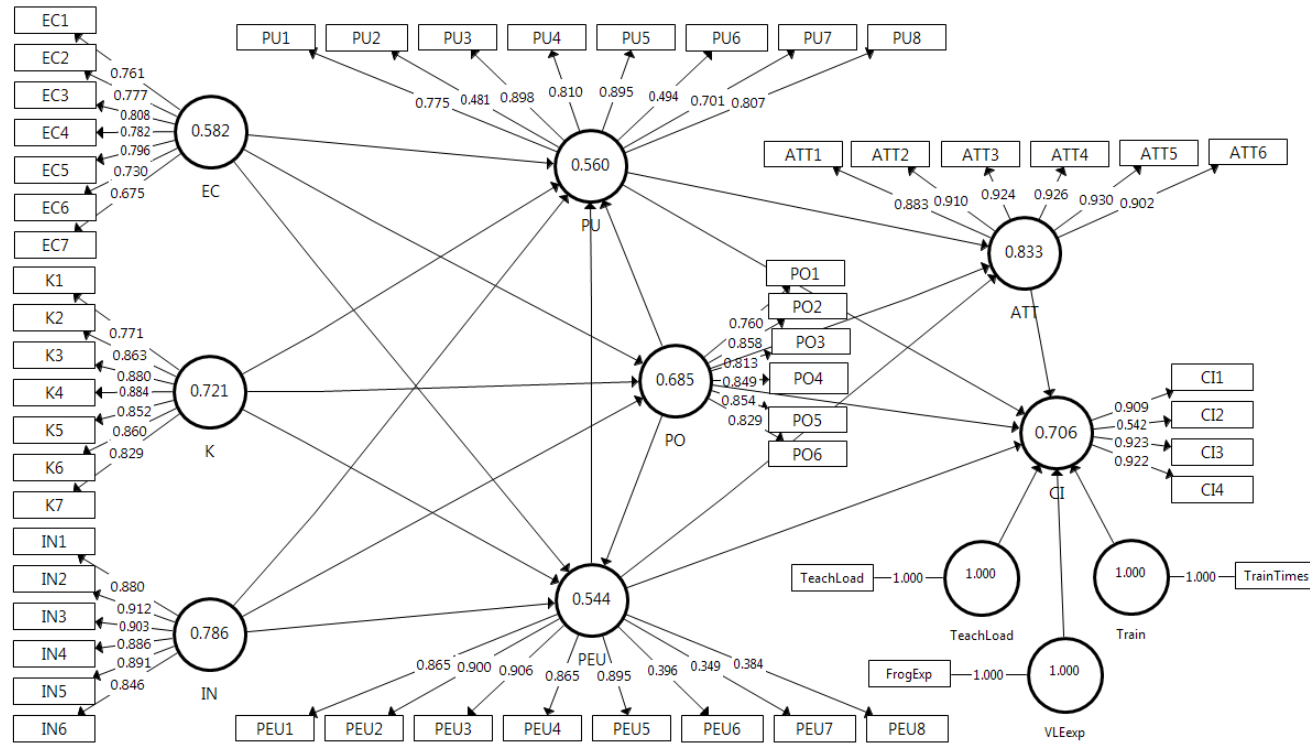
theoretical model (Hair, Hult, Ringle, & Sarstedt, 2014). Measurement model validation is more appropriate in the present study than Exploratory Factor Analysis (EFA) because established measurement scales were used and the factor structures were already known (Green, Tonidandel, & Cortina, 2016; Henson & Roberts, 2006). In contrast, EFA is more applicable when little is known about factor structure (Ramayah et al., 2016).

There are two parts to the assessment of measurement model: convergent validity and discriminant validity. Convergent validity was assessed in terms of internal consistency, the reliability of individual indicator, and average variance extracted. Discriminant validity was assessed with inspection of cross loadings and HTMT. With the validation of measurement model, the study combined the verified measurement theory with a structural theory to fully specify the SEM model.

4.9.1 Preliminary Measurement Model

The research model consisted of eight reflective constructs and 52 corresponding items or indicators that measure these constructs in the preliminary measurement model. The exogenous variables and corresponding indicators were: experienced control was measured by EC1, EC2, EC3, EC4, EC5, EC6, EC7, investment of the self was measured by IN1, IN2, IN3, IN4, IN5, IN6, and knowledge was measured by K1, K2, K3, K4, K5, K6, K7. The mediators consisted of: psychological ownership as measured by PO1, PO2, PO3, PO4, PO5, PO6, perceived usefulness as measured by PU1, PU2, PU3

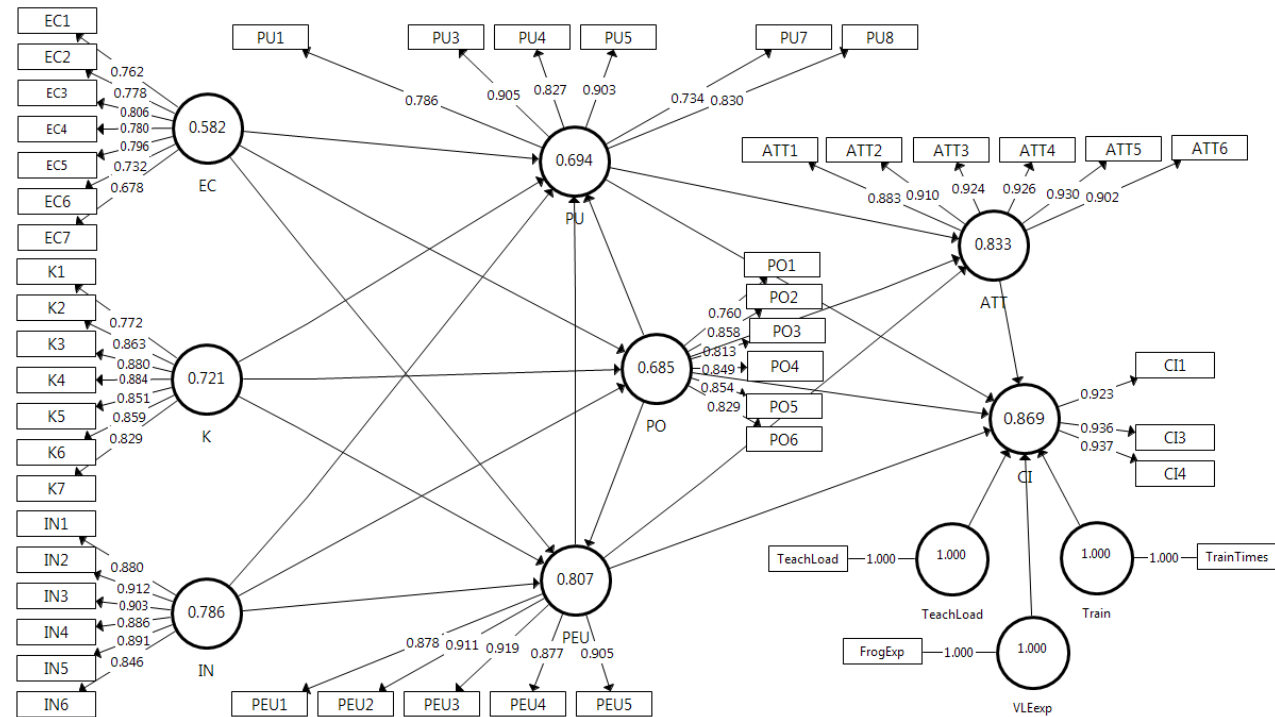
PU4, PU5, PU6, PU7, PU8, perceived ease of use as measured by PEU1, PEU2, PEU3, PEU4, PEU5, PEU6, PEU7, PEU8, and attitude towards using VLE as measured by ATT1, ATT2, ATT3, ATT4, ATT5, ATT6. The outcome variable of continuance intention is measured by C1, C2, C3, C4. The first run of the PLS algorithm is shown in Figure 4.2.



Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness; TeachLoad = Teaching Load; VLEexp = VLE experience; Train = VLE training

Figure 4.2: Preliminary Measurement Model with Outer Loadings and Average Variance Extracted

It was found that the outer loadings of EC7, PU2, PU6, PEU6, PEU7, PEU8, and CI2 did not meet the threshold of .708. Although the average variance extracted of the reflective constructs met the criterion of above .50, Hair et al. (2017) advised that indicators below .70 be removed if their absence leads to increase in average variance extracted (AVE) and composite reliability (CR). However, in some situations, indicators with loading close enough to .70 can be accepted (Hair et al., 2017). Hence, the study decided to retain the indicator of EC7 (with final loading of .678), and removed the other six indicators with loadings of .542 and below. The model was re-estimated after the removal of each indicator to detect changes to AVE and CR. Figure 4.3 shows the results of the final iteration.



Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness; TeachLoad = Teaching Load; VLEexp = VLE experience; Train = VLE training

Figure 4.3: Final Measurement Model with Outer Loadings and Average Variance Extracted

Comparing Figure 4.2 and Figure 4.3, there were an increased in AVE of the constructs of: perceived usefulness from .560 to .694, perceived ease of use from .544 to .807, and continuance intention from .706 to .869. There were also improvements in CR of these constructs respectively: perceived usefulness increased from .907 to .931, perceived ease of use increased from .894 to .954, and continuance intention increased from .902 to .952. Hence, these improvements justified the removal of the indicators concerned, resulting in 46 indicators in the final measurement model.

4.9.2 Internal Consistency Reliability

At the construct level, Cronbach's alpha is a common way of assessing internal consistency of measurement indicators, where high values indicate that indicators within the construct have the same meaning and range. Within PLS, internal consistency is gauged using composite reliability (CR), which is more robust than Cronbach's alpha because it considers the loadings of each indicators (Chin, 1998; Hair et al., 2017). As a general rule, desirable range of CR values falls between .60 and .70 for early stage research, and between .70 and .90 for advanced stage research (Hair et al., 2017). As shown in Table 4.8, the CR of the constructs in the final measurement model were more than the threshold of .70 with values that ranged from .907 to .968, demonstrating satisfactory internal consistency.

Table 4.8: Internal Consistency of Constructs

Constructs	Cronbach's Alpha	Composite Reliability (CR)
ATT	.960	.968
CI	.924	.952
EC	.882	.907
IN	.945	.957
K	.935	.948
PEU	.940	.954
PO	.908	.929
PU	.910	.931

4.9.3 Convergent Validity

Convergent validity of the improved measurement model is evaluated with the reliability of individual indicator and AVE. With individual indicator reliability, a latent variable has to account for at least half (50%) of the variance of each corresponding indicator. Hence, the outer loading of an indicator should be more than .708, as computed from the square of .708 which equals 50% variance of a particular indicator being accounted for (Hair et al., 2017). As shown earlier in Figure 4.3, all outer loadings of the indicators were above .708, with the exception EC7 with loading of .678 which can be retained as it is close to .70 (Hair et al., 2017).

In terms of AVE, this index measures convergent validity at the construct level. With the same logic which explained the reliability of indicators, AVE needs to be more than .50 to indicate that a particular construct accounts for more than half of the variance of its indicators (Hair et al., 2017). As shown in Table 4.9, AVE of the constructs ranged from .582

to .869, indicating that all constructs account for more than 50 percent of variance in the indicators. Additionally, the reliability of these indicators is verified as shown in Table 4.9, with the loadings being statistically significant (t -value > 1.96). As such, convergent validity was established indicating that indicators measuring their corresponding construct converge in sharing a high proportion of variance.

Table 4.9: Significance of Indicators Measuring the Constructs

Indicators	Original Sample	Standard Deviation	t -value	Average Variance Extracted (AVE)
Attitude towards using VLE				
ATT1 <- ATT	.883	.008	106.507	.833
ATT2 <- ATT	.910	.007	136.194	
ATT3 <- ATT	.924	.006	148.905	
ATT4 <- ATT	.926	.006	151.044	
ATT5 <- ATT	.930	.006	161.354	
ATT6 <- ATT	.902	.009	102.574	
Continuance Intention				
CI1 <- CI	.923	.008	116.885	.869
CI3 <- CI	.936	.005	172.517	
CI4 <- CI	.937	.006	166.407	
Experienced Control				
EC1 <- EC	.762	.017	43.667	.582
EC2 <- EC	.778	.016	49.040	
EC3 <- EC	.806	.010	79.990	
EC4 <- EC	.780	.011	71.298	
EC5 <- EC	.796	.014	56.633	
EC6 <- EC	.732	.023	31.444	
EC7 <- EC	.677	.026	26.411	
Investment of the self				
IN1 <- IN	.880	.009	98.628	.786
IN2 <- IN	.912	.007	128.171	
IN3 <- IN	.903	.007	138.152	
IN4 <- IN	.886	.009	94.580	
IN5 <- IN	.891	.008	116.873	
IN6 <- IN	.846	.011	76.351	
Knowledge				
K1 <- K	.772	.015	50.566	.721
K2 <- K	.863	.010	90.675	
K3 <- K	.880	.008	104.459	

Indicators	Original Sample	Standard Deviation	t-value	Average Variance Extracted (AVE)
K4 <- K	.884	.008	107.764	
K5 <- K	.851	.010	81.372	
K6 <- K	.859	.009	92.451	
K7 <- K	.829	.011	75.112	
Perceived Ease of Use				
PEU1 <- PEU	.878	.010	87.710	.807
PEU2 <- PEU	.911	.007	135.467	
PEU3 <- PEU	.919	.006	145.946	
PEU4 <- PEU	.877	.009	94.194	
PEU5 <- PEU	.905	.008	118.583	
Psychological Ownership				
PO1 <- PO	.760	.018	42.688	.685
PO2 <- PO	.858	.010	83.102	
PO3 <- PO	.813	.014	57.031	
PO4 <- PO	.849	.012	73.631	
PO5 <- PO	.854	.011	81.129	
PO6 <- PO	.829	.012	66.679	
Perceived Usefulness				
PU1 <- PU	.786	.018	43.226	.694
PU3 <- PU	.905	.007	125.801	
PU4 <- PU	.827	.014	58.364	
PU5 <- PU	.903	.008	118.342	
PU7 <- PU	.734	.019	38.297	
PU8 <- PU	.830	.012	70.803	

Note: ** t-value > 1.96, (two-tailed)

4.9.4 Discriminant Validity

To verify that the constructs are distinct from each other, the present study established discriminant validity with the inspection of cross loadings and heterotrait-monotrait ratio of correlations (HTMT). Table 4.10 shows that the outer loading of indicators (in bold) loaded highest on the construct they purported to measure.

Table 4.10: Cross Loadings of Indicators measuring the Constructs

	ATT	CI	Control	Invest	Knowledge	PEU	PO	PU
ATT1	.883	.748	.559	.566	.534	.742	.651	.665
ATT2	.910	.736	.529	.549	.517	.750	.640	.701
ATT3	.924	.732	.530	.524	.518	.734	.639	.682
ATT4	.926	.728	.534	.520	.501	.720	.645	.710
ATT5	.930	.743	.537	.531	.505	.727	.654	.697
ATT6	.902	.737	.548	.577	.553	.731	.687	.704
CI1	.740	.923	.533	.509	.466	.678	.625	.628
CI3	.759	.936	.513	.502	.485	.669	.604	.624
CI4	.761	.937	.515	.518	.484	.663	.631	.618
EC1	.420	.388	.762	.455	.503	.441	.481	.407
EC2	.414	.395	.778	.446	.500	.436	.480	.417
EC3	.524	.488	.806	.606	.678	.561	.613	.555
EC4	.557	.525	.780	.685	.732	.602	.667	.588
EC5	.448	.403	.796	.502	.552	.456	.501	.442
EC6	.370	.365	.732	.421	.477	.381	.416	.365
EC7	.357	.361	.678	.418	.474	.383	.442	.384
IN1	.526	.476	.666	.880	.722	.562	.630	.532
IN2	.510	.477	.705	.912	.698	.552	.627	.528
IN3	.528	.496	.689	.903	.688	.568	.625	.524
IN4	.506	.469	.656	.886	.660	.526	.600	.477
IN5	.538	.492	.682	.891	.722	.574	.660	.596
IN6	.559	.495	.706	.846	.705	.594	.656	.609
K1	.498	.462	.688	.565	.772	.540	.555	.465
K2	.453	.378	.606	.666	.863	.493	.537	.445
K3	.452	.390	.634	.667	.880	.509	.549	.442
K4	.452	.406	.651	.614	.884	.505	.533	.445
K5	.461	.409	.610	.664	.851	.511	.553	.467
K6	.553	.496	.663	.725	.859	.557	.620	.536
K7	.510	.488	.606	.683	.829	.530	.623	.498
PEU1	.677	.625	.535	.547	.543	.878	.611	.636
PEU2	.700	.635	.582	.599	.570	.911	.651	.668
PEU3	.718	.633	.564	.581	.571	.919	.630	.644
PEU4	.765	.680	.541	.546	.510	.877	.640	.667
PEU5	.748	.652	.584	.583	.570	.905	.654	.658
PO1	.533	.479	.551	.634	.546	.518	.760	.574
PO2	.640	.559	.588	.613	.568	.607	.858	.661
PO3	.576	.543	.503	.500	.474	.565	.813	.526
PO4	.580	.558	.619	.620	.598	.610	.849	.544
PO5	.650	.619	.617	.619	.573	.634	.854	.598
PO6	.565	.539	.541	.563	.570	.583	.829	.529
PU1	.571	.505	.504	.504	.467	.543	.542	.786
PU3	.710	.622	.561	.591	.523	.693	.646	.905
PU4	.577	.514	.472	.489	.432	.570	.516	.827
PU5	.702	.616	.566	.580	.552	.673	.629	.903
PU7	.548	.466	.385	.379	.330	.504	.500	.734
PU8	.664	.596	.521	.513	.455	.635	.610	.830

The discriminant validity of constructs was verified with HTMT ratio of correlations. HTMT is the approximation of the true correlation between two constructs with the assumption that they are reliably measured (Hair et al., 2017). As shown in Table 4.11, all HTMT correlations between constructs fulfil the quality criteria, being less than the stringent criteria of HTMT .85 (Kline, 2011). The correlation between CI and ATT (.858) was above HTMT .85 but still below the criteria of HTMT .90 (Gold et al., 2001). With this, the study had established the discriminant validity of the final measurement model and verified the psychometric properties in the measurement model of the study.

Table 4.11: HTMT Values between Constructs

	ATT	CI	EC	IN	K	PEU	PO	PU
ATT								
CI	.858							
EC	.628	.605						
IN	.625	.584	.803					
K	.600	.548	.805	.837				
PEU	.846	.770	.669	.673	.654			
PO	.765	.725	.751	.770	.725	.767		
PU	.820	.739	.664	.665	.612	.791	.769	

4.10 Structural Model Validation

This section discusses the different tests employed to validate the structural model of the present study. As noted in Chapter Three, the structural model will be evaluated for significance of path coefficients, mediation effects, the level of coefficient determination (R^2), effect sizes and predictive relevance.

4.10.1 Path Coefficients

Each path within the structural model represents the study's hypothesised relationships between an exogenous and endogenous construct. These paths were analysed with complete bootstrap of 5000 cases, and the option of bias-corrected and accelerated 95% confidence interval. In other words, bootstrap samples were obtained by repetitively estimating the coefficients with at least 5000 resamples. Significance of the path coefficients were determined by the critical values of its corresponding t-statistics. As the hypotheses were not formulated with directions, the critical value for two-tailed test will be 1.96 at the 5% significance level. Hence, path coefficients with t-statistics or t-value of more than 1.96 will be deemed significant. Besides, the bias corrected confidence interval is also obtained to verify whether the path coefficient is significant. If a confidence interval does not include zero, a significant effect is inferred because the corresponding path does not equal to zero (Hair et al., 2017). Based on these criteria, the support of the hypothesised relationships were decided.

As shown from Table 4.12, hypotheses H1 to H10 with the exception of H9 were significant in the hypothesised direction. Path coefficients (β) of significant path ranged from .177 to .578. Specifically, psychological ownership is positively influenced by its hypothesised determinants of experienced control ($\beta = .278, t = 7.091$), knowledge ($\beta = .177, t = 4.057$), and investment of the self into VLE ($\beta = .361, t = 8.567$). Hence hypotheses H1, H2 and H3 were supported. Hypotheses H4 and H5 were also supported with

psychological ownership significantly influenced perceived usefulness ($\beta = .270, t = 6.163$) and perceived ease of use ($\beta = .458, t = 12.853$). In supporting hypotheses H6 and H7, perceived ease of use significantly influenced perceived usefulness ($\beta = .438, t = 9.851$), and perceived usefulness significantly influenced attitude towards using VLE ($\beta = .300, t = 9.633$).

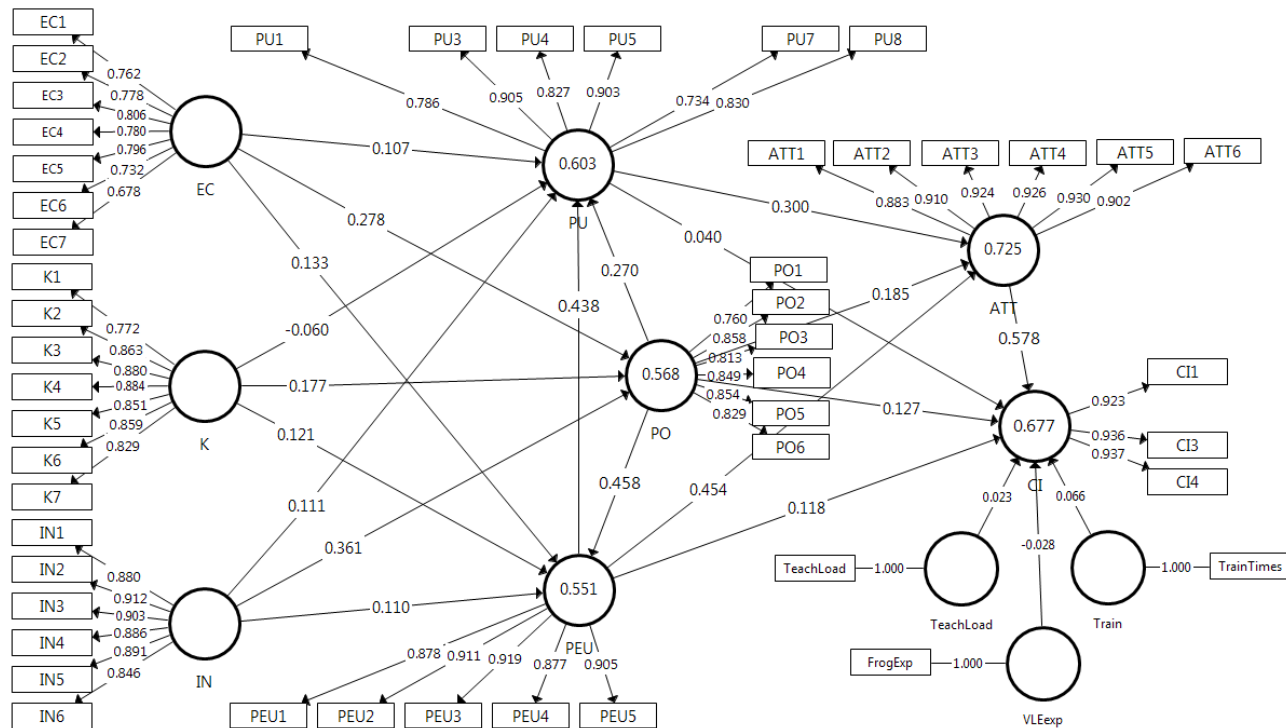
Further from the analysis, hypothesis H8 was supported with perceived ease of use positively and significantly influenced attitude towards using VLE ($\beta = .454, t = 13.037$). Hypotheses H9 was not supported as perceived usefulness did not have any significant influence on continuance intention. Lastly, H10 was supported with attitude towards using VLE significantly influenced continuance intention ($\beta = .578, t = 13.525$). For the control variables H11 to H13, only H13 is supported as VLE training has a significant influence on continuance intention ($\beta = .066, t = 2.702$). Table 4.12 shows the analysis of path coefficients, while Figure 4.4 presents the path diagram of the structural relationships.

Table 4.12: Analysis of Path Coefficients

Hypotheses	Path Coefficient (β)	Standard Error	<i>t</i> -value	Confidence Interval	Decision
H1: EC -> PO	.278	.039	7.091**	[.201, .354]	Supported
H2: Knowledge -> PO	.177	.044	4.057**	[.093, .263]	Supported
H3: Invest -> PO	.361	.042	8.567**	[.277, .446]	Supported
H4: PO -> PU	.270	.044	6.163**	[.182, .355]	Supported
H5: PO -> PEU	.458	.036	12.853**	[.385, .526]	Supported
H6: PEU -> PU	.438	.044	9.851**	[.346, .522]	Supported
H7: PU -> ATT	.300	.031	9.633**	[.238, .361]	Supported
H8: PEU -> ATT	.454	.035	13.037**	[.384, .522]	Supported
H9: PU -> CI	.040	.033	1.215	[-.025, .104]	Not supported
H10: ATT -> CI	.578	.043	13.525**	[.494, .658]	Supported
Control Variables					
H11: TeachLoad -> CI	.023	.017	1.322	[-.010, .056]	Not supported
H12: VLEexp -> CI	-.028	.020	1.388	[-.068, .012]	Not supported
H13: Train -> CI	.066	.024	2.702**	[.021, .118]	Supported

Note: sig ** *t*-value > 1.96, (two-tailed)

ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness; TeachLoad = Teaching Load; VLEexp = VLE experience; Train = VLE training



Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness; TeachLoad = Teaching Load; VLEexp = VLE experience; Train = VLE training

Figure 4.4: Path Diagram for Hypothesis Testing and Adjusted R^2

4.10.2 Mediation Analysis

A mediator (M) intervenes the relationship between an exogenous variable (X) and endogenous variable (Y) such that M accounts for this relationship (Baron & Kenny, 1986). This relationship is illustrated in Figure 4.5, where “*a*” represents the path from X to M, “*b*” represents the path from M to Y, and “*c*” represents the path from X to Y.

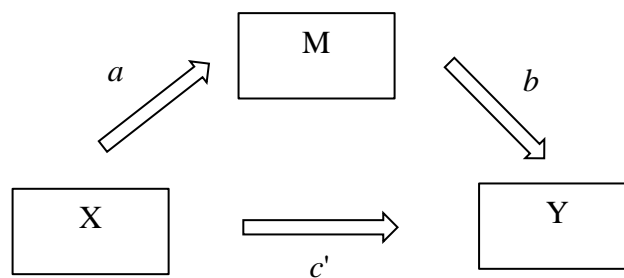


Figure 4.5: Basic Mediation Model

Earlier literature assert that the starting point for mediation requires a significant relationship between X and Y, in the absence of M (Baron & Kenny, 1986), and mediation is established in the occurrences of four conditions: 1) the exogenous variable significantly affects endogenous variable, 2) the exogenous variable is related to the mediator, 3) the mediator is related to the endogenous variable, and 4) the effect of exogenous variable on endogenous variable decrease when the mediator is included in the model (Baron & Kenny, 1986). However, current literature advocate that it is not necessary for mediation to exist with a separate significant relationship between X and Y, and the testing of indirect effect ($a \times b$) offers all sufficient information needed to establish mediation (Nitzl, Roldán, & Carrión, 2016; Shrout & Bolger, 2002).

These updated literature suggest the following steps to guide researchers in testing mediation effects (Shrout & Bolger, 2002; Preacher & Hayes, 2008; Zhao et al., 2010):

1. Obtain and test the significance of indirect effect ($a \times b$) with bootstrap procedure.
2. Classify the mediation effect.
3. Determine the strength of indirect effect ($a \times b$) to ascertain size of mediation.

The present study adopted the afore-mentioned guidelines to test the mediation hypotheses, where bootstrapping is employed. The bootstrapping method is a non-parametric method for testing of path coefficients, hence, it is suitable to be employed in the current study because data distribution is non-normal (Hair et al., 2017; Nitzl et al., 2016). To test the significance of indirect effects, the study employed bootstrapping of 5000 subsamples and 95% bias-corrected confidence interval to obtain path coefficients between constructs. In SmartPLS, mediation can be tested by including all constructs and paths (arrows) in a single model at once as illustrated in Figure 4.4 (Hair et al., 2017). It must be noted that when all constructs are included, the occurrences of multiple mediators are resulted between the linked constructs. The current study did not hypothesise multi-mediation effect, but rather specific mediation through single mediators. In such situation, bootstrapping results for a particular indirect effect is obtained by manual calculation using an excel spreadsheet (Cepeda, Nitzl, & Roldán, 2018; Hair et al., 2017; Nitzl et al., 2016). Bootstrapping in SmartPLS generates path coefficients of 5000

subsamples between each construct, and these subsamples were copied and pasted in an excel sheet. These path coefficients represent the respective paths of a and b , and the indirect effects for each hypothesis were obtained as a product term of $a \times b$ in a new column. The mean value of these indirect effects would constitute the specific indirect effect for the respective hypotheses. To obtain the t-values of these indirect effects, the following equation is referred (Kock, 2014; Henseler et al., 2009), where T = t-value, S = standard error:

$$T = \frac{a * b}{S(a * b)}$$

With this, t-values are computed by dividing the indirect effects concerned by the standard error (S) computed as the standard deviation of the indirect effects ($a \times b$) of the 5000 subsamples computed in excel (Cepeda et al., 2018; Hair et al., 2017). As the hypothesised mediation relationships of the study were non-directional, t-values larger than 1.96 would be deemed significant. In addition to t-values, the bias corrected confidence intervals were also obtained to test the significance of indirect effects. To achieve this, the indirect effects ($a \times b$) of 5000 subsamples were first sorted from smallest to largest in the respective columns (Nitzl et al., 2016). The lower bound and upper bound confidence interval of $a \times b$ is computed with the following equation, where k = number of subsamples, α = alpha error, $ci\%$ = confidence interval (Cepeda et al., 2018; Nitzl et al., 2016):

- Lower bound value at the $k \times (\alpha - ci\% / 2)$ th ordinal position of the sorted list
- Upper bound value at the $1 + k \times (\alpha + ci\% / 2)$ th ordinal position of the sorted list

With 5000 subsamples, a 5% alpha error, at a 95% confidence interval, the lower bound values were at the $5000 \times (.50 - .95 / 2) = 125^{\text{th}}$ position, while the upper bound values were at the $5001 \times (.50 + .95 / 2) = 4876^{\text{th}}$ position of the sorted list. There is potential for bias between path coefficients obtained from the path model (original sample), and also from the mean value of the indirect effects calculated manually from 5000 subsamples (sample mean). To correct this bias, the difference between original sample and sample mean have to be added to the lower and upper bound confidence intervals. With this, Table 4.13 shows the results for the indirect effects of the hypothesised mediational relationships.

Table 4.13: Mediation Analysis

Hypotheses	Indirect Effects	SE	t-value	Confidence Interval	Decision
H14: EC-PO-PU	.075	.016	4.769**	[.047, .107]	Supported
H15: K-PO-PU	.048	.014	3.289**	[.023, .079]	Supported
H16: IN-PO-PU	.097	.020	4.920**	[.061, .138]	Supported
H17: EC-PO-PEU	.127	.022	5.874**	[.086, .172]	Supported
H18: K-PO-PEU	.081	.020	3.936**	[.042, .122]	Supported
H19: IN-PO-PEU	.165	.023	7.221**	[.122, .211]	Supported
H20: PO-PU-ATT	.081	.016	5.117**	[.051, .113]	Supported
H21: PEU-PU-ATT	.131	.021	6.211**	[.092, .174]	Supported
H22: PEU-PU-CI	.018	.015	1.187	[-.011, .048]	Not supported
H23: PO-PU-CI	.011	.009	1.165	[-.007, .029]	Not supported
H24: PO-PEU-PU	.201	.026	7.653**	[.151, .254]	Supported

Hypotheses	Indirect Effects	SE	<i>t</i> -value	Confidence Interval	Decision
H25: PO-PEU-ATT	.208	.023	8.846**	[.164, .256]	Supported
H26: PEU-ATT-CI	.262	.030	8.864**	[.206, .323]	Supported
H27: PU-ATT-CI	.173	.022	7.831**	[.132, .218]	Supported

Note: sig ** *t*-value > 1.96, (two-tailed); SE = Standard Error

In this way, SmartPLS provides evidence on the presence of mediating effects but does not provide guidance on classifying the type of mediation. To complement this, the study referenced Zhao et al. (2010) analysis of mediation. There are five types of mediation: complementary mediation, competitive mediation, indirect-only mediation, direct-only mediation, and “no-effect” mediation. As illustrated in Figure 4.6, these mediation types are determined by a typology which first looks at the significance of indirect effects, then the direct effects, as well as the directions of these effects denoted by their positive and negative signs.

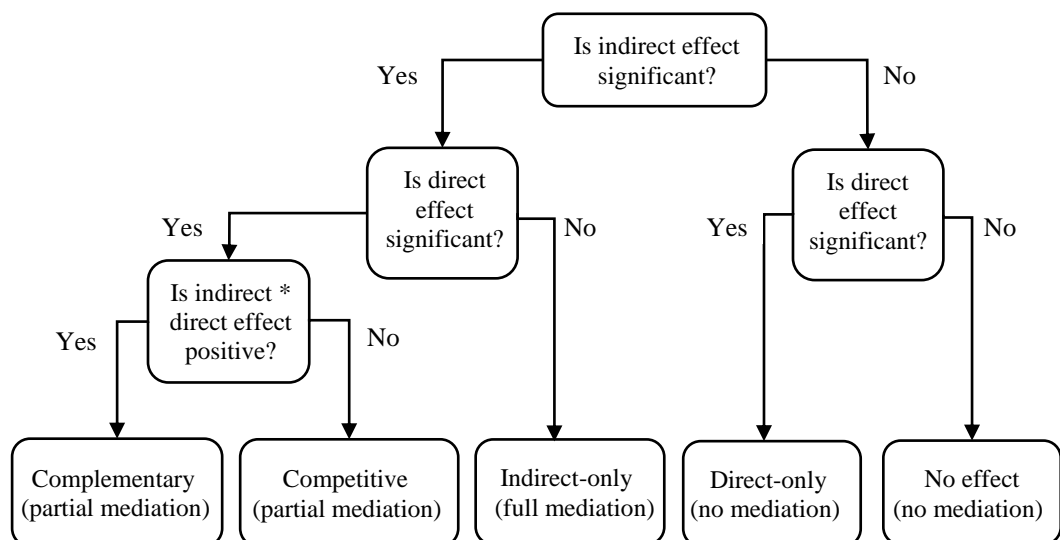


Figure 4.6: Decision Tree for Mediation Analysis by Zhao et al. (2010)

Table 4.14 presents the classification of mediation results. From the table, hypotheses H14, H16 to H21, and H24 to H26 are classified as complementary mediation because both direct and indirect effects were significant with positive direction. This type of mediation can be equated to partial mediation as conceptualised by Baron and Kenny (1986). It must be noted that these complementary (partial) mediation indicate that other possible intervening variables were excluded from the mediated relationship (Sarstedt, Neubert, & Barth, 2016). Interestingly, there is an indirect-only mediation found for H15 and H27 which can be interpreted as full mediation, demonstrated with its significant indirect effects but insignificant direct effects (Zhao et al., 2010). In other words, results for H15 revealed that the effect of knowledge about VLE to perceived usefulness is completely transmitted with the inclusion of psychological ownership of the VLE. Results for H27 also suggested that attitude towards using VLE fully mediated the effect of perceived usefulness on continuance intention. For H22 and H23, there was no evidence of mediation with only significant direct effects.

To determine the strength of the mediation effect, the study computes ratios of indirect effect to total effect, known as variance accounted for (VAF). VAF can demonstrate the degree to which the mediation explains the variance of the endogenous variable. A VAF value less than 20% indicates the absence of mediation, while a value larger than 20% and less than 80% indicates partial mediation. If a VAF value is greater than 80%, a full mediation is inferred (Hair, Hult et al., 2014; Nitzl et al., 2016). As shown in Table 4.14, the VAF values computed concurred with mediation results obtained with bootstrapping

procedures. However, VAF for H15 cannot be interpreted due to the difference in signs (positive and negative) for direct and indirect effects, hence, VAF is not computed (Hair, Hult et al., 2014; Nitzl et al., 2016).

Table 4.14: VAF Values for Mediation Hypotheses

Hypotheses	Effects	SE	<i>t</i> -value	Confidence Interval	Mediation type	VAF	
H14: EC-PO-PU	Direct	.107	.039	2.763**	[.031, .182]	Complementary (partial)	41%
	Indirect	.075	.016	4.769**	[.047, .107]		
H15: K-PO-PU	Direct	-.060	.038	1.590	[-.136, .011]	Indirect-Only (full mediation)	N/A
	Indirect	.048	.014	3.289**	[.023, .079]		
H16: IN-PO-PU	Direct	.111	.043	2.597**	[.029, .196]	Complementary (partial)	47%
	Indirect	.097	.020	4.920**	[.061, .138]		
H17: EC-PO-PEU	Direct	.133	.043	3.078**	[.048, .217]	Complementary (partial)	49%
	Indirect	.127	.022	5.874**	[.086, .172]		
H18: K-PO-PEU	Direct	.121	.044	2.748**	[.033, .205]	Complementary (partial)	40%
	Indirect	.081	.020	3.936**	[.042, .122]		
H19: IN-PO-PEU	Direct	.110	.041	2.684**	[.034, .192]	Complementary (partial)	60%
	Indirect	.165	.023	7.221**	[.122, .211]		
H20: PO-PU-ATT	Direct	.185	.036	5.170**	[.118, .258]	Complementary (partial)	30%
	Indirect	.081	.016	5.117**	[.051, .113]		
H21: PEU-PU-ATT	Direct	.454	.035	13.037**	[.384, .522]	Complementary (partial)	22%
	Indirect	.131	.021	6.211**	[.092, .174]		
H22: PEU-PU-CI	Direct	.118	.041	2.917**	[.040, .199]	Direct-only (no mediation)	13%
	Indirect	.018	.015	1.187	[-.011, .048]		
H23: PO-PU-CI	Direct	.127	.036	3.573**	[.058, .197]	Direct-only (no mediation)	8%
	Indirect	.011	.009	1.165	[-.007, .029]		
H24: PO-PEU-PU	Direct	.270	.044	6.163**	[.182, .355]	Complementary (partial)	43%
	Indirect	.201	.026	7.653**	[.151, .254]		
H25: PO-PEU-ATT	Direct	.185	.036	5.192**	[.118, .258]	Complementary (partial)	53%
	Indirect	.208	.023	8.846**	[.164, .256]		
H26: PEU-ATT-CI	Direct	.118	.041	2.917**	[.040, .199]	Complementary (partial)	69%
	Indirect	.262	.030	8.864**	[.206, .323]		
H27: PU-ATT-CI	Direct	.040	.033	1.215	[-.025, .104]	Indirect-only (full mediation)	81%
	Indirect	.173	.022	7.831**	[.132, .218]		

4.10.3 Coefficient of Determination

Coefficient of Determination (R^2) measures the predictive power of the structural model and represents the amount of variance in a particular endogenous construct which is explained by all exogenous constructs connected to it. While there is no absolute convention for the acceptable value of R^2 , the literature suggested few criteria on its classification. Hair et al. (2017) classified R^2 of .75, .50, and .25 as substantial, moderate, and weak, whereas Chin (1998) interpreted .67, .33, and .19 as substantial, moderate, and weak using the results of his model. Additionally, Cohen (1988) had earlier classified the values of .26, .13, and .02 to be substantial, moderate, and weak respectively.

As shown in Table 4.15, attitude towards using VLE had the highest R^2 of .725, denoting that its predictors explained 72.5% of its variance. This is followed by the R^2 for continuance intention where its predictors explained 67.7% of its variance, and R^2 of perceived usefulness which predictors explained 60.3% of its variance. Lastly, the predictors for psychological ownership and perceived ease of use accounted for 56.8% and 55.1% of variance in these constructs respectively. According to the aforementioned criteria by Hair et al. (2017), Chin (1998), and Cohen (1998), these values which ranged from .551 to .725 can be classified as moderate to substantial.

4.10.4 Effect Size

Effect size reveals the relative importance of an exogenous construct on an endogenous construct. The impact of the exogenous on the endogenous construct is reflected by the change in R^2 of a particular endogenous construct, when a particular exogenous construct is removed. It can be calculated as follows:

$$f^2 = \frac{R_{included}^2 - R_{excluded}^2}{1 - R_{included}^2}$$

The f^2 effect size can be computed by SmartPLS software, and can be gauged with f^2 values of .02, .15, and .35, represented as effect sizes which are small, medium, and large (Cohen, 1988). As shown in Table 4.15, perceived ease of use has a medium effect size on attitude towards using VLE ($f^2 = .292$), while attitude towards using VLE also has a medium effect size on continuance intention ($f^2 = .282$). Medium effect sizes are also observed for the relationships between perceived ease of use and perceived usefulness ($f^2 = .217$), as well as psychological ownership and perceived ease of use ($f^2 = .202$). There are small effect sizes for the influences of perceived usefulness on attitude towards using VLE ($f^2 = .134$), and psychological ownership on perceived usefulness ($f^2 = .079$). Finally, small effect sizes are also noted for the influences of experienced control ($f^2 = .063$), knowledge ($f^2 = .024$), and investment of the self ($f^2 = .092$) on psychological ownership. There is negligible effect ($f^2 = .013$) between perceived usefulness and continuance intention. Table 4.15 shows the R^2 of endogenous variables and their corresponding f^2 .

Table 4.15 Coefficient of Determination (R^2) of Endogenous Variables and Effect Sizes (f^2)

Constructs	Coefficient of Determination (R^2)	Effect Size (f^2)				
		ATT	CI	PEU	PO	PU
ATT	.725		.282			
CI	.677					
EC					.063	
IN					.091	
K					.024	
PEU	.551	.292				.217
PO	.568			.202		.066
PU	.603	.134	.013			

4.10.5 Predictive Relevance

The assessment of R^2 values is complemented with Stone-Geisser's Q^2 index (Stone, 1974). This test demonstrates the out-of-sample predictive ability of the model, which is the structural model's predictive accuracy on data not used in model estimation. This is achieved with blindfolding procedures with removal data on every 7th data point. PLS-SEM algorithm treats these removed data as missing data, where resulting estimates are used to predict the removed data (Hair et al., 2017). Q^2 values from cross-validated redundancy calculation is analysed, where values greater than zero indicate predictive relevance for the particular endogenous construct. In contrast, values which are zero and below indicates inadequate predictive relevance. Additionally, the relative impact of Q^2 , can be assessed with its effect size (q^2) with the following formula:

$$q^2 = \frac{Q_{included}^2 - Q_{excluded}^2}{1 - Q_{included}^2}$$

The q^2 effect size is not available from the SmartPLS software and has to be manually computed. However, $Q^2_{included}$ can be estimated from the final structural model, whereas $Q^2_{excluded}$ is obtained by re-estimating the structural model after the removal of specific predictor of an endogenous model. These values were used to calculate q^2 , where values of .02, .15, and .35 denote small, medium, and large effects (Hair et al., 2017). Table 4.16 shows the Q^2 values obtained with blind folding procedures with omission distance of seven, as well as the corresponding q^2 effect sizes on the designated endogenous variables.

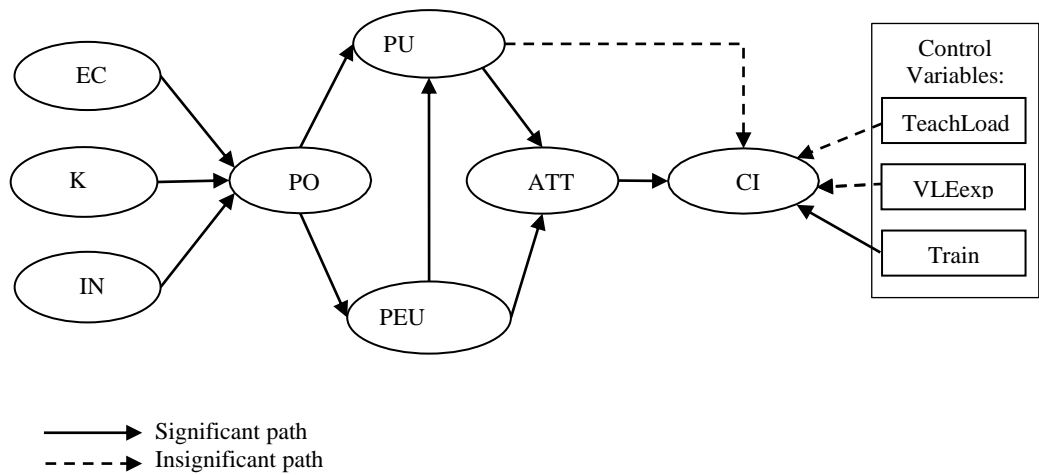
Table 4.16: Predictive Relevance (Q^2) of Endogenous Variables and Effect Sizes (q^2)

Constructs	Predictive Relevance (Q^2)	Effect Size (q^2)				
		ATT	CI	PEU	PO	PU
ATT	.564		.169			
CI	.557					
EC					.027	
IN					.038	
K					.009	
PEU	.417	.144				.090
PO	.363			.117		.028
PU	.391	.067	.000			

From the results, the Q^2 values for all endogenous variables were above zero, indicating the exogenous variables in the model has sufficient predictive relevance in predicting their designated endogenous variables. In terms of q^2 , medium effects were observed for the relationship between attitude towards using VLE and continuance intention ($q^2 = .169$), while the relationship of perceived ease of use and attitude towards using VLE has a nearing to medium effect ($q^2 = .144$). The other exogenous variables had small q^2 effects on their

designated endogenous variables that ranged from .009 to .117. There is no evidence of predictive relevance between perceived usefulness and continuance intention.

In sum, the hypothesised model is largely supported and explained 67.7% variance in continuance intention. Figure 4.7 shows the model with the results of the path coefficients.



Note: ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness; TeachLoad = Teaching Load; VLEexp = VLE experience; Train = VLE training

Figure 4.7: Structural Model with Significant and Non-significant Paths

4.11 Summary

This chapter presents the analysis of data collected. Data were subjected to screening and treatment where data were deleted after the inspection of missing values, outliers, and disengaged response pattern with “straight-line” responses. The cleaned data were then assessed for statistical assumptions, where the assumption of linearity, homoscedasticity, and collinearity were satisfied. However, data were not normally distributed, but this was not a concern as the non-parametric software SmartPLS was used, and PLS-SEM does not require distributional assumptions. Descriptive statistics were used to present the mean and standard deviation of the constructs, and also to describe the respondents’ profile. PLS-SEM was employed to verify the measurement model and structural model. The measurement model was established in terms of internal consistency reliability, convergent validity, and discriminant validity. Lastly, the structural model was assessed to answer the hypotheses in terms of path coefficients, coefficient of determination, effect sizes, and predictive relevance. Out of the 27 hypotheses proposed in the study, 22 were supported.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

The previous chapter empirically assesses the articulated mechanism proposed by the research model by evaluating its measurement model properties and testing of structural paths. Based on these results, this final chapter discusses the possible inferences drawn from the significance and insignificance of the underpinning hypotheses. Section 5.2 discusses the results and findings of each hypothesis that corresponds to the research objectives. In addition, the section also discusses the impact of the control variables on teachers' continuance intention in using VLE. Section 5.3 highlights the contributions of the study, in terms of the theoretical and practical implications synthesised from the results obtained. Section 5.4 discusses the study's limitations with suggestions to improve these limitations in future research. Finally, the chapter ends with section 5.5 with a brief conclusion.

5.2 Overview and Discussions of Findings

Overall, the research model explained 67.7% of variance in continuance intention. Most of the exogenous variables in the model significantly influenced their designated endogenous variables, with 22 out of 27 hypotheses being supported. The overall variance explained in this study is considered

substantial (Chin, 1998), while research in e-learning continuance intention which are based on TAM have reported explained variances which ranged from 47.2% (Yang et al., 2017) to 92% (Lin et al., 2011). Results supported the central premise of this study that psychological ownership which is brought about by users' experienced control, having knowledge, and investment of the self into a VLE is a significant driver to the beliefs of perceived ease of use and perceived usefulness. These beliefs in turn significantly influence attitude which is a significant predictor of continuance intention in using a VLE. The research objectives and results of its corresponding hypotheses are summarised as below:

RQ1. Are there significant influences of experienced control, having knowledge about VLE, and investment of the self on psychological ownership of a VLE?

	Hypotheses	Results
H1	Experienced control has a significant influence on psychological ownership.	Supported
H2	Knowledge has a significant influence on psychological ownership.	Supported
H3	Investment of the self has a significant influence on psychological ownership.	Supported

RQ2. Are there significant influences of psychological ownership of VLE on continuance intention based on the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using a VLE)?

	Hypotheses	Results
H4	Psychological ownership has a significant influence on perceived usefulness.	Supported

	Hypotheses	Results
H5	Psychological ownership has a significant influence on perceived ease of use.	Supported
H6	Perceived ease of use has a significant influence on perceived usefulness.	Supported
H7	Perceived usefulness has a significant influence on attitude towards using VLE.	Supported
H8	Perceived ease of use has a significant influence on attitude towards using VLE.	Supported
H9	Perceived usefulness has a significant influence on continuance intention.	Not supported
H10	Attitude towards using VLE has a significant influence on continuance intention.	Supported

RQ3. Are there significant influences of control variables (teaching load, VLE experience, and VLE training) on continuance intention?

	Hypotheses	Results
H11	Teaching load has a significant influence on continuance intention.	Not supported
H12	VLE experience has a significant influence on continuance intention.	Not supported
H13	VLE training has a significant influence on continuance intention.	Supported

RQ4. Is psychological ownership a significant mediator between its antecedents (experienced control, knowledge, investment of the self) and perceived ease of use and perceived usefulness?

	Hypotheses	Results
H14	Psychological ownership mediates the relationship between experienced control and perceived usefulness.	Supported
H15	Psychological ownership mediates the relationship between knowledge and perceived usefulness.	Supported
H16	Psychological ownership mediates the relationship between	Supported

	Hypotheses	Results
	investment of the self and perceived usefulness.	
H17	Psychological ownership mediates the relationship between experienced control and perceived ease of use.	Supported
H18	Psychological ownership mediates the relationship between knowledge and perceived ease of use.	Supported
H19	Psychological ownership mediates the relationship between investment of the self and perceived ease of use.	Supported

RQ5. Are the TAM variables (perceived usefulness, perceived ease of use, and attitude towards using VLE) significant mediators in the hypothesised model?

	Hypotheses	Results
H20	Perceived usefulness mediates the relationship between psychological ownership and attitude towards using VLE.	Supported
H21	Perceived usefulness mediates the relationship between perceived ease of use and attitude towards using VLE.	Supported
H22	Perceived usefulness mediates the relationship between perceived ease of use and continuance intention.	Not supported
H23	Perceived usefulness mediates the relationship between psychological ownership and continuance intention.	Not supported
H24	Perceived ease of use mediates the relationship between psychological ownership and perceived usefulness.	Supported
H25	Perceived ease of use mediates the relationship between psychological ownership and attitude towards using VLE.	Supported
H26	Attitude towards using VLE mediates the relationship between perceived ease of use and continuance intention.	Supported
H27	Attitude towards using VLE mediates the relationship between perceived usefulness and continuance intention.	Supported

In achieving these objectives, a survey research that applied quantitative method was designed, and constructs were measured with established scales. The instrument was subjected to content validation by a panel of subject matter experts, after which it was translated from English language to the Malay language and back translated. The translated instrument was pre-tested and pilot tested, and finally used in the planned field work. Data collected from field work were subjected to rigorous screening and hypothesised relationships were assessed with SEM-PLS techniques. The following sections discuss the results and inferences drawn from the study based on theoretical explications and previous studies.

5.2.1 Experienced Control and Psychological Ownership

Experienced control significantly influenced psychological ownership, demonstrating that control experienced over a target of ownership fosters the development of its psychological ownership. The significance of this hypothesis concurs with studies based on the context of social media platform, online game, and virtual communities (Lee & Suh, 2015; Moon et al., 2013; Zhao et al., 2016), and evidence from this study lend new support of this relationship from the VLE context. A major similar characteristic between a VLE and the aforementioned technologies is that users have the ability to exercise control to produce their desired outcome in the technological environment. For instance, social media platforms afford users with functions to control and manipulate processes such as the sharing of information and playing embedded games (Zhao et al., 2016). From the virtual community

aspect, users' psychological ownership was brought about by their control to define the virtual identity using digital tools and images, where ownership is enforced when users express themselves freely in the virtual community (Lee & Suh, 2015). This effect of experienced control on psychological ownership is also echoed by research in massive multiplayer online role-playing games, where ownership is enhanced by increased ability to control a game character (Moon et al., 2013).

In the personal online learning environment context, Buchem et al. (2014) found that control exercised over elements such as access, content, design, and planning in the platform is significantly related to psychological ownership. The present study further affirmed this relationship as Frog VLE also offers teachers with opportunities to exercise discretion and control, providing more opportunities for exploration and manipulation. Teachers are free to utilise tools and applications which run through the cloud. This ability to customise content in the VLE enables teachers to experience that they are "the cause" of their VLE, boosting ownership over the VLE. Moreover, teachers control and organise instructional materials in the VLE for later re-use, and involve in the ritual of storing or saving these materials for fear of losing it. Such actions may intensify their possessive feelings for the VLE, this especially when unlimited cloud capacity is available for storage.

5.2.2 Knowledge and Psychological Ownership

Knowledge about VLE has a significant influence on psychological ownership of VLE. This finding is consistent with theoretical speculation that having comprehensive knowledge about an object can positively affect psychological ownership for it. Findings concur with research carried out in the context of social media (Chen et al., 2016; Zhao et al., 2016) as well as online communities (Kim et al., 2016). A possible perspective which explains this similar result is that knowledge acquired through active and frequent association with the aforementioned platforms can breed familiarity that foster attachment and ownership for it. Social media platforms are embedded with various applications which attract users to increase frequency of visits and know the platform better (Chen et al., 2016; Zhao et al., 2016). On the other hand, knowledge used to create contents in online communities deepened the bond between contents and its creators (Kim et al., 2016). In the context of this study, Frog VLE offers varied functionalities that are not only catered for instructional purposes, but also encompasses administrative tools such as cloud storage, booking of school venues, and communication tools with ministry department, students and school administration. Knowledge is paramount for teachers to effectively optimise the benefits of the platform which can be a digital equivalence of a school's eco-system. The contexts of social media platforms, virtual world, and VLE offers users opportunities to experience a wealth of knowledge when using its functions, promoting users' ownership with proximity and familiarity towards these platforms.

Knowledge might impact psychological ownership by the way it is applied to carried out tasks, as scholars suggested that complex tasks call for more exploration and knowledge acquisition (Brown et al., 2014), and routine tasks cannot promote psychological ownership (Huang et al., 2016). Huang et al. (2016) found that frontline data entry staff from manufacturing and service industries did not develop ownership when performing routine tasks associated with data entry. This implies that routinisation reduces task complexity which impede opportunities for knowledge acquisition. In contrast, Frog VLE is a flexible environment equipped with an array of functionalities for different non-routine purposes. The complexity accompanying the VLE requires teachers to come to know it more thoroughly, as there is a greater demand for teachers to comprehend the information needed before executing the desired tasks. Thus, findings supported the notion that teachers develop psychological ownership for a VLE through familiarity bred by knowledge.

5.2.3 Investment of the Self and Psychological Ownership

Self-investment into a VLE significantly influenced psychological ownership with a medium effect size, demonstrating that the more teachers invest their personal aspects such as time, talents, and intellect into the VLE, the stronger their sense of ownership for the VLE will become. Among the three antecedents of psychological ownership hypothesised in the study, investment of the self into VLE had the strongest effect. Despite suggestions that psychological ownership can be context specific (Jussila et al., 2015), this finding concurred with earlier research in social media context (Chen et al.,

2016; Zhao et al., 2016) and also psychology ownership for the job itself (Brown et al., 2014) which found self-investment to be the most salient antecedent of psychological ownership. The similarity between social media platforms (Chen et al., 2016; Zhao et al., 2016) and cloud-based VLE lies in their dependence on content creation. Social media platforms are built on a coded infrastructure, with developers who maintain the platform, and the servers which host its contents, yet, it depend on the creation of contents by users who upload their photos, videos, or posts. Likewise, one of the main activities in cloud-based Frog VLE include the creation of learning sites for different subjects by uploading of various instructional materials (Soon, 2014). It is possible for psychological ownership to emerge through teachers' personal contribution in orchestrating these activities. Teachers devote their time, ideas, and effort in producing VLE contents, and this foster a sense of possessive feeling over their VLE account which consisted of these contents. Hence, findings supported the notion that creation is a profound means by which individuals invest themselves into an object (Baxter, Aurisicchio, & Childs, 2015).

Brown et al. (2014) provided clear evidence from the job context, that individuals become intertwined with their job itself when they invest and immerse themselves in it. Looking from the concepts of Csikszentmihalyi and Rochberg-Halton (1981) which closely resonates with the Theory of Psychological Ownership, individuals tend to invest more psychic energy (i.e., time, attention, effort) into tools of their trade, because human existence is sustained by their productive effort assisted by these tools. Tools are often

associated with a particular occupation, for instance, carpenters and power tools, police and handguns, hairdressers and scissors, teachers and teaching materials. Much psychic energy will be invested into these tools used for producing the necessities for livelihood. These tools reveal much of the users' skills, ideas, talents, as well as their limitations, defining them and becoming part of the central component of the self (Csikszentmihalyi & Rochberg-Halton, 1981). Transposing this logic to the current study, the Frog VLE can be an emerging tool for teachers' profession because their ideas, time, efforts, and talents are embedded within the VLE, making it a psychological property considered as part of themselves, by which their professional identity is enacted.

5.2.4 Psychological Ownership and Perceived Usefulness

Psychological ownership has a significant influence on perceived usefulness, supporting the theoretical proposition that psychological ownership is a driver for the belief that the particular VLE is useful to increase teachers' job performance. The significance of this hypothesis is similar to findings obtained by Smith et al. (2014) study in the context of Health Information Technology (HIT) IS, where users develop psychological ownership when they were involved in system development. As users had input into its development, the ownership fostered significantly influenced perceived usefulness of the system. As such, it is reasonable to infer that ownership resulted from teachers' direct hands-on experiences with a VLE can lead to beliefs that is it useful for

their job performance. This also underscores the utilitarian aspect of VLE, where teachers regard a VLE favourably when it can complement their work.

Additionally, this can also be explained with the self-regulatory concept of self-enhancement which resonates with the Theory of Psychological Ownership (Pierce & Jussila, 2011). The concept suggests that individuals will strive to enhance themselves, thus engaging in behaviours which advance themselves. A customised VLE embodies the desired outcome of its users. It is possible that teachers evaluate a VLE favourably when they see themselves in it, because such positive evaluation serves to enhance their self-view. Teachers may perceive that “their” VLE is useful for improving work tasks. With this, the study offered insights about the intrinsic motivational effect of psychological ownership in resulting belief that a VLE is beneficial for performing tasks and elevating job performance. Hence, evidence from this study affirms the value of psychological ownership in enforcing the useful – performance contingency proposed by the TAM.

5.2.5 Psychological Ownership and Perceived Ease of Use

Psychological ownership has a significant influence on perceived ease of use with a medium effect size. This result concurs with earlier research (Barki et al., 2008), which suggested that users who psychologically own a system will feel that it is easy to use. In Barki et al.’s (2008) seminal work, psychological ownership resulted from involvement in clinical IS system development was found to significantly ease the learning curve of using the

system. The present finding further corroborates findings on psychological ownership and usability of virtual world (Lee & Chen, 2011), whereby usability is linked to psychological ownership due to the ease of navigation and understanding of the virtual world. It is reasonable to infer that teachers are free to input into their VLE in creating contents and customising VLE spaces and develop a sense of ownership towards their VLE. The customised VLE increase preference fit, making it user friendly and requires less effort to operate. As such, psychological ownership developed for a VLE can promote a more favourable belief that a VLE is easy to operate.

Sinclair and Tinson (2017) provided evidence that psychological ownership is related to utilitarian factors of a technology to foster the belief that it can help save users' effort. Similarly, it is also important that teachers believe that a VLE can save their time and effort. Teachers participate in a VLE by creating activities, monitoring students' participation, and involve in collaborative activities, while fulfilling their actual teaching and work deadlines. They are tasked with different responsibilities, and a VLE which is easy to operate can facilitate their work, instead of adding to it. It is important that using a VLE would be relatively free of efforts, so that effort saved can be diverted for other work tasks. As ease of use taps into the capability of the VLE in alleviating teachers' physical effort, mental effort, and learning effort exerted within the VLE, this study confirms the benefit of psychological ownership in easing these efforts cognitively.

Both perceived ease of use and perceived usefulness constitute important beliefs in the TAM, and this study reveals that psychological ownership influences both beliefs, and with greater effect on perceived ease of use. This suggests that psychological ownership can give rise to the positive belief that using a cloud-based VLE is easy and relatively free of effort, influencing teachers' favourable beliefs about the advantage and value of a VLE in performing their tasks.

5.2.6 Perceived Ease of Use and Perceived Usefulness

Perceived ease of use significantly influences perceived usefulness with a medium effect size, implying that the usability of a VLE is a pre-requisite for useful platforms. This finding is congruent with theoretical accounts in continuance intention research that is based on the TAM in the context of e-learning (Joo et al., 2018; Rodríguez-Ardura & Meseguer-Artola, 2016), and MOOC (Wu & Chen, 2017). These studies were carried out on learning platforms among users with experience, and the significance of this relationship highlighted the importance of perceived ease of use as an evaluative tool for ascertaining whether a platform is user friendly.

Intriguingly, this finding disagrees with some research which found perceived ease of use to be insignificant in the context of cloud-computing technology (Tripathi, 2017) and mobile banking (Yuan, Liu, Yao, & Liu, 2016). From the context of cloud computing, ease of use was insignificant on perceived usefulness among IT personnel, as they are well-trained and not

concerned with the technicality of the technology (Tripathi, 2017). In the present study, ease of use is important to teachers who do not possess the competence of IT personnel. In the context of mobile banking, perceived ease of use was found not significant as users become familiar in using the technology (Yuan et al., 2016). This is a common understanding in continuance research, which suggest that the effect of perceived ease of use will diminished over time as users gain experience and skills in using a particular technology and overcome technical barriers (Bhattacharjee & Lin, 2014). However, this explanation does not seem to hold in this study with the medium effect size of perceived ease of use. One possible explanation is that a cloud-based VLE replicates a real-life classroom, where traditional teaching is transferred from the classroom to the cloud. As teachers transpose teaching and learning to the cloud, the convenience and ease of using the functionalities and cloud-based tools is essential to give rise to the belief that the VLE is useful. Not all systems which are easy to use can be deemed as useful, but this study supports previous research in educational context which emphasise that a learning platform has to be user friendly to qualify as a useful platform (Joo et al., 2018; Rodríguez-Ardura & Meseguer-Artola, 2016; Wu & Chen, 2017).

5.2.7 Perceived Usefulness and Attitude Towards Using VLE

Perceived usefulness has a significant influence on attitude towards using VLE, confirming this connection of the TAM. Perceived usefulness in this study taps into the usefulness of VLE to enhance teachers' job performance and reflects the motivation for performance enhancement.

Research had noted that perceived usefulness is more profoundly influenced by utilitarian context which is task-oriented rather than hedonic context which is pleasure-oriented (Plaza-Lora & Villarejo-Ramos, 2017; Wakefield & Whitten, 2006). This explains this study's context where VLE is used for instruction and work purposes, and the significance of perceived useful on attitude concurs with research done on other learning platforms which are also task-oriented such as learning blogs (Ifinedo, 2017), e-learning (Rodríguez-Ardura & Meseguer-Artola, 2016), and MOOC (Wu & Chen, 2017).

Additionally, perceived usefulness in this study is measured at the post-adoption stage of VLE and is based on the realised usefulness of a VLE which is conceived from teachers' direct use experience. Research in e-learning continuance which is based on post-adoption phase noted that belief about usefulness needs more complex appraisal than ease of use, and experienced users are more capable to better evaluate the aspects of the e-learning's usefulness (Lin, 2011). In this vein of reasoning, teacher respondents in the current study possess an average of three years' usage experience, and thus they were capable of assessing the VLE's usefulness in a more in-depth way. Therefore, the significance of perceived usefulness as cognitive belief on attitude towards Frog VLE suggests that teachers considered the VLE as an instrument useful to improve their performance, and this resulted in favourable affective attitude towards using the VLE.

5.2.8 Perceived Ease of Use and Attitude Towards Using VLE

Among the two key beliefs constructs of the TAM, perceived ease of use significantly influenced attitude more than perceived usefulness. With a medium effect size, the significance of ease of use contradicts research which found it to be less important than perceived usefulness in continuance intention research (Rodríguez-Ardura & Meseguer-Artola, 2016; Wu & Zhang, 2014). As discussed, ease of use is not an important factor in continuance research, with a common underlying premise that it becomes less important over time when users become familiar with a technology (Lin, 2011; Lu, 2014). Yet, finding of this study reveals that teacher respondents who have an average VLE experience of three years still think that the platform needs to be relatively easy to use. In comparing some studies which contradicts the present finding, Song and Kong (2017) investigated learning platform based on Moodle, Wu and Chen (2017) examined MOOC. Perceived ease of use takes precedence over perceived usefulness in a cloud-based VLE because its functionalities are more extensive than that of a traditional e-learning (Moodle) and MOOC platform. Cloud-based VLE offers more comprehensive functions than traditional e-learning, as it provides on-demand unlimited resources, unrestricted storage, and various applications that run through the cloud (Hew & Syed Abdul Kadir, 2016c). The functions of cloud-based VLE are also more extensive than MOOC which focuses on “massiveness” and “openness” of the platform to deliver short videos and related contents to the masses (Shao, 2018; Wu & Chen, 2017).

The significance of perceived ease of use in this study can be attributed to the dynamic nature of Frog VLE which serves as a gateway to an array of resources and applications for different purposes. A longitudinal research of LMS had affirmed that perceived ease of use may have precedence over perceived usefulness when users have to adapt to new features and functions (Cheng & Yuen, 2018). Similarly, the features in the Frog VLE are not static and subject to updates, and teachers have to continue to expend effort to effectively operate it. This suggests that the skills acquired in using a specific application may not be entirely transferable to other applications in the VLE. For instance, the skills in creating learning sites may be different from interpreting and utilising students' learning style reports. This explanation is reasonably inferred as observed from other research of cloud-based computing which also found perceived ease of use to have profound role in influencing attitude towards using cloud services (Shiau & Chau, 2016).

In sum, both beliefs of usefulness and ease of use have significant influence on attitude towards using VLE, with the latter having a larger effect. This suggests that teachers are more concerned with the technical know-how to use the cloud-based VLE. Amidst the array of functionalities, fundamentals competencies are still important for effective usage of the VLE. Hence, this study gives fresh evidence that perceived ease of use cannot be discounted in IT continuance research in a cloud computing context. As perceived ease of use taps into the efficacy dimension, the more teachers find the VLE to be easy to use, the greater should be their sense of efficacy which influences attitude towards using the VLE (Davis et al., 1989).

5.2.9 Perceived Usefulness and Continuance Intention

The hypothesis between perceived usefulness and continuance intention is not supported, as perceived usefulness has no significant effect on teachers' intention to continue using Frog VLE. This finding is inconsistent with previous studies which mostly found perceived usefulness to be a key determinant of continuance intention (Wu & Zhang, 2014; Tripathi, 2017; Yang et al., 2017), but agrees with a recent study which was conducted in the context of flipped classroom (Cai et al., 2018). This research found that perceived usefulness was not significant to teachers' intention to continue using flipped classroom for teaching and learning (Cai et al., 2018). It was reasoned that beliefs are not as important as relevant specific skills to migrate from traditional face-to-face teaching to computer-mediated instructions. This echoes a recent local research which found Frog VLE to be lacking relevance in the delivery of certain subjects such as mathematics, whereby teachers were unable to use certain mathematical symbols for teaching (Cheok et al., 2017). Relevance is important to the perceived usefulness of an educational technology (To & Tang, 2018); and the incompatibility may hinder teachers in achieving their tasks which makes it to be unhelpful to their job performance.

As discussed earlier, perceived usefulness is more profound in the utilitarian context, acting as an extrinsic motivation for using technology to improve one's work task (Plaza-Lora & Villarejo-Ramos, 2017; Wakefield & Whitten, 2006). Hence it is possible that perceived usefulness is not significant

when a technology is not helpful in achieving tasks required as formal part of performance.

5.2.10 Attitude Towards Using VLE and Continuance Intention

The relationship between attitude towards using VLE and continuance intention has the largest path coefficient with an effect size close to being large. The significance is consistent with the TAM's original proposition that individuals develop intention to perform a particular behaviour which they like (Davis, 1986). Even though subsequent TAM models had discounted the value of attitude in predicting behaviour intention, this study supports the theoretical accounts of previous studies that attitude is an important predictor of continuance intention for e-learning (Ifinedo, 2017; Rodríguez-Ardura & Meseguer-Artola, 2016; Shiue et al., 2017; Wu & Zhang, 2014). Similar to the present study, attitude in these studies were also jointly influenced by perceived usefulness and perceived ease of use, and the significance of these beliefs strengthen users' positive feelings towards using e-learning which subsequently resulted profound impact on continuance intention (Shiue et al., 2017; Wu & Zhang, 2014). Additionally, Rodríguez-Ardura and Meseguer-Artola (2016) revealed that users' positive attitude that is bolstered by a flexible and comprehensible e-learning system can foster continuance intention. In this line of reasoning, the profound impact of attitude in this study can be due to the significant influence of its predictors (perceived usefulness and perceived ease of use), and also because Frog VLE being a flexible environment.

Scholars had suggested that attitude towards using a technology which is formed during the post-adoption phase is closely related to users' experiences with the system (Kim, Chun, & Song, 2009; Venkatesh, Thong, Chan, Hu, & Brown, 2011). Attitude which is formed based on prior experiences create a stronger schema about a behaviour, and can be persistent over time, resilient to counter persuasion, and predictive of a particular behaviour (Kim et al., 2009). In the post adoption context, it is possible that users through their hands-on experience are more convinced about their attitude that is developed over time compared to potential adopters or novice users. Similarly, in the present study's context, teachers' attitude is formed based on their exposure to the VLE and having opportunities to evaluate its various attributes. The profound effect of attitude on continuance intention suggests that attitude which is shaped by prior experiences in VLE can result in a stronger schema about the intention to continue using it. Hence, actively enhancing teachers' attitude towards using the VLE is a key mission in augmenting their intention to continue using the platform.

5.2.11 Control Variables and Continuance Intention

As for the control variables in the study, only VLE training was significantly linked to continuance intention. This finding concurs with a recent local study that also accentuated the importance of training to facilitating e-learning among Malaysian teachers (Cheok et al., 2017). In a nation-wide implementation of e-learning such as the Frog VLE, there is a need for large-scale teacher development initiative not only to overcome technical barriers,

but also to impact pedagogical strategies to make necessary changes in the process of teaching and learning using ICT (Kong et al., 2017).

Interestingly, teaching load is not related to continuance intention. This finding contravened studies which suggested that workload is one of main hindrances of e-learning when adoption is voluntary (Awang et al., 2018; Cheok et al., 2017; Yeop et al., 2019). The discrepancy can be due to the difference in investigation of workload. While the aforementioned studies investigated teachers' workload in general which encompass teaching itself, lesson planning, administrative tasks, and assessment works, the present study focused on the weekly load of teaching hours. This suggests that having more hours of teaching may not be a hindrance to teachers' continuance intention in using Frog VLE. This may be due to the ability of Frog VLE to facilitate time saving, by easy administration of saved learning contents that can be shared and re-used over time (Fisher et al., 2017). This is echoed by a recent study where teachers reported that the Frog VLE helps in time-saving, and makes their job easier compared to the conventional approach, in terms of organisation of teaching materials (Cheok & Wong, 2016).

Lastly, VLE experience was also not significant to teachers' continuance intention. This is inconsistent with studies which found higher experience with MOOC is significantly linked to higher continuance intention (Yang et al., 2017). MOOC platforms focus on providing educational opportunities to the masses through videos, while the Frog VLE is an integrated system which serves as a gateway to an array of resources and

applications for different purposes. In this dynamic environment with varied applications, the experience acquired in using a particular application may not be transferable to other applications. Hence, having more experience using VLE has no influence on higher intention to continue using the VLE.

5.2.12 Mediation Effect of Psychological Ownership

Mediating effect of psychological ownership between of experienced control and perceived usefulness. A complementary (partial) mediation was found as denoted by the positive directions of its direct and indirect effects. In terms of VAF, 41% of experienced control's influence on perceived usefulness is explained via psychological ownership. This implies that higher levels of experienced control not only increase perceived usefulness directly, but also increase psychological ownership of the VLE, which in turn leads to the belief in its usefulness. Results are consistent with experimental studies which found psychological ownership to be a consistent mediator of object valuation (Brasel & Gips, 2014; Sarstedt et al., 2016). These experiments found that individuals tend to give higher valuation of objects for which they have direct interactions, or objects which they co-created. Through these means, individuals exercise control over the objects and develop psychological ownership which result in more favourable object evaluation. In the technological context, psychological ownership was found to influence instrumental value of information system, where it significantly mediates the effect of resistance to change on perceived usefulness, suggesting its capability in elevating the instrumental value of a system's usefulness (Smith et al., 2014). The present study also found psychological ownership to influence perceived usefulness, and its mediating

effect indicates that perceived usefulness is also indirectly influenced by the control teachers experienced while using the VLE. This finding lends support to psychological ownership's potential in mediating the influence of control on user behaviour such as loyalty, where higher control over game characters increases psychological ownership, and in turn foster loyalty for online games (Moon et al., 2013). Hence, results give credence to the mediating role of psychological ownership, with new evidence from the VLE context that reveals its significance in intervening between experienced control and perceived usefulness. This evidence contributes to the theoretical understanding of linking the Theory of Psychological Ownership and the TAM.

Mediating effect of psychological ownership between knowledge and perceived usefulness. Psychological ownership is found to be a significant mediator between knowledge and perceived usefulness. The mediation effect was classified as indirect-only indicative of full mediation (Zhao et al., 2010). The effect of knowledge about VLE on perceived usefulness became insignificant with the introduction of psychological ownership as a mediator, demonstrating that the effect of knowledge on perceived usefulness is completely transmitted via psychological ownership. As discussed earlier relevance is important to perceived usefulness (To & Tang, 2018), and it is possible that teachers do not entirely think that the knowledge acquired is relevant and useful for enhancement of job performance. This is reflective of the current scenario that usage of VLE is not formally tied to teachers' individual performance, as usage metric of Frog VLE is tracked by the MOE in terms of the entire school rather than individually (Fisher, Bushko, & White,

2017). The full mediation effect indicates that teachers do not perceive the VLE to be useful merely because they possess knowledge about it. Despite having broad knowledge regarding the VLE, they may not think it is useful unless they have a sense of ownership towards it.

This evidence reveals the capability of psychological ownership in explaining the process which knowledge works in resulting users' beliefs in the context of VLE. Having intimate and broad knowledge of an object can be extended into the self, developing an intimate association which fused the object with its owner (Chen et al., 2016; Zheng et al., 2018). Not all knowledge acquired will be considered valuable to teachers, and it is possible that a sense of ownership intervenes the effect of knowledge which increases the proximity between VLE and teachers, and in turn impacts perceived usefulness. The literature suggests that "coming to know" is a powerful mean to deepen relationship between owner and objects (Kim et al., 2016). It is possible that the ownership effect intervenes knowledge and induce teachers to develop a deeper relationship with "their" VLE which alter the belief of its usefulness. On another note, the present finding of full mediation should be interpreted with caution, because mediation effects in technological context are dependent on the nature of IT and external variables of the TAM (Burton-Jones & Hubona, 2006).

Mediating effect of psychological ownership between investment of the self and perceived usefulness. Psychological ownership significantly mediates the effect of investment of the self on perceived usefulness. Specifically, this

relationship is classified as complementary mediation (partial), where investment of the self directly and indirectly influences perceived usefulness. This result reflects the notion of efforts justification that labour leads to value, where higher contribution of personal aspects leads to higher value (Norton, Mochon, & Ariely, 2012). This suggests that self-investment into VLE influences the utility value of a VLE, whereby teachers perceive the VLE to be useful because they had invested much in it, through the sense of ownership for the VLE. The study's results corroborated research which found psychological ownership's capability to significantly intervene the feelings of ownership for an object and the positive evaluation of it (Brasel & Gips, 2014). Recall that this study found self-investment to be the most salient determinant of psychological ownership, and self-integration into VLE can possibly turn it to become teachers' emerging tools of the trade (Csikszentmihalyi & Rochberg-Halton, 1981). Hence, it can be further reasoned that a VLE can be perceived as useful when it became essential tools of the trade for the teaching profession.

The interaction between these three constructs gives new insights into previous research which investigated mediation of psychological ownership between various users' factors, such as between self-investment and virtual world visit intention (Lee & Chen, 2011), as well as between resistance toward a new system and its perceived usefulness (Smith, 2014). The study's results provided a link between self-investment and perceived usefulness. Teachers are involved in determining their VLE contents and spaces and can invest much of themselves in doing so. Such investment can be taken as an approach in cultivating and transforming digital products into personally meaningful

belongings (Watkins, Denegri-Knott, & Molesworth, 2016). In this way, the VLE is perceived to be useful because it is considered a meaningful possession worthwhile of teachers' investment. Teachers' investment into the VLE may increase preference fit that increase belief in its usefulness, and this is facilitated by psychological ownership that cause teachers to identity with the VLE in a stronger way.

Mediating effect of psychological ownership between experienced control and perceived ease of use. Results demonstrate a complementary mediation (partial) effect of psychological ownership between the relationship of experienced control and perceived ease of use. This effect implies that increased influence and control over tasks, decisions, and interactions in Frog VLE lead to higher psychological ownership, which in turn leads to increased belief that using the VLE requires little effort. Research had demonstrated that individuals develop psychological ownership as a result of customising objects to fit with their personal representation of it, in turn, this psychological ownership developed can induce more favourable evaluations of the particular object (Stoner et al., 2018). In the technological context, psychological ownership for digital books was found to mediate the effect of perceived control on users' willingness to pay (Kirk & Swain, 2015). The interactivity and customisation ability of digital books allow users to control its intangible contents, enabling these contents to be brought into their extended self (Belk, 2013; Kirk & Swain, 2015). In a similar vein, teachers also customise contents in the interactive VLE, and the significant direct and indirect effect indicate that the more teachers control the VLE and get it to execute their tasks, the

more ownership is perceived, and they believe that it facilitates task performance. Ownership may have constructive benefits to the platform, as users may have the tendency to “own up” the mistakes made in the VLE, instead of blaming the usability of the VLE. Nevertheless, the partial mediation revealed that experienced control still explains a portion of perceived ease of use which is independent of psychological ownership, and there are other possible factors which facilitate this relationship.

Mediating effect of psychological ownership between knowledge and perceived ease of use. Psychological ownership is a significant mediator that partially mediate the influence of knowledge and perceived ease of use. This mediation effect is classified as complementary mediation (partial) with knowledge about VLE having a positive direct and indirect effect on perceived ease of use. As discussed earlier, direct effects of knowledge on psychological ownership, and psychological ownership on perceived ease of use were found to be significant, and consistent with some literature (Chen et al., 2016; Lee & Suh, 2015; Zhao et al., 2016; Zheng et al., 2018). This study added to the knowledge of these existing studies with psychological ownership being a significant mediator between knowledge and perceived ease of use. Results suggest that psychological ownership can intercede knowledge acquired on VLE, possibly by lessening information asymmetry to facilitate the belief about the easiness in using the VLE. Results also support the logic that getting to know more about a VLE can improve the belief that using the VLE is easy and free of difficulty (To & Tang, 2018). As conceptualised, perceived ease of use reflects the ease in using a VLE which frees the users from physical,

mental, and effort exerted in learning to operate a technology. As this construct taps into the efficacy dimension, results indicate that it is more effective to increase perceived ease of use by promoting broad knowledge among users. Knowledge increases the level of familiarity and reduces uncertainty, and foster positive feelings among users (Pereira, Salgueiro, & Rita, 2017). As individuals alter their choice strategy to use technology in response to task complexity, it is reasonable to infer that knowledge can reduce task complexity in the VLE thereby inducing the belief that the VLE is easy to use.

Mediating effect of psychological ownership between investment of the self and perceived ease of use. Psychological ownership of VLE is found to be a significant mediator between the relationship of investment of the self and perceived ease of use. The mediation is classified as complementary (partial) mediation with significant direct and indirect effects. The interaction between these variables revealed that teachers not only think that a VLE is easy to operate when they invested in it, but they also have high regard for its ease of use when they have a sense of ownership towards it. This is reflected in research that found software developers have high regards for the software they helped to specify, as they invested in tailoring the software features which fit their abilities (Shmueli, Pliskin, & Fink, 2015). In a similar vein, teachers invest themselves in tailoring the VLE, which promotes ownership and identification with it, and in turn foster a better appreciation of the VLE capability and perceived ease of use. Findings also supported the view that individuals will tend to attribute a higher value to an object which they personally invested their time and effort, as the object evoke their

psychological ownership and they do not wish to waste their investment (Damm, de Pablos Heredero, & Rodríguez-Monroy, 2013). It is reasonable to infer that the ownership effect intervenes self-investment, due to teachers' invested effort in acquiring VLE skills which they do not wish to see go to waste (Hooi & Cho, 2017). Teachers are reaping the benefits of their investment as it reduces the physical effort, mental effort, and learning effort required to use the VLE.

5.2.13 Mediation Effect of Perceived Usefulness

Mediating effect of perceived usefulness between psychological ownership and attitude towards using VLE. Perceived usefulness is a significant mediator which partially mediates the influence of psychological ownership on attitude towards using VLE. This mediation is classified as complementary mediation (partial), which implies that increasing teachers' psychological ownership can promote perceived usefulness, which in turn fosters their positive attitude towards the platform. This result attests to the TAM's core assumptions of perceived usefulness mediating effects on external variables (Venkatesh, 2000). While research had established the influence of perceived usefulness on attitude towards e-learning use (Ifinedo, 2017; Shiue et al., 2017; Wu & Zhang, 2014), this finding adds-on to the limited literature of the mediation of perceived usefulness on psychological ownership as an external variable. Research has shown that psychological ownership influences perceived usefulness (Smith et al., 2014). As discussed earlier, the self-regulatory concept explains that psychological ownership can serve as an

intrinsic motivation for people to enhance their self-view (Pierce & Jussila, 2011). It is reasonable to infer that teachers evaluate a VLE favourably when ownership is perceived and they see themselves in it, and the ownership effect enhances the instrumental value and favourable attitude towards the VLE. It is possible that a sense of ownership leads teachers to think that “their” VLE is useful and helpful in improving their job, and this belief leads to a favourable attitude towards the VLE.

Mediating effect of perceived usefulness between perceived ease of use and attitude towards using VLE. Perceived usefulness is a significant mediator which partially mediates the influence of perceived ease of use on attitude towards using VLE. This mediation is classified as complementary mediation, suggesting that increasing belief about ease of use would increase perceived usefulness, and in turn indirectly improve their attitude towards the VLE. This mediating effect is consistent with prior studies done on students using flipped classroom, which suggested that students will accept some degree of technical difficulty if they think the technology is useful (Mohamed & Lamia, 2018). The mediating effect of the present study also concurred with findings from the context of mobile learning and e-learning, where students developed favourable attitude when they find the platform to be easy to use, and at the same time realise its perceived usefulness (Ooi et al, 2018; Rodríguez-Ardura & Meseguer-Artola, 2016; Wu & Zhang, 2104). The relationship of perceived ease of use – perceived usefulness – attitude demonstrated the sequence that teachers firstly need to overcome the barrier in the technicality of using the VLE (ease of use), before they can consider it to be useful to elevate their job

performance. Noteworthy is the larger direct effect of ease of use on attitude towards using VLE, suggesting that the usability of the system is more important than usefulness in impacting attitude towards using VLE.

Mediating effect of perceived usefulness between perceived ease of use and continuance intention. Perceived usefulness is not a significant mediator between the relationship of perceived ease of use and continuance intention, as there is an absence of indirect effect. Perceived usefulness in this study is conceptualised as usefulness in improving job performance, and its insignificance as a mediator may be reflective of the current scenario that Frog VLE adoption is not formally tied to teachers' individual key performance index, as usage metric is tracked by the respective school districts in terms of the entire school rather than individually (Fisher et al., 2017). The usage of Frog VLE is evaluated as part of teachers' ICT adoption, where ICT infusion into lessons is considered as one of the resources for instruction that can be substituted with other learning aids and teaching tools (MOE, 2018b). In other words, teachers may find that Frog VLE is not useful enough for them to continue using it.

Mediating effect of perceived usefulness between psychological ownership and continuance intention. There is no evidence of mediating effect of perceived usefulness, with the absence of indirect effect between psychological ownership and continuance intention. As discussed in the preceding paragraphs, perceived usefulness is insignificant in transmitting

effect on continuance intention, as teachers may not think the VLE is relevant enough in contributing to their job performance, for them to continue using it.

5.2.14 Mediation Effect of Perceived Ease of Use

Mediating effect of perceived ease of use between psychological ownership and perceived usefulness. Perceived ease of use is a significant intervening factor of the relationship between psychological ownership and perceived usefulness, with a complementary mediation (partial) effect. Psychological ownership significantly influences perceived usefulness directly, as well as indirectly via perceived ease of use. While extant literature has established the classic relationship between perceived ease of use and perceived usefulness (Joo et al., 2018; Rodríguez-Ardura & Meseguer-Artola, 2016; Wu & Chen, 2017), the mediating effect of the study extends the understanding with psychological ownership as an external variable. Previous study had shown the potential of psychological ownership in influencing perceived ease of use, where users who voluntarily choose to use a particular technology are more prepared to accept and overcome technical issues when ownership is developed (Klesel et al., 2016). Such dynamics may be possible in the current study, teachers who voluntarily choose to use the VLE are more willing to accept a certain degree of difficulty when they have ownership towards the VLE. Feeling of ownership may induce teachers to think that “their” VLE is easy to use and hence useful.

As psychological ownership is formed by teachers' direct experiences of using a VLE over time, teachers may adjust their beliefs of ease of use from a general view to become more system specific (Venkatesh, 2000). Teachers realised the usability of platform from their usage experiences. In this line of reasoning, psychological ownership brought about by experiences of control, having knowledge, and self-investment can increase preference fit of the system, and thus facilitates perceived ease of use which is more system specific. In turn, belief in ease in operation significantly impacts perceived usefulness. This is a consistent relationship in continuance intention research that suggest a system which is easy to use will be more likely considered useful (Cai et al., 2018; Fathali & Okada, 2018).

Mediating effect of perceived ease of use between psychological ownership and attitude towards using VLE. Perceived ease of use is a significant intervening factor of the relationship between psychological ownership and attitude towards using VLE, with a complementary mediation (partial) effect. Psychological ownership significantly influences attitude toward using VLE directly, as well as indirectly. Results agree with investigation from the context of augmented reality (AR) applications, where perceived ownership affects attitude towards products, facilitated through the interactions of AR applications in smart devices which enhanced its ease of use (Brenngman, Willems, & Van Kerrebroeck, 2018). As attitude towards using VLE in this study represents an affective component, the significance of perceived ease of use as a mediator affirms the rationale that individuals will tend to like and value possessions which are easy to use, easy to learn, and

flexible. As ease of use also taps into the efficacy dimension (Davis et al., 1989), the significant indirect effect via perceived ease of use indicate that psychological ownership can lead to a belief of competency when using the VLE, which in turn drives attitude towards using the VLE. Teachers can acquire different competencies when using Frog VLE, such as for work management (e.g., cloud storage, and link to school dashboard), instructions (e.g., virtualised resources, assignment of school work, and creation of sites), and communication (e.g., email, forums, and link to ministry departments). It is possible that teachers who perceived VLE ownership will tend to favour using the VLE, because the competency acquired alleviates the efforts required to operate the VLE.

As teachers develop psychological ownership towards the VLE they tend to like using it, and this finding supported those carried out within social media (Chen et al., 2016; Zhao et al., 2016), where psychological ownership is found to be critical for user engagement and the cultivation of users' long-term commitment of these platforms. Similar to the present study, these aforementioned studies also examined psychological ownership as predicted by control, knowledge, and self-investment. Psychological ownership formed through these antecedents can foster a sense of attachment to a particular object (Sinclair & Tinson, 2017). Hence it is possible that teachers come to like using the VLE through the ownership develop which fosters their belief that it is easy to use.

5.2.15 Mediation Effect of Attitude Towards Using VLE

Mediating effect of attitude towards using VLE between perceived ease of use and continuance intention. Attitude towards using VLE significantly mediated the influence of perceived ease of use on continuance intention with a complementary (partial) mediation effect. This result is consistent with the TAM's seminal work where Davis et al. (1989) also found partial mediation of attitude between perceived ease of use and behavioural intention. The effects found for perceived ease of use, attitude towards using VLE, and continuance intention affirms the TAM's framework in explaining the influence of belief – attitude – and intention (Davis, 1993). As demonstrated by previous research in the context of cloud services for education (Huang, 2016), users may continue using cloud applications which are easy to use, and their continuance intention is reinforced by positive feelings towards using these applications. Attitude in this study represents an affective component, and these effects affirm the rationale that individuals will tend to like and value possessions which are easy to use, and thus continue using them. Similarly, teachers in this study may also continue using Frog VLE if they find it easy to operate. The indirect effect in the mediated relationship is larger than the direct effect, and this implies that a positive attitude towards using VLE can significantly accentuate teachers' intention for continuous use.

Mediating effect of attitude towards using VLE between perceived usefulness and continuance intention. Attitude towards using VLE is a significant mediator between perceived usefulness and continuance intention.

An indirect only (full) mediation effect is found where direct effect of perceived usefulness and continuance intention became insignificant after the introduction of attitude towards using VLE as mediator. This result is congruent with continuance intention research carried out in contexts such as MOOC (Wu & Chen, 2017) and cloud services (Huang, 2016). Huang (2016) reasoned that attitude is a significant mediator because Google Doc is available to student users without any costs and allows them develop a positive attitude towards using it. In the context of MOOC where drop out (discontinuance) rate is high, attitude played an important role to intervene perceived usefulness of MOOC in influencing continuance intention (Wu & Chen, 2017). Similar to the present study, these research also conceptualised attitude as positive feelings towards using a particular technology, and evidences emphasised the accessibility and voluntary use nature to cultivate a positive attitude.

In scrutiny, it is possible that results are congruent with the above example due to the similar voluntary nature of Frog VLE, where usage does not entail monetary cost to teachers. The present finding of full mediation indicates that attitude towards using VLE substantially absorbs the effect between perceived usefulness and continuance intention. This has important implication because Frog VLE usage is not linked to teachers' formal job performance, and they may have weak belief that it is useful for improving their job performance. Hence, positive attitude towards using the VLE can help elevate teachers' intention to continue using the Frog VLE. Some research had excluded attitude as part of the TAM, however, its prominence as both predictor and mediating variable in this study supports previous research

(Lopez-Bonilla & Lopez-Bonilla, 2017; Ursavas, 2013) which suggest that this construct should not be discounted especially in voluntary use context. Instead, it should be assigned an important role in future research on continuance intention.

5.3 Implications

This work combined the research streams of psychological ownership and the TAM to predict teachers' continuance intention to use a cloud-based VLE. Empirical evidences obtained supported the central premise of the study, resulting in added knowledge to the existing mechanism of TAM in affecting continuance intention. The following sections discuss the theoretical and practical implications of the study.

5.3.1 Theoretical Implications

The review of literature has identified that psychological ownership of technology is an increasingly relevant phenomenon which is under-theorised, and there is potential to apply this concept to examine continuance intention. Hence, the study investigates this concept to explain continuance intention with the TAM as a base model. With 22 out of 27 hypotheses supported, results validated the specified nomological network within the hypothesised model. Psychological ownership causes an object to be fused with the self and is considered stable because it is developed over time, hence, incorporating this

concept in continuance intention research has provided valuable insights in cultivating a VLE's long term allegiance among teachers.

The review of literature has noted that a majority of the studies in e-learning had focused on acceptance phase of adoption, rather than post-adoption (Rodríguez-Ardura & Meseguer-Artola, 2016). Although this study re-produces original connections between the TAM constructs of perceived usefulness, perceived ease of use, and attitude, the post-adoption context of the study offers new insights into these variables. These constructs are conceptualised as beliefs and attitude based on accumulated experiences with the VLE, rather than beliefs at the initial implementation of technology. This study confirms the constructs' relevance and significance as exogenous constructs as well as mediators in examining a VLE which has been introduced earlier.

The value of technology lies in the continuous efforts to explain the complex phenomena where users and technology interact and transform each other (Hong & Tam, 2006). This study contributes to such effort to increase this understanding by considering teachers' experiences (experienced control, having knowledge, investment of the self) which taps into the engagement with the VLE. By doing so, the ownership effect also addresses one of the shortcomings of the TAM – fulfilling the absence of explanation for the motivation behind perceived usefulness and ease of use with the ownership effect. The inclusion of psychological ownership explains the mechanism behind teachers' belief structures. The VLE can go beyond its utilitarian role as a work tool, as

ownership explains how an object can become an extended self, thus potentially supporting the sustainability of the VLE. It can possibly become an intrinsic motivation that turn teachers to become advocators, not merely users of the VLE. Hence, this study provided initial cognitive insights with the process of psychological ownership not found in the VLE literature until now, to predict continuance intention of it.

With psychological ownership being a significant mediator, this research demonstrates that the tenets of psychological ownership hold true in the TAM by providing important link between users' experiences and beliefs, giving additional insights into the stimulation of users' sustainable behaviour towards technology. Continuance intention was explained by the process where the bond between users and technology is strengthened, and makes users see the technology as part of themselves, rather than a tool or gadget. This indicates that psychological ownership is beneficial to other theoretical standpoints. Besides continuance intention, it can also be applied in the broader perspective of acceptance. Instead of users' rejection or acceptance of a technology, psychological ownership explains how users can connect to a technology until it come to be an extension of themselves. This goes above being willing to utilise technology, and include a state of possessiveness that encompass attachment and personal involvement with the technology. In this vein, psychological ownership is significant to continuance behaviour due to the costs associated with discontinuing VLE usage. For instance, if teachers discontinue using the platform, the contribution of their personal aspects such as time and effort into the VLE will be lost and diminished.

The study also noted an intriguing finding where perceived ease of use is more profound than perceived usefulness, as an exogenous variable as well as a mediator. This is a sharp contrast from some post adoption studies whereby ease of use is discounted or disregarded, with the logic that its effect will wear off when users accumulated experiences in post-adoption phase (Bhattacharjee & Lin, 2014). This supports suggestions from literature that users make decisions differently in different technological contexts (Venkatesh et al., 2011). Cloud-based VLEs are ubiquitous learning environments that operate with software applications that run through the cloud (e.g., Google Classroom, Frog Assignments, FrogPlay Mobile, Frog Chat). These softwares are subject to updates which can make the platform to be different from what users are used to. In such non-static context, perceived ease of use is useful to gauge the learning costs imposed by software and product updates. As most software or technologies are subject to updates for improvement or bug-fixes, the current study implies that the original TAM factor of perceived ease of use is still fundamental, and can be investigated with technology which requires updates in continuance intention research.

Lastly, the study also contributes to the measurement of theoretical constructs as there are no available scales which measure psychological ownership and its determinants in the VLE context. By updating and developing relevant scales, this study formally conceptualised psychological ownership and its antecedents with proactive considerations for the context of cloud-based VLE. These scales were content validated by subject matter experts, translated from the English Language to the Malay Language, pre-

tested, and pilot tested. Measures developed have demonstrated robust levels of reliability and validity in measuring the conceptualised constructs. As the sampling frame was cross sectioned across four northern states in Malaysia, these scales may possess relevance and generalisability for a wider population of Malaysian teachers.

5.3.2 Practical Implications

Local studies noted that Malaysian teachers are not optimising the adoption of technology in schools (Cheok et al., 2017; Hew & Syed Abdul Kadir, 2016a), thus psychological ownership is beneficial to augment their continuance in the Frog VLE because experiences that underlie psychological ownership (experienced control, having knowledge, and investment of the self) are seen as stable (Karahanna et al., 2015). As new cloud services emerge, these findings can help practitioners to improve in design and functionalities that can enhance users' experiences to facilitate teachers' ownership for the VLE. Findings can also offer insights for the MOE in making decisions for resource allocations, policy strategies, and system design. More importantly, this work benefits teachers themselves as it demonstrates how their experiences with Frog VLE can bolster their continuance intention to use it as instructional tool.

The sense of ownership can be susceptible to erosion, whereby an owner sees less of himself/ herself in an object of ownership (Watkins et al., 2016). The study shows that psychological ownership can be strengthen

through improvement of its antecedents of experienced control, knowledge about the VLE, and investment of the self. Additionally, the mediation effects of this study suggest that strategies to promote psychological ownership through these antecedents can contribute to positive belief about the usefulness and ease of use of Frog VLE. Hence, it is fundamental that the experiences of control, having knowledge, and investing oneself into the VLE be maintained through manipulation of system design and policy strategies. To enhance experienced control over the VLE, applications developers can offer more control for teachers in customising their VLEs, especially in terms of creation of learning sites which is a major VLE activity. For instance, rather than offering a few pre-fixed themes for creating learning sites, extra features for customisation can be provided. This can produce unique spaces which satisfy the needs for having personal spaces and stimulation. To strengthen control, ownership can also be encouraged in the digital domain by acknowledging or crediting the creator of the content or digital possession. It is worthwhile for developers to include this acknowledgement in the sharing options, where creators are notified to get them interested in tracking their digital possessions. This can prevent a sense of losing control of digital possessions and weakening of the sense of ownership attributed to sharing or re-posting by unknown individuals. Moreover, it is essential for updates in the VLE to be integrated smoothly so that the platform is not unexpectedly different from what teachers are used to. This is to preserve the platform's familiarity which is essential to psychological ownership. These components of VLE can potentially extend to other educational technologies such as E-learning 3.0 and MOOC, to enhance

users' psychological ownership and beliefs towards a particular technology to foster its continued usage.

Knowledge about the VLE can be enforced through teacher development programmes. Besides the top-down cascade model of knowledge dissemination through trainings, seminars, and conferences which cannot be inclusive, the ministry can consider bottom-up approaches that stems from teacher communities (Kong et al., 2017). For instance, some Asian countries such as Singapore, Taiwan, Hong Kong, and China have in place approaches for e-learning development like: engaging teacher communities responsible for e-learning programmes, sharing of best practices among peers, involving universities to offer courses to teachers, and offering online courses for teachers' self-paced learning (Kong et al., 2017). These strategies can be adopted in Malaysia as they are more inclusive to enable teachers to broaden their knowledge for effective usage of VLE.

With regards to self-investment, this experience was the most salient predictor of psychological ownership, suggesting that the MOE can encourage teachers to contribute more ideas, design, and effort into the Frog VLE. Teachers' contribution into the VLE can be formalised by giving them incentives or recognition for content creation and usage. There is currently the annual 1BestariNet teacher award which honours teachers who implement 21st century learning through Frog VLE, where finalists are chosen via a nomination and voting system, and five winners are then concluded with individual presentations and report (Voon, 2017). Objective measures such as

number of learning sites created, or number of re-used materials by VLE community can be incorporated into the selection criteria. Besides, participation of VLE activities can be formalized, such as recognising teachers' contributions to VLE contents as part of their ICT competency.

Usage of Frog VLE is currently monitored at the school level to indicate satisfactory or unsatisfactory levels of usage. The MOE may consider to track and reward teachers' contribution individually to create awareness and encourage them to "invest" more into the VLE. Instead of rewarding teachers through nomination and voting, VLE service providers can acknowledge teachers individually according to respective contributions to the VLE, for example giving badges to recognise a certain level of participation. Collecting badges can help teachers to map their participation progressively because achievements are self-monitored, and this can be more inclusive compared to recognition given via voting. In terms of system design, it is not enough to just equip the platform with various cloud applications, but also important for developers to create user spaces which encourage teachers to spend more time on the VLE and come to know it well. Hence, cloud service providers need to put equal weights on the cognitive and affective factors (psychological ownership, beliefs, and attitude) to retain service users.

Findings also underscore the significance of ease of use, suggesting that it is still important despite teachers having experience in using VLE. Hence it is important to pay urgent attention to technical knowledge and solutions for teachers to alleviate their problems encountered while using the platform.

Findings also suggest that continuous training programs are important for teachers to keep abreast of the essential ICT skills to use the VLE, despite the national implementation of the platform six years ago. It must be noted that training, as a control variable, was significant to continuance intention. This indicates that teachers still need to master the fundamental competencies to use the plethora of subscribed virtualized resources and applications provided by cloud services, as it can affect their intention to continue using the VLE. Alternatively, IT personnel can also be deployed to assist teachers to overcome technical barriers. There is currently no such position available in schools, where usually one of the teachers in the schools is appointed to administer the platform.

5.4 Limitations of the Study with Future Recommendations

One of the limitations of the study lies in the internal validity of the study. The first threat to internal validity is posed by the possibility of bi-directional effects. For example, psychological ownership may influence individuals to be more willing to invest in an object, yet, PLS does not allow the examination of this possibility. Even though the directions of constructs in this study are hypothesised based on theoretical exposition, future study could venture into other possible interactions among constructs in the model. The second threat to internal validity exists in the cross-sectional nature of the data collected. Even though data were cross-sectioned across states and school districts, this nature of research design may restraint understanding of the degree that causality can be established within a wider population. Future

studies might focus on a longitudinal research design to strengthen the causality and directions of the relationship between constructs in affecting continuance intention. Longitudinal study can also track the changes in teachers' psychological ownership, beliefs structure, and attitude towards using the VLE to deepen understanding of their continuance intention in the VLE.

Another limitation concerns the external validity of the present study. In terms of locality, interpretation of results can only be generalised to the four Malaysian states in the northern region where data were collected even though the study examined a homogenous technology (Frog VLE) and respondents have similar responsibilities (teaching in secondary schools). Besides this, the scope of the study is limited to teachers of secondary schools. Users' beliefs, attitudes, experiences with VLE, and psychological ownership can be viewed differently from other contexts such as in universities, teacher training institutions, or primary schools. Findings cannot be generalised to these contexts, for instance, to pre-service teachers who may not have enough exposure to a VLE, and thus they do not have adequate time to develop psychological ownership. Nevertheless, this limitation opens opportunity for future research to test the applicability of the hypothesised model in other contexts.

While the model demonstrates good predictive validity of teachers' intention to continue using Frog VLE, there is still a portion of the variance not being accounted for. Future investigation can include additional factors to enhance the model's explanatory ability on continuance intention. The model

can be extended to include system related variables such as design of digital environment (Baxter et al., 2015), information quality (Rodríguez-Ardura & Meseguer-Artola, 2016; Wu & Zhang, 2014; Yang et al., 2017), and perceived interactivity (Kirk & Swain, 2015). This could provide new insights into the VLE's attributes which affect users' psychological ownership and intention to continue using it. Apart from this, moderators can be included, such as training because it was found to be significant as control variables. Additionally, the partial mediating effect of most of the mediational hypotheses is suggestive of the possibilities of other factors which can intervene these hypotheses. This indicates that future investigation can include other related mediating variables such as task-technology fit and individual-technology fit (Lin, 2012; Wu & Chen, 2017) to deepen understanding of the model's relationship. Apart from testing other mediating variables, future research can look into other means of testing the mediators in the hypothesised model. For instance, attitude can be classified in terms of attitude strength, as some research suggested that strong attitude can give rise to full mediation, while weak attitude can result in partial mediation (Kim et al., 2009). Besides this, perceived usefulness which taps into teachers' performance is found insignificant, and future work can delineate this construct according to achievement of specific performance goals, to reflect different dimensions of teachers' performance (Scherer, Siddiq, & Teo, 2015). Testing the mediators with these suggested approaches can lend a more comprehensive understanding of the mechanism between predictors and endogenous variables.

Also, the study investigated psychological ownership from its positive and constructive perspective in bringing benefits to a VLE. However, there may be a negative side to its effect. For instance, instead of promoting VLE use, it is possible for teachers to become overtly possessive over their VLE, thus inducing territorial, protective, or competitive behaviours. These behaviours may prevent teachers from sharing VLE contents with other teachers, possibly hinders good practices and collaborative efforts. This can be a crucial tilting point for future investigation in psychological ownership, and research can look at the negative consequences of psychological ownership as it may be potentially destructive to the effectiveness and purported objectives of the VLE.

Lastly, as the research model only accounted for 67.7% variance in continuance intention, it may be limited by the exclusion of other factors especially contextual factors. Users' decisions in using technology may be affected by contextual factors such as subjective norm, leadership support in using VLE, the availability of resources, or Internet speed which can affect users' decision in using the Frog VLE.

5.5 Conclusion

To conclude, this last chapter of the dissertation presented the discussions of the results obtained for the hypothesised paths of the research model, and discussed theoretical implications stimulated by the research and practical implications interpreted from the results obtained. Limitations of the research are also presented together with suggestion for future research to

address them. As such, this work successfully achieved its research objectives by empirically providing a clear picture of teacher's intention to continue using Frog VLE through the mechanism of their psychological ownership, beliefs, and attitude.

This work presented a detailed investigation to explain continuance intention of a VLE among Malaysian teachers, through psychological ownership, beliefs, and attitude. By using the TAM as a base model, this research demonstrated the applicability of psychological ownership in examining continuance intention, and paved the way for future research to delve into the ownership effect for sustainability and continuity of technology use. As psychological ownership explains how a sense of self can be embedded within a particular technology, the concept would be valuable in this technology-mediated world.

Further, this work has provided empirical evidences from the Southeast Asian perspective to demonstrate the applicability of concepts originally developed in the Western world. Culture plays an important role in the manifestation of human behaviours and feelings, and this work has contributed to a more inclusive global view to widen the boundary of understanding of users' continuance intention across cultures.

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Davis, Fred <fred.davis@ttu.edu>
To: YIM SAU CHING JOANNE <yimsc@tarc.edu.my>

Tue, May 30, 2017 at 5:07 AM

Joanne
You have my permission to adopt, adapt, and translate the scales from my 1989 MISQ paper for your doctoral research.

Best wishes
Fred Davis

From: YIM SAU CHING JOANNE [yimsc@tarc.edu.my]
Sent: Sunday, May 28, 2017 7:59 PM
To: Davis, Fred
Subject: Permission to used scales developed for purpose of PhD studies

Good day professor.

Greetings from Malaysia.

I am a post-grad student undergoing doctoral research in the area of web-based learning. My PhD research involves users' behavior and experience in a virtual learning environment. A recent review had noted that your originally validated scales of PU and PEOU have better measurement characteristics and yield better reliability coefficient (Hess, T. J., McNab, A. L., & Basoglu, K. A. (2014). Reliability Generalization of Perceived Ease of Use, Perceived Usefulness, and Behavioral Intentions. *Mis Quarterly*, 38(1), 1-28).

For this purpose, I would like to seek your permission to adopt, adapt, and translate (Malay Language) the scales used for the following research.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.

Your consent is highly appreciated and will greatly facilitate the study.

Thanking you in advance.

Yours sincerely,

Joanne Yim (Ms)

Universiti Tunku Abdul Rahman
Jalan Universiti Bandar Barat,
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Malaysia



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YIM SAU CHING JOANNE <yimsc@tarc.edu.my>
To: YIM SAU CHING JOANNE <yimsc@tarc.edu.my>

Mon, Nov 12, 2018 at 11:27 AM

On Tue, Jan 10, 2017 at 10:44 PM henri barki <henri.barki@hec.ca> wrote:

Dear Ms. Yim,

Thank you for your message and your interest in translating and using the scales of the studies in question. So long as you cite their source in your thesis and related publications, please feel free to use them as you see fit. I wish you plenty of success in your research

Cordially,

Henri Barki, MSRC (FRSC)

Chaire de recherche du Canada en implantation et gestion des TI
(Canada Research Chair in IT Implementation and Management)
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<http://chaireimplantationti.hec.ca/>

De : YIM SAU CHING JOANNE [mailto:yimsc@tarc.edu.my]

Envoyé : 10 janvier 2017 07:35

À : henri barki <henri.barki@hec.ca>

Objet : From Malaysia - Permission to use scales developed

Good day Professor,

Greetings from Malaysia. I am a post-grad student undergoing doctoral research in the area of Technology Acceptance. My research involves investigations of e-learning system among teachers, with the main variables of user participation, psychological ownership of IT and technology acceptance. For this purpose, I would like to seek your permission to adopt, adapt, and translate (Malay Language) the scales used for the following research.

Barki, H., Paré, G., & Sicotte, C. (2008). Linking IT implementation and acceptance via the construct of psychological ownership of information technology. *Journal of Information Technology*, 23, 269-280.

Your consent will be highly appreciated and greatly facilitate the study.

Thanking you in advance.

Yours sincerely,

Ms Joanne Yim

University Tunku Abdul Rahman

YIM SAU CHING JOANNE <yimsc@tarc.edu.my>
To: wtwang@mail.ncku.edu.tw

Tue, Jan 10, 2017 at 9:13 PM

Good day Professor,

Greetings from Malaysia.

I am a student undergoing doctoral research in the area of Educational Technology. My research focuses on the acceptance of virtual learning environment among teachers. For this purpose, I would like to seek your permission to adopt, adapt, and translate (Malay Language) the scales used for the following research.

Wang, W. T., & Wang, C. C. (2009). An empirical study of instructor adoption of web-based learning systems. *Computers & Education*, 53, 761-774. doi:10.1016/j.compedu.2009.02.021

Your consent is highly appreciated and will greatly facilitate the study.

Thanking you in advance.

Yours sincerely,

Ms Joanne Yim
Universiti Tunku Abdul Rahman
Jalan Universiti Bandar Barat,
Kampar, Perak, 31900, Malaysia

Wei-Tsong Wang <wtwang@mail.ncku.edu.tw>
To: YIM SAU CHING JOANNE <yimsc@tarc.edu.my>

Tue, Jan 10, 2017 at 9:14 PM

Dear Joanne

Please feel free to use the scale. I wish you the best with your research.

Wei-Tsong Wang
Professor
Department of Industrial and Information
Management
National Cheng Kung University
1 University Road, Tainan 701, Taiwan
Tel: +886-6-2757575 ext. 53122
Fax: +886-6-2362162

林甘敏 <linmin@teamail.ltu.edu.tw>
To: YIM SAU CHING JOANNE <yimsc@tarc.edu.my>

Sat, Mar 25, 2017 at 2:55 PM

Dear Joanne Yim

Yes, you can use it.

Best wishes,

Kan-min Lin

----- Original Message -----

From: YIM SAU CHING JOANNE <yimsc@tarc.edu.my>

To: linmin@teamail.ltu.edu.tw

Sent: 2017/03/24 16:12b

Good day Professor,

Greetings from Malaysia.

I am a student undergoing doctoral research in the area of virtual learning environment among teachers. For this purpose, I would like to seek your permission to adopt, adapt, and translate (Malay Language) the scales developed in the following research.

Lin, K. (2011). E-Learning continuance intention: Moderating effects of user e-learning experience. *Computers & Education*, 56(6), 515-526. doi:10.1016/j.compedu.2010.09.017.

Your consent is highly appreciated and will greatly facilitate the study.

Thanking you in advance.

Yours sincerely,

Joanne Yim (Ms)

Universiti Tunku Abdul Rahman
Jalan Universiti Bandar Barat,
Kampar, Perak, 31900, Malaysia

On Fri, May 26, 2017 at 4:55 PM Ritu Agarwal <ragarwal@rsmith.umd.edu> wrote:

Dear Joanne,
You have my permission to use the scale.

Best,
Ritu

On Fri, May 26, 2017 at 4:12 AM, YIM SAU CHING JOANNE <yimsc@tarc.edu.my> wrote:

Dear Professor Ritu,

Greetings from Malaysia.

I am a post-grad student undertaking doctoral research. My research involves investigations of psychological ownership and users' behavior of a virtual learning platform. The scales will be use for my PhD research and not for commercial purposes. For this reason, I would like to seek your permission to adopt, adapt, and translate (Malay Language) the scales used for the following study.

Zhang, T., Agarwal, R., & Lucas, H. C. (2011). The value of IT-enabled retailer learning: Personalized product recommendations and customer store loyalty in electronic markets. *MIS Quarterly*, 35(4), 859-881.

Thank you.

Joanne Yim (Ms)
Tunku Abdul Rahman University College

Ritu Agarwal
Senior Associate Dean
Professor and Dean's Chair of Information Systems
Director, Center for Health Information and Decision Systems
Robert H. Smith School of Business
2416F Van Munching Hall
University of Maryland
College Park, MD 20742-1815
301.405.3121 TEL
301.314.9120 FAX
<http://www.rsmith.umd.edu/chids>
<http://www.rsmith.umd.edu/directory/ritu-agarwal>

Appendix B

Final Questionnaire



Kajian Niat Meneruskan Penggunaan Persekitaran Pembelajaran Maya Dalam Kalangan Guru-Guru

Guru-guru yang dihormati,

Soal selidik ini bertujuan untuk mendapatkan respon daripada guru-guru sekolah tentang Frog VLE. Tuan/puan dengan segala hormatnya diminta memilih SATU pernyataan dengan menandakan (✓) pada petak yang disediakan atau membulatkan pilihan tuan/puan. Identiti tuan/puan tidak akan didedahkan dalam mana-mana laporan kajian, dan semua respon yang diberi akan dianggap sulit. Tiada jawapan yang dinilai betul atau salah, dan semua respon adalah amat penting bagi kami. Tuan/puan juga berhak menarik diri daripada menjalani kajian ini pada bila-bila masa. Masa yang diperuntukkan untuk menjawab soal selidik ini ialah lebih kurang 15 minit. Terima kasih atas kerjasama dan sokongan tuan/puan.

Bahagian A – Maklumat latar belakang

1. *Jantina:* Perempuan Lelaki

2. *Kelayakan tertinggi:*
Sijil/Diploma Ijazah Sarjana Muda Lيسان Ijazah & ke atas

3. *Pernahkah anda menggunakan VLE-Frog?* Ya Tidak

4. *Pernahkah anda menghadiri bengkel VLE-Frog?* Ya Tidak

5. *Berapa kali pernah anda menghadiri bengkel VLE-Frog?* _____ kali

6. *Pengalaman menggunakan VLE-Frog:* _____ tahun

7. *Umur:* _____ tahun

8. *Pengalaman mengajar:* _____ tahun

9. *Beban mengajar mingguan:* _____ jam

Bahagian B: Pengalaman berkaitan dengan penggunaan Frog VLE

No	Penyataan	Sangat tidak setuju	Tidak setuju	Agak Tidak setuju	Tidak setuju ataupun setuju	Agak setuju	Setuju	Sangat setuju
EC1	<i>Saya mempunyai pengaruh terhadap perkara-perkara yang membawa kesan ke atas akaun Frog VLE saya.</i>	1	2	3	4	5	6	7
EC2	<i>Saya mempunyai pengaruh terhadap tugas-tugas yang saya lakukan dalam Frog VLE saya.</i>	1	2	3	4	5	6	7
EC3	<i>Saya mempengaruhi keputusan yang dibuat terhadap Frog VLE saya.</i>	1	2	3	4	5	6	7
EC4	<i>Saya menetapkan tarikh akhir menyelesaikan tugas dalam Frog VLE saya.</i>	1	2	3	4	5	6	7
EC5	<i>Saya mengawal jadual tugas-tugas yang melibatkan Frog VLE.</i>	1	2	3	4	5	6	7
EC6	<i>Saya berasa dapat mengawal interaksi yang berlaku di dalam Frog VLE.</i>	1	2	3	4	5	6	7
EC7	<i>Saya berada dalam kawalan ketika melayari laman Frog VLE.</i>	1	2	3	4	5	6	7
K1	<i>Saya amat biasa dengan perkara yang sedang berlaku dengan akaun Frog VLE saya.</i>	1	2	3	4	5	6	7
K2	<i>Saya mempunyai pengetahuan mendalam mengenai Frog VLE.</i>	1	2	3	4	5	6	7
K3	<i>Saya mempunyai pemahaman yang komprehensif tentang fungsi-fungsi dalam Frog VLE.</i>	1	2	3	4	5	6	7
K4	<i>Saya mempunyai pemahaman yang luas tentang Frog VLE.</i>	1	2	3	4	5	6	7
K5	<i>Saya sentiasa tahu cara mencari maklumat yang saya perlukan dalam Frog VLE.</i>	1	2	3	4	5	6	7
K6	<i>Saya selalu mengunjungi laman Frog VLE.</i>	1	2	3	4	5	6	7
K7	<i>Saya telah mengunjungi laman Frog VLE banyak kali.</i>	1	2	3	4	5	6	7
IN1	<i>Saya menumpukan sebahagian besar diri saya dalam penggunaan Frog VLE.</i>	1	2	3	4	5	6	7

No	Penyataan	Sangat tidak setuju	Tidak setuju	Agak Tidak setuju	Tidak setuju ataupun setuju	Agak setuju	Setuju	Sangat setuju
IN2	<i>Saya telah menyumbang banyak idea saya dalam Frog VLE.</i>	1	2	3	4	5	6	7
IN3	<i>Saya telah menyumbang bakat saya dalam Frog VLE.</i>	1	2	3	4	5	6	7
IN4	<i>Saya telah meluang sejumlah besar masa saya dalam Frog VLE.</i>	1	2	3	4	5	6	7
IN5	<i>Saya selalu menggunakan Frog VLE untuk kerja.</i>	1	2	3	4	5	6	7
IN6	<i>Saya selalu menggunakan Frog VLE untuk tujuan pengajaran dan pembelajaran.</i>	1	2	3	4	5	6	7

Persepsi tentang Frog VLE

No	Penyataan	Sangat tidak setuju	Tidak setuju	Agak Tidak setuju	Tidak setuju ataupun setuju	Agak setuju	Setuju	Sangat setuju
PU 1	<i>Penggunaan Frog VLE meningkatkan prestasi kerja saya.</i>	1	2	3	4	5	6	7
PU 2	<i>Frog VLE membolehkan saya menyelesaikan tugas dengan lebih cepat.</i>	1	2	3	4	5	6	7
PU 3	<i>Penggunaan Frog VLE meningkatkan hasil kerja saya.</i>	1	2	3	4	5	6	7
PU 4	<i>Penggunaan Frog VLE meningkatkan keberkesanan kerja saya.</i>	1	2	3	4	5	6	7
PU 5	<i>Penggunaan Frog VLE memudahkan kerja saya.</i>	1	2	3	4	5	6	7
PU 6	<i>Saya mendapati Frog VLE berguna untuk kerja saya.</i>	1	2	3	4	5	6	7
PU 7	<i>Penggunaan Frog VLE meningkatkan interaksi saya dengan pelajar-pelajar.</i>	1	2	3	4	5	6	7
PU 8	<i>Frog VLE menggalakkan penggunaan semula bahan-bahan rujukan pengajaran.</i>	1	2	3	4	5	6	7
PO 1	<i>Saya menghabiskan banyak (masa, idea, tenaga dll) dalam pelaksanaan Frog VLE.</i>	1	2	3	4	5	6	7
PO 2	<i>Saya boleh mengaitkan pengajaran saya dalam Frog VLE.</i>	1	2	3	4	5	6	7

No	Penyataan	Sangat tidak setuju	Tidak setuju	Agak Tidak setuju	Tidak setuju ataupun setuju	Agak setuju	Setuju	Sangat setuju
PO 3	<i>Saya berasa Frog VLE dimiliki oleh semua guru.</i>	1	2	3	4	5	6	7
PO 4	<i>Saya mempunyai pemilikan yang tinggi terhadap akaun Frog VLE saya.</i>	1	2	3	4	5	6	7
PO 5	<i>Saya menganggap diri saya sebagai penyokong pelaksanaan Frog VLE di sekolah saya.</i>	1	2	3	4	5	6	7
PO 6	<i>Saya menyusun atur kandungan Frog VLE berdasarkan strategi pengajaran saya.</i>	1	2	3	4	5	6	7
PEU 1	<i>ia adalah mudah bagi saya untuk belajar menggunakan Frog VLE.</i>	1	2	3	4	5	6	7
PEU 2	<i>ia adalah mudah untuk menyuruh Frog VLE melakukan apa yang saya inginkan.</i>	1	2	3	4	5	6	7
PEU 3	<i>ia adalah mudah bagi saya untuk memahami cara menggunakan Frog VLE.</i>	1	2	3	4	5	6	7
PEU 4	<i>Frog VLE adalah fleksibel untuk digunakan untuk bekerja.</i>	1	2	3	4	5	6	7
PEU 5	<i>Frog VLE adalah mudah untuk digunakan.</i>	1	2	3	4	5	6	7
PEU 6	<i>ia adalah mudah bagi saya untuk menjadi mahir dalam penggunaan Frog VLE.</i>	1	2	3	4	5	6	7
PEU 7	<i>Saya mendapati ia mudah untuk menggunakan Frog VLE sepertimana yang dikehendaki dalam rancangan pengajaran saya.</i>	1	2	3	4	5	6	7
PEU 8	<i>ia adalah mudah bagi saya untuk membetulkan kesilapan semasa menggunakan Frog VLE.</i>	1	2	3	4	5	6	7
ATT 1	<i>Setelah saya menggunakan Frog VLE, saya akan terus menggunakannya.</i>	1	2	3	4	5	6	7
ATT 2	<i>Penggunaan Frog VLE adalah menyenangkan.</i>	1	2	3	4	5	6	7
ATT 3	<i>Saya suka menggunakan Frog VLE.</i>	1	2	3	4	5	6	7
ATT 4	<i>Frog VLE menjadikan kerja saya lebih menarik.</i>	1	2	3	4	5	6	7
ATT 5	<i>Frog VLE adalah seronok untuk digunakan.</i>	1	2	3	4	5	6	7
ATT 6	<i>Saya menanti-nantikan aspek kerja saya yang melibatkan Frog VLE.</i>	1	2	3	4	5	6	7
CI 1	<i>Saya akan kerap menggunakan Frog VLE pada masa hadapan.</i>	1	2	3	4	5	6	7

No	Penyataan	Sangat tidak setuju	Tidak setuju	Agak Tidak setuju	Tidak setuju ataupun setuju	Agak setuju	Setuju	Sangat setuju
CI 2	<i>Saya akan amat mengesyorkan penggunaan Frog VLE kepada orang lain.</i>	1	2	3	4	5	6	7
CI 3	<i>Saya akan selalu menggunakan Frog VLE pada masa hadapan.</i>	1	2	3	4	5	6	7
CI 4	<i>Saya akan terus menggunakan Frog VLE untuk melaksanakan pengajaran dan pembelajaran.</i>	1	2	3	4	5	6	7

Terima kasih!

SECTION B: Experience with Frog VLE

No	Statement	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
EC1	I have influence over the things that affect my Frog VLE account.	1	2	3	4	5	6	7
EC2	I have influence over the tasks that I perform in my Frog VLE.	1	2	3	4	5	6	7
EC3	I influence decisions made on my Frog VLE.	1	2	3	4	5	6	7
EC4	I set my own deadlines in my Frog VLE.	1	2	3	4	5	6	7
EC5	I control the scheduling of the tasks that involve Frog VLE.	1	2	3	4	5	6	7
EC6	I felt in control of the interaction in the Frog VLE.	1	2	3	4	5	6	7
EC7	I feel in control when using the Frog VLE	1	2	3	4	5	6	7
K1	I am intimately familiar with what is going on with regard to my Frog VLE account.	1	2	3	4	5	6	7
K2	I have a depth of knowledge which relates to Frog VLE.	1	2	3	4	5	6	7
K3	I have a comprehensive understanding of the functions in Frog VLE.	1	2	3	4	5	6	7
K4	I have a broad understanding of Frog VLE.	1	2	3	4	5	6	7
K5	I always know where I can find the information I am looking for in Frog VLE.	1	2	3	4	5	6	7
K6	I visit Frog VLE very often.	1	2	3	4	5	6	7
K7	I have visited Frog VLE many times.	1	2	3	4	5	6	7
IN1	I have invested a major part of "myself" into Frog VLE.	1	2	3	4	5	6	7
IN2	I have invested many of my ideas into Frog VLE.	1	2	3	4	5	6	7

No	Statement	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
IN3	I have invested a number of my talents into Frog VLE.	1	2	3	4	5	6	7
IN4	I have invested a significant amount of my time into Frog VLE.	1	2	3	4	5	6	7
IN5	I often perform work using Frog VLE.	1	2	3	4	5	6	7
IN6	I often use Frog VLE for teaching and learning purposes.	1	2	3	4	5	6	7

Perception about Frog VLE

No	Statement	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
PU 1	Frog VLE enables me to accomplish tasks more quickly.	1	2	3	4	5	6	7
PU 2	Using Frog VLE improves my job performance.	1	2	3	4	5	6	7
PU 3	Using Frog VLE increases my job productivity.	1	2	3	4	5	6	7
PU 4	Using Frog VLE improves my work effectiveness.	1	2	3	4	5	6	7
PU 5	Using Frog VLE makes my job easier.	1	2	3	4	5	6	7
PU 6	I find Frog VLE useful to my job.	1	2	3	4	5	6	7
PU 7	Using Frog VLE enhances my interactions with the students.	1	2	3	4	5	6	7
PU 8	Using Frog VLE increases the reuse rate of the teaching and learning materials.	1	2	3	4	5	6	7
PO 1	I personally invested a lot (time, ideas, energy etc.) in the implementation of the Frog VLE.	1	2	3	4	5	6	7
PO 2	I can see a part of my teaching in the Frog VLE.	1	2	3	4	5	6	7
PO 3	I feel the Frog VLE belongs to all the teachers.	1	2	3	4	5	6	7

No	Statement	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
PO 4	I feel a high level of ownership toward the Frog VLE.	1	2	3	4	5	6	7
PO 5	I see myself as a supporter of the Frog VLE in my school.	1	2	3	4	5	6	7
PO 6	I organized the content of the Frog VLE to better align it with my teaching practice.	1	2	3	4	5	6	7
PEU 1	It is easy for me to learn to use Frog VLE.	1	2	3	4	5	6	7
PEU 2	I find it easy to get Frog VLE to do what I want it to do.	1	2	3	4	5	6	7
PEU 3	It is easy for me to understand how to use Frog VLE.	1	2	3	4	5	6	7
PEU 4	The Frog VLE is flexible to work with.	1	2	3	4	5	6	7
PEU 5	Frog VLE is easy to use.	1	2	3	4	5	6	7
PEU 6	It is easy for me to become skilful at using Frog VLE.	1	2	3	4	5	6	7
PEU 7	I find it easy to use Frog VLE to carry out my lesson plan.	1	2	3	4	5	6	7
PEU 8	It is easy for me to recover from errors encountered while using Frog VLE.	1	2	3	4	5	6	7
ATT 1	Once I start using Frog VLE for teaching, I find it hard to stop.	1	2	3	4	5	6	7
ATT 2	I find using Frog VLE to be enjoyable.	1	2	3	4	5	6	7
AT 3	I like using Frog VLE.	1	2	3	4	5	6	7
ATT 4	Frog VLE makes work more interesting.	1	2	3	4	5	6	7
ATT 5	Working with Frog VLE is fun.	1	2	3	4	5	6	7
ATT 6	I look forward to those aspects of my job that require me to use Frog VLE.	1	2	3	4	5	6	7
CI 1	I will use the Frog VLE on a regular basis in the future.	1	2	3	4	5	6	7

No	Statement	Strongly disagree	Disagree	Somewhat disagree	Neither agree or disagree	Somewhat agree	Agree	Strongly agree
CI 2	I will strongly recommend others to use Frog VLE.	1	2	3	4	5	6	7
CI 3	I will frequently use Frog VLE system in the future.	1	2	3	4	5	6	7
CI 4	I will continue using the Frog VLE for instructional purposes.	1	2	3	4	5	6	7

Thank you!

Appendix C

Permission by Universiti Tunku Abdul Rahman Ethical Review Committee to Conduct Research



UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

Re: U/SERC/08/2017

8 February 2017

Dr Priscilla a/p Moses
Department of General Studies
Faculty of Creative Industries
Universiti Tunku Abdul Rahman
Jalan Sungai Long
Bandar Sungai Long
43000 Kajang
Selangor

Dear Dr Priscilla,

Ethical Approval For Research Project/Protocol

We refer to your application dated 23 January 2017 for ethical approval for your research project (PhD candidate's project) and are pleased to inform you that your application has been approved under expedited review.

The details of your research project are as follows:

Research Title	Modeling Teachers' Usage of Virtual Learning Environment: The Role of User Participation and Psychological Ownership in an Extended Technology Acceptance Model
Investigator(s)	Dr Priscilla a/p Moses (PI) Joanne Yim Sau Ching (UTAR Postgraduate Student)
Research Area	Social Sciences
Research Location	Secondary Schools in Perak
No of Participants	377 participants (Age: 20 - 65)
Research Costs	UTAR Research Fund
Approval Validity	8 February 2017 - 7 February 2018

The conduct of this research is subject to the following:

- (1) The participants' informed consent be obtained prior to the commencement of the research,
- (2) Confidentiality of participants' personal data must be maintained; and
- (3) Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.

Address: Jalan Sg. Long, Bandar Sg. Long, Cheras, 43000 Kajang, Selangor D.E. Postal Address: P O Box 11384, 50744 Kuala Lumpur, Malaysia
Tel: (603) 9086 0288 Fax: (603) 9019 8868 Homepage: <http://www.utar.edu.my>

Should you collect personal data of participants in your study, please have the participants sign the attached Personal Data Protection Statement for your records.

The University wishes you all the best in your research.

Thank you.

Yours sincerely,

A handwritten signature in black ink, consisting of a large, sweeping arch that starts on the left, rises to a peak, and then descends to the right.

Professor Ir Dr Lee Sze Wei
Chairman
UTAR Scientific and Ethical Review Committee

c.c Dean, Faculty of Creative Industries
 Director, Institute of Postgraduate Studies and Research

Appendix D

Permission by Division of Education Policies Research and Planning to Conduct Research



KEMENTERIAN PENDIDIKAN MALAYSIA
MINISTRY OF EDUCATION MALAYSIA
BAHAGIAN PERANCANGAN DAN PENYELIDIKAN DASAR PENDIDIKAN
EDUCATIONAL PLANNING AND RESEARCH DIVISION
ARAS 1-4, BLOK E8
KOMPLEKS KERAJAAN PARCEL E
PUSAT Pentadbiran Kerajaan Persekutuan
62604 PUTRAJAYA



KEMENTERIAN
PENDIDIKAN
MALAYSIA

Telefon : 03-8884 6500
Faks : 03-8884 6439
Laman Web : www.moe.gov.my

Ruj. Kami : KPMS.P.600-3/2/3 Jld ()

Tarikh : 03 November 2016

Joanne Yim Sau Ching
K.P.:780912085634

Jalan Kolej
Taman Bandar Baru
31900 Kampar
Perak

Tuan,

KELULUSAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH, INSTITUT PENDIDIKAN GURU, JABATAN PENDIDIKAN NEGERI DAN BAHAGIAN DI BAWAH KEMENTERIAN PENDIDIKAN MALAYSIA

Perkara di atas adalah dirujuk.

2. Sukacita dimaklumkan bahawa permohonan tuan untuk menjalankan kajian seperti di bawah telah diluluskan.

" Modelling Teachers' Acceptance of Virtual Learning Environment: The Role of User Participation and Psychological Ownership in an Extended Technology Acceptance Model "

3. Kelulusan ini adalah berdasarkan kepada kertas cadangan penyelidikan dan instrumen kajian yang dikemukakan oleh tuan kepada Bahagian ini. Walau bagaimanapun kelulusan ini bergantung kepada kebenaran Jabatan Pendidikan Negeri dan Pengetua / Guru Besar yang berkenaan.

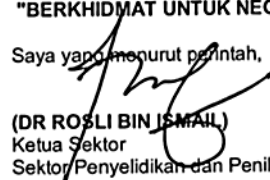
4. Surat kelulusan ini sah digunakan bermula dari **31 Januari 2017 hingga 30 September 2017**.

5. Tuan juga mesti menyerahkan senaskhah laporan akhir kajian dalam bentuk *hardcopy* bersama salinan *softcopy* berformat Pdf di dalam CD kepada Bahagian ini. Tuan diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian ini sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum, seminar atau diumumkan kepada media massa.

Sekian untuk makluman dan tindakan tuan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,


(DR ROSLI BIN ISMAIL)
Ketua Sektor
Sektor Penyelidikan dan Penilaian
b.p. Pengarah
Bahagian Perancangan dan Penyelidikan Dasar Pendidikan
Kementerian Pendidikan Malaysia



Appendix E

Permission by State Education Departments of Perak, Pulau Pinang, Kedah, and Perlis to Conduct Research



KEMENTERIAN PENDIDIKAN MALAYSIA

Jabatan Pendidikan Negeri Perak
Jalan Tun Abdul Razak
30640 Ipoh, Perak Darul Ridzuan

Tel : 605 501 5000
Faks : 605 527 7273
Laman Web : <http://jpnperak.moe.gov.my>

“1MALAYSIA : RAKYAT DIDAHULUKAN PENCAPAIAN DIUTAMAKAN”

Ruj. Tuan :

Ruj. Kami : J. Pel. Pk (AM)5114/4 Jld.26 (60)

Tarikh : 02 Oktober 2017

JOANNE YIM SAU CHING,

Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej,
Taman Bandar Baru,
31900 Kampar,
Perak Darul Ridzuan.

Tuan,

KELULUSAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH - SEKOLAH DI NEGERI PERAK DI BAWAH JABATAN PENDIDIKAN NEGERI PERAK

Sukacitanya perkara di atas di rujuk dan surat dari Bahagian Perancangan Dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia, Rujukan : KPMSPP.600-3/2/3 Jld 30 (90) bertarikh 14 September 2017 adalah berkaitan.

2. Sehubungan dengan itu, dimaklumkan bahawa Jabatan Pendidikan Negeri Perak **tiada halangan** untuk membenarkan pihak tuan menjalankan kajian “**Modelling Teacher’ Acceptance of Virtual Learning Environment: The Role of User Participation and Psychological Ownership in an Extended Technology Acceptance Model**” seperti dinyatakan dalam surat tuan dengan syarat-syarat berikut :-

- 2.1 Pihak tuan perlu mendapatkan kebenaran terlebih dahulu daripada Pegawai Pendidikan Daerah dan Pengetua sekolah untuk menggunakan sampel kajian;
- 2.2 Kajian yang dijalankan hendaklah tidak mengganggu proses pengajaran dan pembelajaran yang telah ditetapkan oleh pihak sekolah;
- 2.3 Pihak tuan bertanggungjawab menjaga keselamatan dan kebajikan guru-guru yang terlibat dalam kajian ini;
- 2.4 Pihak tuan hendaklah bertanggungjawab menanggung semua kos kajian;
- 2.5 Guru-guru/ murid tidak boleh dipaksa terlibat dengan kajian ini;

Perak Excellent

Sila catatkan rujukan Jabatan ini apabila berhubung



2.6 Pihak tuan dipohon agar mengemukakan satu (1) salinan laporan kajian dalam tempoh 30 hari ke jabatan ini selepas kajian tersebut dilaksanakan; dan

2.7 Tiada sebarang implikasi kewangan terhadap Jabatan Pendidikan Negeri Perak, Pejabat Pendidikan Daerah dan pihak sekolah.

3. Sukacita juga dingatkan sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum atau seminar atau diumumkan kepada media massa, pihak tuan perlulah **mendapatkan kebenaran terlebih dahulu** daripada Bahagian Perancangan dan Penyelidikan Dasar Pendidikan Kementerian Pendidikan Malaysia dan satu salinan kepada Jabatan Pendidikan Negeri Perak.

4. Kebenaran permohonan ini adalah untuk tujuan yang dipohon dan melibatkan sekolah dalam daerah yang dinyatakan sahaja dan luput selepas tarikh 30 April 2018

Sekian terima kasih.

“BERKHIDMAT UNTUK NEGARA”

Saya yang menuruf perintah,



(HAJI MOHD ROSLI BIN AHMAD, AMP. PPT.)

Timbalan Pengarah Pendidikan Negeri Perak

b.p Pengarah Pendidikan Negeri Perak

- s.k
1. Pengarah Pendidikan Negeri Perak
 2. Ketua Sektor Pengurusan Sekolah
 3. Semua Pegawai Pendidikan Daerah



JABATAN PENDIDIKAN PULAU PINANG
JALAN BUKIT GAMBIR
11700 PULAU PINANG
Tel : 04-657 5500, Faks : 04-658 2500
<http://jpnpp.edu.my>



"1 MALAYSIA : RAKYAT DIDAHULUKAN PENCAPAIAN DIUTAMAKAN."

Ruj Tuan :
Ruj Kami : JPNPP(PER) 1000-4/2 Jld.11 Bil(53)
Tarikh : 29 September 2017

 **Jeanne Yim Sau Ching**
Kolej Universiti Tunku Abdul Rahman, Jalan Kolej, Taman Bandar Baru
31900 Kampar, Perak

Tuan/Puan,

**KELULUSAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH, INSTITUT
PERGURUAN, JABATAN PENDIDIKAN NEGERI DAN BAHAGIAN – BAHAGIAN DI
BAWAH KEMENTERIAN PENDIDIKAN MALAYSIA**

Dengan hormatnya saya diarah merujuk perkara tersebut di atas.

2. Surat kelulusan menjalankan kajian daripada Bahagian Perancangan Dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia KPM.600-3/2/3 Jld 30(98) bertarikh **14 September 2017** adalah dirujuk.

3. Dengan ini dimaklumkan bahawa pihak Jabatan Pendidikan Pulau Pinang, tiada halangan untuk Tuan/Puan menjalankan penyelidikan di sekolah-sekolah negeri Pulau Pinang yang bertajuk:

"Modelling Teachers' Acceptance of Virtual Learning Environment: The Role of User Participation and Psychological Ownership in an Extended Technology Acceptance Model" diluluskan.

4. Walau bagaimanapun Tuan/Puan adalah tertakluk kepada syarat-syarat seperti berikut:
- 4.1 Mendapat kebenaran dari Pengetua/Guru Besar sekolah berkenaan.
 - 4.2 Tidak mengganggu perjalanan, peraturan dan disiplin sekolah.
 - 4.3 Segala maklumat yang dikumpul adalah untuk tujuan akademik sahaja.
 - 4.4 Menghantar satu salinan laporan kajian ke Jabatan ini setelah selesai kajian.
 - 4.5 Sila kemukakan surat ini apabila berurusan dengan pihak sekolah.
 - 4.6 Surat ini berkuatkuasa sehingga **30 April 2018**.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang meurut perintah,


(**ZURIDA BINTI MUSTAPHA**)
Penolong Pendaftar Institusi Pendidikan
Jabatan Pendidikan Pulau Pinang
b.p Ketua Pendaftar Institusi Pendidikan
Kementerian Pendidikan Malaysia



KEMENTERIAN PENDIDIKAN MALAYSIA
JABATAN PENDIDIKAN NEGERI KEDAH
KOMPLEKS PENDIDIKAN, JALAN STADIUM
05604 ALOR SETAR
KEDAH DARUL AMAN

Telpon : 04-740 4000
Faksa : 04-740 4342
Laman Web : www.moe.gov.my

"MUAFKAT KEDAH"

Ruj Kami : JPK. SPS.UPP 600-1/1/2 Jld 4 (53)
Tarikh : 9 Oktober 2017

Joanne Yim Sau Ching
Kolej Universiti Tunku Abdul Rahman
Jalan Kolej, Taman Bandar Baru
31900 Kampar
Kedah Darul Aman

Tuan,

**Kebenaran Untuk Menjalankan Kajian/ Soal Selidik di Jabatan Pendidikan Negeri /
Pejabat Pendidikan Daerah dan Sekolah – Sekolah di Negeri Kedah Darul Aman**

Saya dengan hormatnya diarah merujuk kepada perkara tersebut di atas.

2. Dimaklumkan bahawa permohonan tuan untuk menjalankan kajian yang bertajuk "**Modelling Teachers' Acceptance of Virtual Learning Environment: The Role of User Participation and Psychological Ownership in a Extended Technology Acceptance Model**" telah diluluskan.

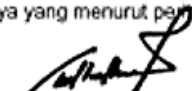
3. Kelulusan ini adalah berdasarkan kepada apa yang terkandung di dalam cadangan penyelidikan yang tuan kemukakan ke Kementerian Pendidikan Malaysia. Tuan dikehendaki mengemukakan senaskah laporan akhir kajian setelah selesai kelak dan diingatkan supaya mendapat kebenaran terlebih dahulu daripada Jabatan ini sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum, seminar atau diumumkan kepada media.

4. Kebenaran ini adalah tertakluk kepada persetujuan Pengetua sekolah berkenaan dan adalah sah bermula dari 1 Oktober 2017 hingga 30 April 2018.

Sekian, terima kasih.

" BERKHIDMAT UNTUK NEGARA "
" MUAFKAT KEDAH "
" PENDIDIKAN CEMERLANG KEDAH TERBILANG "

Saya yang menurut perintah,


(**ABDULLAH BIN ABDULL MANAF, bck**)
Penolong Pengarah Kanan (Ketua Unit)
Unit Perhubungan dan Pendaftaran
Sektor Pengurusan Sekolah
b.p. Pengarah Pendidikan Negeri Kedah Darul Aman

"1 Malaysia: Rakyat Didahulukan, Pencapaian Diutamakan"

Sila cubakan rujukan Jabatan ini apabila berhubung



Appendix F

Permission by School Districts to Conduct Research



PEJABAT PENDIDIKAN DAERAH KERIAN
JALAN PERMAI UTAMA
TAMAN KERIAN PERMAI
34200 PARIT BUNTAR
PERAK DARUL RIDZUAN



Telefon: 05-716 1302 Faks: 05-7160468 Portal: <http://ppdkerian.edu.my>

"1 MALAYSIA: RAKYAT DIDAHULUKAN PENCAPAIAN DIUTAMAKAN"

Ruj. Tuan :
Ruj.Kami : PPD.KRN.(PT)200/216/01.Jld 7 (7C)
Tarikh : 25 Januari 2017

PN. JOANNE YIM SAU CHING,
Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej,
Taman Bandar Baru,
31900 Kampar,
Perak Darul Ridzuan.

Tuan,

KEBENARAN MENJALANKAN KAJIAN DI SEKOLAH-SEKOLAH DAERAH KERIAN, PERAK

Dengan segala hormatnya perkara di atas dirujuk.

2. Sukacita dimaklumkan merujuk kepada surat Tuan bertarikh 19 Januari 2017, bahawa pihak Pejabat Pendidikan Daerah Kerian memberi kebenaran dan sokongan kepada pihak Tuan untuk melaksanakan kajian "Modelling Teachers' Acceptance of a Virtual Learning Environment: The Role of User Participation and Psychological Ownership Among Secondary School Teachers".

3. Namun begitu, pihak Pejabat Pendidikan Daerah Kerian memohon pihak Tuan untuk mematuhi SOP (Prosedur Operasi Standard) seperti berikut:

- 3.1 Mendapatkan kebenaran Pengetua sekolah-sekolah berkenaan untuk menggunakan sampel kajian.
- 3.2 Kajian yang dijalankan tidak mengganggu proses pengajaran dan pembelajaran di sekolah.
- 3.3 Pihak tuan bertanggungjawab menjaga keselamatan dan kebajikan guru-guru dan murid-murid yang terlibat dalam kajian ini.
- 3.4 Pihak tuan hendaklah bertanggungjawab menanggung semua kos kajian termasuk pengangkutan, makan dan minum guru/murid yang terlibat.
- 3.5 Guru-guru dan murid-murid tidak boleh dipaksa melibatkan diri dalam kajian ini.
- 3.6 Tiada sebarang implikasi kewangan terhadap pihak Jabatan Pendidikan Negeri Perak, Pejabat Pendidikan Daerah dan pihak sekolah.

4. Sebarang pertanyaan berhubung dengan perkara ini, sila hubungi En. Zolkefli bin Jamaluddin (Pen. PPD Perhubungan) di talian 017-5149114.

5. Segala kerjasama dan perhatian yang diberikan amatlah dihargai.

Sekian, terima kasih.

“ BERKHIDMAT UNTUK NEGARA ”

Saya yang menurut perintah,



(HAJI MAZALANI BIN ABDUL MUHAINI)

Timbalan Pegawai Pendidikan Daerah,
b.p. Pegawai Pendidikan Daerah Kerian



**PEJABAT PENDIDIKAN DAERAH
LARUT MATANG DAN SELAMA**
Jalan Taming Sari,
34000 Taiping,
PERAK DARUL RIDZUAN



Tel: 05-808 4119 / 05-807 9488
Faks: 05-808 0660
Portal Rasmi: www.ppdms.edu.my
E-mail: ppdms@ppdms.edu.my

"1MALAYSIA: RAKYAT DIDAHULUKAN, PENCAPAIAN DIUTAMAKAN"
"PERAK EXCELLENT"

Ruj. Kami : PPD.LMS 620-4/1/8 (25)
Tarikh : 25 Januari 2017

Pn. Joanne Yim Sau Ching
Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej,
Taman Bandar Baru,
31900 Kampar

Tuan,

**KELULUSAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH-SEKOLAH MENENGAH DI
DAERAH LARUT MATANG DAN SELAMA**

Sukacitanya perkara di atas dirujuk dan surat tuan bertarikh 19 Januari 2017, adalah berkaitan.

2. Sehubungan dengan itu, dimaklumkan bahawa Pejabat Pendidikan Daerah Larut Matang dan Selama tiada halangan untuk membenarkan pihak tuan menjalankan kajian di sekolah menengah di Daerah Larut Matang dan Selama, seperti dinyatakan dalam surat tuan dengan mematuhi syarat-syarat berikut:

- 2.1 Pihak tuan perlu mendapat kebenaran terlebih dahulu daripada Pengetua atau Guru Besar sekolah berkenaan untuk menggunakan sampel kajian.
- 2.2 Kajian yang dijalankan hendaklah tidak mengganggu proses pengajaran dan pembelajaran yang telah ditetapkan oleh pihak sekolah.
- 2.3 Pihak tuan bertanggungjawab menjaga keselamatan dan kebajikan guru dan murid yang terlibat dalam kajian ini.
- 2.4 Pihak tuan hendaklah bertanggungjawab menanggung semua kos kajian.
- 2.5 Guru-guru dan murid-murid tidak boleh dipaksa melibatkan diri dalam kajian ini.
- 2.6 Tiada sebarang Implikasi kewangan terhadap pihak Pejabat Pendidikan Daerah dan pihak sekolah.
- 2.7 Pihak tuan dipohon agar mengemukakan satu (1) salinan kajian dalam tempoh 30 hari ke Pejabat Pendidikan Daerah ini selepas kajian tersebut dilaksanakan.

3. Sukacita juga diingatkan sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum atau seminar atau diumumkan kepada

MAM/mrmm

CINTAILAH BAHASA KITA




media massa, pihak tuan perlu mendapat kebenaran terlebih dahulu daripada Bahagian Perancangan dan Penyelidikan Dasar Pendidikan Kementerian Pendidikan Malaysia, Jabatan Pendidikan Perak dan satu salinan kepada Pejabat Pendidikan Daerah Larut Matang dan Selama.

4. Kelulusan permohonan ini adalah untuk tujuan yang dipohon sahaja dan luput selepas tarikh 30 September 2017.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,


(HAJI MAZLAN BIN ABDUL MAJID, AMP.,PPT.)
Penolong Pegawai Pendidikan Daerah (M)
b.p Pegawai Pendidikan Daerah,
Larut, Matang dan Selama

s.k Pegawai Pendidikan Daerah



PEJABAT PENDIDIKAN DAERAH KINTA SELATAN
JALAN KUALA DIPANG
31900 KAMPAR
PERAK DARUL RIDZUAN



Telefon : 05-4650521
Faks : 05-4650519
<http://www.ppdks.gov.my>

"1 MALAYSIA : RAKYAT DIDAHULUKAN, PENCAPAIAN DIUTAMAKAN"

Ruj. Kami : KPM.PPDKSPk.620-1/5 Jld.4(05)
Tarikh : 14 Januari 2017

Pn. Joanne Yim Sau Ching,
Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej,
31900 Kampar,
Perak Darul Ridzuan.

Tuan,

**KEBENARAN MENJALANKAN KAJIAN PENYELIDIKAN DOKTOR FALSAFAH DI SEKOLAH-SEKOLAH
MENENGAH DAERAH KINTA SELATAN**

Dengan segala hormatnya perkara di atas adalah dirujuk.

2. Pihak Pejabat Pendidikan Daerah Kinta Selatan tiada halangan untuk membenarkan pihak tuan menjalankan kajian "Modelling Teachers' Acceptance of a Virtual Learning Environment: The Role of User Participation and Psychological Ownership Among Secondary School Teachers" dengan syarat :

- i. Mendapat kebenaran dari Pengetua sekolah berkenaan.
- ii. Tidak mengganggu pembelajaran dan pengajaran guru dan pelajar.
- iii. Tiada sebarang kos melibatkan sekolah dan guru-guru.
- iv. Guru-guru tidak dipaksa terlibat dengan kajian tersebut.
- v. Bertanggungjawab terhadap keselamatan guru yang terlibat dalam kajian tersebut.

3. Kebenaran ini hanya untuk tujuan yang dipohon dan dibenarkan sehingga 30 September 2017 sahaja.

Sekian terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(HAJI MAT JAAFAR BIN HAJI MAT ZAIN, PPT.)
Pegawai Pendidikan Daerah Kinta Selatan

"KINTA SELATAN CEMERLANG DAN SENTIASA DI HADAPAN"





PEJABAT PENDIDIKAN DAERAH KUALA KANGSAR,
PETI SURAT 84,
33007 KUALA KANGSAR,
PERAK DARUL RIDZUAN.

Telefon : 05-7761184
Faks : 05-7761188
E-mail : ppdkuala@mos.gov.my



"1 MALAYSIA: RAKYAT DIDAHULUKAN, PENCAPAIAN DIUTAMAKAN"
PERAK EXCELLENT, KUALA KANGSAR EXCELLENT

Ruj. Kami: PPD.KK 01/29/004 JLD.3 (63)
Tarikh : 24 Rabiulakhir 1438
23 Januari 2017

PN. JOANNE YIM SAU CHING,
Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej,
Taman Bandar Baru,
31900 Kampar,
Perak Darul Ridzuan.

Tuan,

KELULUSAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH-SEKOLAH DI KUALA KANGSAR DI BAWAH PEJABAT PENDIDIKAN DAERAH KUALA KANGSAR

Sukacitanya saya merujuk surat tuan bertarikh 19 Januari 2017, surat dari Bahagian Perancangan Dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia, Rujukan : KPMS.P.600-3/2/3Jld () bertarikh 03 November 2016 dan surat dari Jabatan Pendidikan Perak, Rujukan : J.Pel.Pk(AM)5114/4 Jld.23 (43) bertarikh 12 Januari 2017 berkaitan perkara di atas.

2. Sukacita dimaklumkan bahawa Pejabat Pendidikan Daerah Kuala Kangsar tiada halangan untuk membenarkan pihak tuan untuk menjalankan kajian "Modelling Teachers' Acceptance of a Virtual Learning Environment : The Rule of User Participation and Psychological Ownership Among Secondary School Teachers" seperti dinyatakan dalam surat tuan.

3. Sehubungan itu, mohon kerjasama dan perhatian tuan untuk mematuhi syarat-syarat yang telah dinyatakan. Surat Jabatan Pendidikan Perak Rujukan : J.Pel.Pk(AM)5114/4 Jld.23 (43) bertarikh 12 Januari 2017 adalah dirujuk. Segala kerjasama dan perhatian yang pihak tuan berikan berhubung perkara di atas amat saya hargai dan didahului dengan ucapan terima kasih.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(HAJI SYED MAHIZAN B. SYED HASHIM, PPT.)
Pegawai Pendidikan Daerah Kuala Kangsar

"Cintailah Bahasa Kebangsaan"

SAIPPP/PPM 2013-2025: 5 Aspirasi Sistem, 6 Aspirasi Murid, 11 Anjakan, 3 Gelombang





PEJABAT PENDIDIKAN DAERAH HULU PERAK
JALAN HAJI MEOR YAHYA,
33300 GERIK,
PERAK DARUL RIDZUAN.

Telefon : 05-791 2153
Faks : 05-791 2162
Portal : <http://jpnperak.moe.gov.my/ppdhuluperak/>



PENGETRAFAN MS ISO 9001:2008
NO. SUL MYAR 4186



MALAYSIA: RAKYAT DIDAHULUKAN PENCAPAIAN DIUTAMAKAN

"PERAK EXCELLENT"

Ruj. Kami : PPD.HUP.500-10/5/Jld.2 (13)
Tarikh : 25 Januari 2017

Pn. Joanne Yim Sau Ching,
Kolej Tunku Abdul Rahman,
Jalan Kolej,
Taman Bandar Baru,
31900 Kampar,
Perak.

Tuan,

**KELULUSAN UNTUK MENJALANKAN KAJIAN PENYELIDIKAN DOKTOF FALSAFAH
DI DAERAH HULU PERAK 2017**

Dengan hormatnya perkara di atas dirujuk dan surat dari Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia, No. Rujukan KPMS.P.600-3/2/3 Jld () bertarikh 3 November 2016 dan surat dari Jabatan Pendidikan Negeri Perak, No. Rujukan J.Pel.Pk(AM) 5114/4 Jld.23 (43) bertarikh 12 Januari 2017 adalah berkaitan.

2. Sukacita dimaklumkan Pejabat Pendidikan Daerah Hulu Perak tiada halangan dan memberi kelulusan untuk membenarkan tuan menjalankan kajian bertajuk "*Modelling Teachers' Acceptance of a Virtual Learning Environment: The Role of User Participant and Psychological Ownership Among Secondary School Teachers*" dalam kalangan guru-guru sekolah menengah dalam daerah ini.

3. Sehubungan dengan itu, pihak tuan dimohon supaya mematuhi semua syarat seperti yang telah ditetapkan oleh Jabatan Pendidikan Negeri Perak semasa menjalankan kajian penyelidikan tersebut dan tempoh kajian mestilah berakhir pada 30 September 2017.

Sogala kerjasama tuan diucapkan terima kasih.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(HAJI MOHAMAD ZAHARI BIN-MOHAMAD RAMLI PPT.,)
Pegawai Pendidikan Daerah
Pejabat Pendidikan Daerah Hulu Perak.

s.k 1. Pengetua Sekolah Menengah Daerah Hulu Perak

"CINTAI BAHASA KITA"
(Sila catatkan rujukan jabatan ini apabila berurusan)



PEJABAT PENDIDIKAN DAERAH PERAK TENGAH,
SERI ISKANDAR,
32610 BANDAR BARU SERI ISKANDAR
PERAK DARUL RIDZUAN.

Fax : 05-3711272
No. Telefon : 05-3711273

"1 MALAYSIA : RAKYAT DIDAHULUKAN, PENCAPAIAN DIUTAMAKAN"
"PERAK EXCELLENT"

Ruj. Kami : PPD.PET. 100-B/10.(56).Jid.,

Tarikh 31 Januari 2017.

Joanne Yim Sau Ching (Puan),
Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej,
Taman Bandar Baru,
31900 Kampar,
Perak Darul Ridzuan.

Tuan,

**KEBENARAN UNTUK MENJALANKAN KAJIAN PENYELIDIKAN DOKTOR FALSAFAH
DI SEKOLAH-SEKOLAH MENENGAH NEGERI PERAK**

Dengan hormatnya saya arah merujuk surat tuan bertarikh 09 Januari 2017 mengenai perkara tersebut di atas.

2. Sukacita dimaklumkan bahawa pentadbiran ini tiada halangan dan membenarkan pihak tuan menjalankan kajian penyelidikan "Modeling Teachers' Acceptance of Virtual Learning Environment : The Role of User Participation and Psychological Ownership in an Extended Technology Acceptance Model" peringkat Doktor Falsafah di Negeri Perak.

3. Kebenaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan oleh Jabatan Pendidikan Negeri Perak melalui surat kebenaran J.Pel.Pk.(AM)5114/4 Jld.23 (43) bertarikh 12 Januari 2017.

Sekian, terima kasih,

"BERKHIDMAT UNTUK NEGARA"

Saya yang manurut perintah,


(ZAUDI BIN HJ. LEBAT MAT., AMP)
Pegawai Pendidikan Daerah,
Perak Tengah.

s.k.

1. Pengarah Pendidikan Negeri Perak.
2. Timbalan PPD, Perak Tengah.
3. Pengurus,
Sekolah Menengah Daerah Perak Tengah.
4. Fail Timbul.

3/1/2017

"CINTAILAH BAHASA KITA"
(Sila catatkan rujukan jabatan ini apabila berhubung)



PEJABAT PENDIDIKAN DAERAH BATANG PADANG
JALAN PAHANG,
35000 TAPAH,
PERAK DARUL RIDZUAN.
PORTAL: <http://www.ppdbatangpadang.edu.my>

Telefon : 05-401 1383
Faks : 05-401 3527
: 05-401 8701

Ruj. Kami : PPD.BP.620-1/5/11 (81)
Tarikh : 01 FEBRUARI 2017

Joanne Yim Sau Ching
Kolej Universiti Tunku Abdul Rahman
Jalan Kolej, Taman Bandar Baru
31900 Kampar
Perak Darul Ridzuan

Tuan,

KELULUSAN KHAS UNTUK MENJALANKAN KAJIAN/PROGRAM/AKTIVITI DI SEKOLAH, INSTITUT PERGURUAN, JABATAN PENDIDIKAN NEGERI, PEJABAT PENDIDIKAN DAERAH DAN BAHAGIAN-BAHAGIAN DI BAWAH KEMENTERIAN PENDIDIKAN MALAYSIA

Dengan hormatnya saya menujuk perkara di atas.

2. Sukacita dimaklumkan Pejabat Pendidikan Daerah Batang Padang **TIADA HALANGAN** untuk pihak tuan menjalankan kajian "**MODELLING TEACHERS ACCEPTANCE OF A VIRTUAL LEARNING ENVIROMENT: THE ROLE OF USER PARTICIPATION AND PSYCHOLOGICAL OWNERSHIP AMONG SECONDARY SCHOOL TEACHERS**" seperti yang dinyatakan dalam surat tuan.
3. Kelulusan ini adalah berdasarkan kepada kertas cadangan penyelidikan dan instrument kajian yang dikemukakan oleh pihak tuan. Walau bagaimanapun kelulusan ini bergantung kepada kebenaran Pengetua/Guru Besar sekolah berkenaan.
4. Surat kelulusan ini sah digunakan bermula dari **31 Januari 2017 hingga 30 September 2017**. Pihak tuan juga mesti menyerahkan senaskah laporan akhir kajian dalam bentuk *hardcopy* bersama salinan *softcopy* berformat Pdf di dalam CD kepada bahagian ini. Pihak tuan diingatkan supaya mendapat kebenaran terlebih dahulu daripada Bahagian Perancangan Dan Penyelidikan Dasar Pendidikan, KPM sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum, seminar atau diumumkan kepada media massa.

Sekian, dimaklumkan

" BERKHIDMAT UNTUK NEGARA "

Saya yang menurut perintah,

(HISHAMUDIN BIN ADNAN, AMP.)
Timbalan Pegawai Pendidikan Daerah
b/p Pegawai Pendidikan Daerah

"CINTAILAH BAHASA KITA"
(Silalah catatkan rujukan pejabat ini apabila berhubung)



**PEJABAT PENDIDIKAN DAERAH KINTA UTARA
LEBUH CATOR,
30450 IPOH,
PERAK DARUL RIDZUAN**

Telefon (Am) : 05-254 4877, 05-243 7295, Faks : 05-241 9154
Portal : <http://jppperak.moe.gov.my/jppdkinta>
Email : ppdku@moe.gov.my



"1MALAYSIA: RAKYAT DIDAHULUKAN, PENCAPAIAN DIUTAMAKAN"

Ruj. Kami : PPDKU 100-2/43/1 (87)
Tarikh : 04 Mac 2017
07 Rejab 1438H

**JOANNE YIM SAU CHING,
KOLEJ UNIVERSITI TUNKU ABDUL RAHMAN,
JALAN KOLEJ,
TAMAN BANDAR BARU,
31900, KAMPAR.**

Tuan,

**KEBENARAN UNTUK MENJALANKAN KAJIAN DI SEKOLAH-SEKOLAH MENENGAH
DI DAERAH KINTA UTARA.**

Sukacita saya merujuk kepada perkara di atas dan surat tuan bertarikh 30 Mac 2017 dan surat dari Jabatan Pendidikan Perak J.Pel. Pk (AM) 5114/4 Jld 23 (43) bertarikh 12 Januari 2017.

2. Dengan ini dimaklumkan bahawa Pejabat Pendidikan Daerah Kinta Utara tiada halangan membenarkan tuan untuk berurusan dengan Sekolah-sekolah Menengah di dalam Daerah Kinta Utara untuk menjalankan kajian "Modelling Teacher's Acceptance of Virtual Learning Environment: The Role of User Participation and Psychological Ownership in an Extended Technology Acceptance Model" seperti dinyatakan dalam surat tuan dengan syarat-syarat berikut :-

- 2.1 Mendapatkan kebenaran dan persetujuan Pengetua/Guru Besar Sekolah berkenaan untuk menggunakan sampel kajian;
- 2.2 Kajian yang dijalankan hendaklah tidak mengganggu proses pengajaran dan pembelajaran yang telah ditetapkan oleh pihak sekolah;
- 2.3 Pihak tuan bertanggungjawab menjaga keselamatan dan kebajikan guru-guru yang terlibat dalam kajian ini;
- 2.4 Pihak tuan hendaklah bertanggungjawab menanggung semua kos kajian;
- 2.5 Murid-murid perlu mendapat kebenaran ibubapa atau penjaga dan Pengetua/Guru Besar sekolah sebelum terlibat dalam kajian ini;
- 2.6 Guru-guru dan murid-murid tidak boleh dipaksa atau diwajibkan terlibat dengan kajian ini;
- 2.7 Tiada sebarang implikasi kewangan terhadap pihak Jabatan Pendidikan Perak, Pejabat Pendidikan Daerah Kinta Utara dan pihak sekolah.

"CINTAILAH BAHASA KITA"
(Silacatkanrujukanjabatariniapeblaberhubung)

3. Kebenaran permohonan ini adalah untuk tujuan yang dipohon dan melibatkan pelajar dan guru di sekolah-sekolah dalam Daerah Kinta Utara sahaja dan luput selepas tarikh 30 September 2017.

Sekian dimaklumkan.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,


(HAJI AMERUDIN BIN MOHD KHAIRI, AMP.)
Timbalan Pegawai Pendidikan Daerah,
b/p Pegawai Pendidikan Daerah Kinta Utara.

sk - Fail tinbal



PEJABAT PENDIDIKAN DAERAH MANJUNG,
LORONG SELAMAT,
32000 SITIAWAN,
PERAK DARUL RIDZUAN
Telefon : 05-8911763
Fax : 05-8919200
Homepage: ppdmanjung.edu.my



"MANJUNG 3 TERBAIK"

Ruj.Kami: PPD.MJG.100-2/2/2 (14)
Ruj.Tuan:
Tarikh : 27 Februari 2017

JOANNE YIM SAU CHING
Kolej Universiti Tunku Abdul Rahman
Jalan Kolej
Taman Bandar Baru
31900 Kampar
Perak

Tuan,

**KELULUSAN UNTUK MENJALANKAN KAJIAN PENYELIDIKAN DOKTOR
FALSAFAH DI SEKOLAH – SEKOLAH MENENGAH DI DAERAH MANJUNG**

Sukacitanya perkara di atas di rujuk surat tuan, surat Jabatan Pendidikan Negeri Perak, Rujukan : J.Pel.Pk (AM) 5114/4 Jld. 23 (43), bertarikh 12 Januari 2017 serta surat dari Bahagian Perancangan Dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia, Rujukan : KPMSPP.600-3/2/3 Jld (), bertarikh 03 November 2016 adalah berkaitan.

2. Sehubungan dengan itu, dimaklumkan bahawa Pejabat Pendidikan Daerah Manjung tiada halangan untuk membenarkan pihak tuan menjalankan kajian "Modelling Teachers' Acceptance Of A Virtual Learning Enviroment: The Role Of User Participation And Psychological Ownership Among Secondary School Teachers" seperti dinyatakan dalam surat tuan dengan syarat-syarat berikut :-

- 2.1 Pihak tuan perlu mendapatkan kebenaran terlebih dahulu daripada Pengetua sekolah untuk menggunakan sampel kajian;
- 2.2 Kajian yang dijalankan hendaklah tidak mengganggu proses pengajaran dan pembelajaran yang telah ditetapkan oleh pihak sekolah;
- 2.3 Pihak tuan bertanggungjawab menjaga keselamatan dan kebajikan guru-guru yang terlibat dalam kajian ini;
- 2.4 Pihak tuan hendaklah bertanggungjawab menanggung semua kos kajian;
- 2.5 Guru-guru/ murid tidak boleh dipaksa terlibat dengan kajian ini;

'CINTAILAH BAHASA MIA'
(Sila catitkan rujukan bahagian ini apabila berhubung)



2.6 Pihak tuan dipohon agar mengemukakan satu (1) salinan laporan kajian dalam tempoh 30 hari ke jabatan ini selepas kajian tersebut dilaksanakan; dan

2.7 Tiada sebarang implikasi kewangan terhadap Jabatan Pendidikan Negeri Perak, Pejabat Pendidikan Daerah dan pihak sekolah.


3. Sukacita juga ditingkatkan sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum atau seminar atau diumumkan kepada media massa, pihak tuan perlulah **mendapatkan kebenaran terlebih dahulu** daripada Bahagian Perancangan dan Penyelidikan Dasar Pendidikan Kementerian Pendidikan Malaysia dan satu salinan kepada Jabatan Pendidikan Negeri Perak dan Pejabat Pendidikan Daerah Manjung.

4. Kebenaran permohonan ini adalah untuk tujuan yang dipohon dan melibatkan sekolah dalam daerah yang dinyatakan sahaja dan hujut selepas tarikh 30 September 2017.

Sekian terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang mensuruh perintah,


(SUHALMI BIN RAMLI)
Pegawai Pendidikan Daerah Manjung

s.k 1. Penolong PPD (Menengah)
2. Semua Pengetua Daerah Manjung



Ruj Kami : PPD.H.Pk 15/01/11/Jld.6()
Tarikh : 31 Januari 2017

PUAN JOANNE YIM SAU CHING,
Kolej Universiti Tunku Abdul Rahman,
Jalan Kolej, Taman Bandar Baru,
31900 KAMPAR,
Perak Darul Ridzuan.

Tuan,

KELULUSAN MENJALANKAN KAJIAN DI SEKOLAH-SEKOLAH DAERAH HILIR PERAK

Dengan hormatnya, surat tuan bertarikh 19 Januari 2017, dan surat Jabatan Pendidikan Perak J.Pel.Pk(AM)5114/4/Jld.23(43) bertarikh 12 Januari 2017 serta surat Kementerian Pendidikan Malaysia KPMS.P.600-3/2/3 Jld. () bertarikh 03 November 2016 berkaitan perkara tersebut di atas adalah dirujuk untuk perhatian dan tindakan tuan.

2. Sukacita dimaklumkan bahawa Pejabat Pendidikan Daerah Hilir Perak tiada halangan untuk membenarkan pihak tuan menjalankan kajian bertajuk "**Modelling Teachers' Acceptance of a Virtual Learning Environment : The Role of User Participation and Psychological Ownership Among Secondary School Teachers**" di sekolah-sekolah menengah daerah Hilir Perak seperti dinyatakan dalam surat tuan dengan syarat-syarat berikut :-

- 2.1 Pihak tuan perlu berunding dengan Pengetua sekolah berkenaan dan mendapatkan kebenarannya untuk menggunakan sampel kajian;
- 2.2 Kajian yang dijalankan hendaklah tidak mengganggu atau menjejaskan waktu pengajaran dan pembelajaran di sekolah;
- 2.3 Pihak tuan bertanggungjawab menjaga keselamatan dan kebajikan guru-guru yang terlibat dalam kajian ini;
- 2.4 Guru-guru tidak boleh dipaksa atau diwajibkan terlibat dalam kajian ini;
- 2.5 Tiada implikasi kewangan kepada Kementerian Pendidikan Malaysia, Jabatan Pendidikan Perak, Pejabat Pendidikan Daerah Hilir Perak, sekolah, guru dan
- 2.6 Pihak tuan hendaklah bertanggungjawab menanggung semua kos kajian;
- 2.7 Pihak tuan dipohon agar mengemukakan sesalinan laporan kajian dalam tempoh 30 hari ke pejabat ini selepas kajian tersebut dilaksanakan.

3. Sukacita juga diingatkan sekiranya sebahagian atau sepenuhnya dapatan kajian tersebut hendak dibentangkan di mana-mana forum atau seminar atau diumumkan kepada media massa, pihak tuan perlulah **mendapatkan kebenaran terlebih dahulu** daripada Bahagian Perancangan dan Penyelidikan Dasar Pendidikan, Kementerian Pendidikan Malaysia.

4. Pejabat Pendidikan Daerah Hilir Perak berhak menarik balik Surat Kelulusan/ Kebenaran ini sekiranya pihak tuan gagal mematuhi syarat-syarat dan peraturan yang ditetapkan atau bercanggah dengan dasar yang sedia ada. Kelulusan ini hanyalah untuk tujuan yang dipohon sahaja dan luput selepas tarikh 30 September 2017.

Kerjasama dan perhatian tuan dalam hal ini didahului dengan ucapan terima kasih.

Sekian dimaklumkan.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,


HAJI SULAIMAN BIN HAJI SAMSUDIN)
Pegawai Pendidikan Daerah Hilir Perak.

SS/mms

Appendix G

Missing Value Analysis

Item	N	Mean	Standard Deviation	Missing		No. of Extremes	
				Count	Percent	Low	High
ATT1	1152	4.1589	1.31487	2	.20	35	13
ATT2	1151	4.0973	1.32701	3	.30	39	14
ATT3	1154	4.2548	2.00327	0	.00	0	1
ATT4	1152	4.3307	1.79511	2	.20	0	1
ATT5	1152	4.2839	1.38196	2	.20	37	0
ATT6	1152	4.1849	2.04927	2	.20	0	1
CBI1	1153	4.3304	1.27649	1	.10	17	15
CBI2	1153	3.2437	1.51970	1	.10	0	16
CBI3	1153	4.3382	1.28428	1	.10	28	13
CBI4	1153	4.4345	1.29345	1	.10	23	0
EC1	1152	4.4288	1.45365	2	.20	21	0
EC2	1153	4.5386	1.38648	1	.10	16	0
EC3	1151	4.5812	1.37435	3	.30	18	0
EC4	1151	4.4778	1.44919	3	.30	28	0
EC5	1147	4.3487	1.44308	7	.60	19	0
EC6	1149	4.520	1.3808	5	.40	15	0
EC7	1151	4.7194	1.58426	3	.30	11	1
IN1	1151	3.7202	1.59180	3	.30	0	11
IN2	1152	3.5651	1.32644	2	.20	0	9
IN3	1152	3.5573	1.32876	2	.20	0	7
IN4	1149	3.5959	1.37247	5	.40	0	14
IN5	1152	3.7526	1.39581	2	.20	0	14
IN6	1150	3.8687	1.48891	4	.30	0	15
K1	1151	4.4136	1.32834	3	.30	19	0
K2	1152	3.9505	1.35337	2	.20	28	9
K3	1153	4.0017	1.33593	1	.10	26	12
K4	1150	3.7913	1.35574	4	.30	41	19
K5	1152	4.1241	1.31728	2	.20	20	18
K6	1151	4.0904	1.41440	3	.30	34	31
K7	1153	4.3270	1.42636	1	.10	25	0
PEU1	1151	4.1633	1.35367	3	.30	40	16
PEU2	1149	3.9817	1.31879	5	.40	37	10
PEU3	1150	4.1009	1.31282	4	.30	37	8
PEU4	1151	4.1494	1.35271	3	.30	34	14
PEU5	1151	4.1069	1.34030	3	.30	39	15
PEU6	1152	3.3116	1.55388	2	.20	0	23
PEU7	1152	3.3568	1.57808	2	.20	2	53

Item	N	Mean	Standard Deviation	Missing		No. of Extremes	
				Count	Percent	Low	High
PEU8	1154	3.5381	1.38910	0	.00	0	14
PO1	1151	4.0078	1.42674	3	.30	38	30
PO2	1152	4.3802	2.25126	2	.20	0	1
PO3	1152	4.5503	1.31260	2	.20	25	0
PO4	1150	4.1661	1.34652	4	.30	30	28
PO5	1152	4.3281	1.37243	2	.20	33	0
PO7	1147	4.5118	1.31198	7	.60	18	0
PU1	1151	4.1286	1.33155	3	.30	29	11
PU2	1148	3.6803	1.50491	6	.50	0	32
PU3	1152	4.0425	1.33421	2	.20	28	14
PU4	1151	4.0478	1.35466	3	.30	40	20
PU5	1152	4.0694	1.37384	2	.20	39	19
PU6	1148	3.5819	1.44329	6	.50	0	28
PU7	1151	4.4553	1.28586	3	.30	21	0
PU8	1152	4.2995	1.31147	2	.20	22	20

Appendix H

Assessment of Multivariate Skewness and Kurtosis

WebPower
Statistical power analysis online

Output of skewness and kurtosis calculation

Sample size: 1068
Number of variables: 8

Univariate skewness and kurtosis

	Skewness	SE_skew	Kurtosis	SE_kurt
ATT	-0.4689662	0.07484818	-0.22918997	0.1495573
CI	-0.5495572	0.07484818	-0.02485006	0.1495573
EC	-0.3622540	0.07484818	-0.30200952	0.1495573
IN	0.0266614	0.07484818	-0.59307686	0.1495573
K	-0.2831945	0.07484818	-0.49944543	0.1495573
PEU	-0.3485808	0.07484818	-0.32834985	0.1495573
PO	-0.5385218	0.07484818	-0.03950121	0.1495573
PU	-0.3606195	0.07484818	-0.22745334	0.1495573

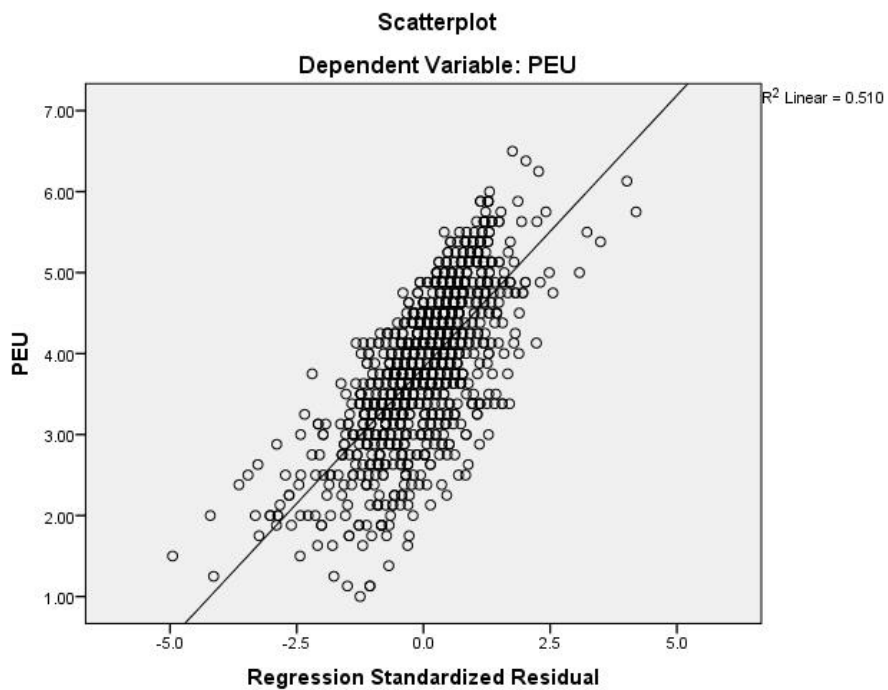
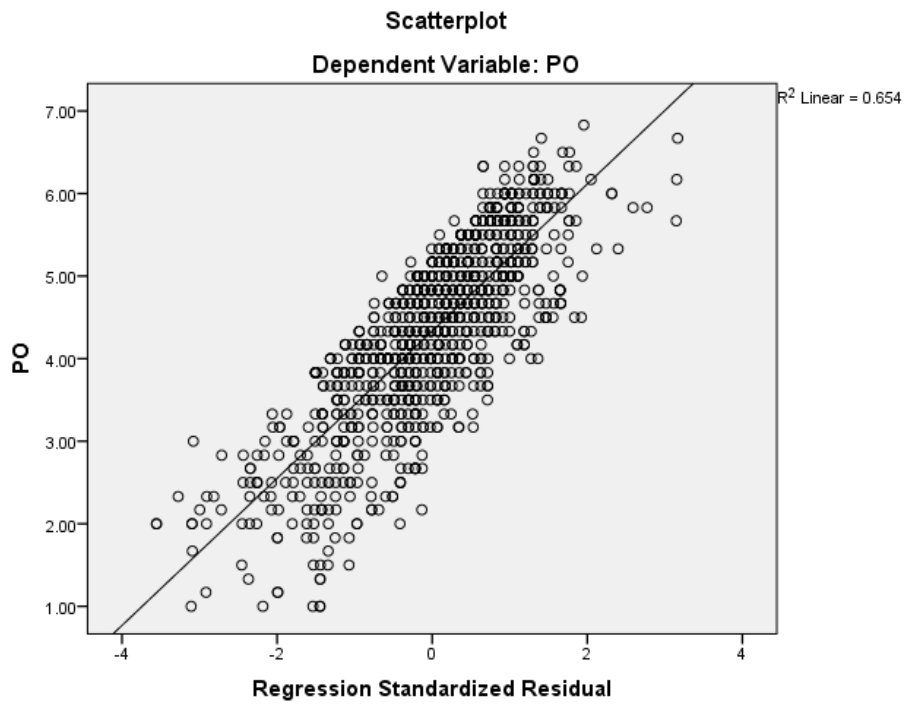
Mardia's multivariate skewness and kurtosis

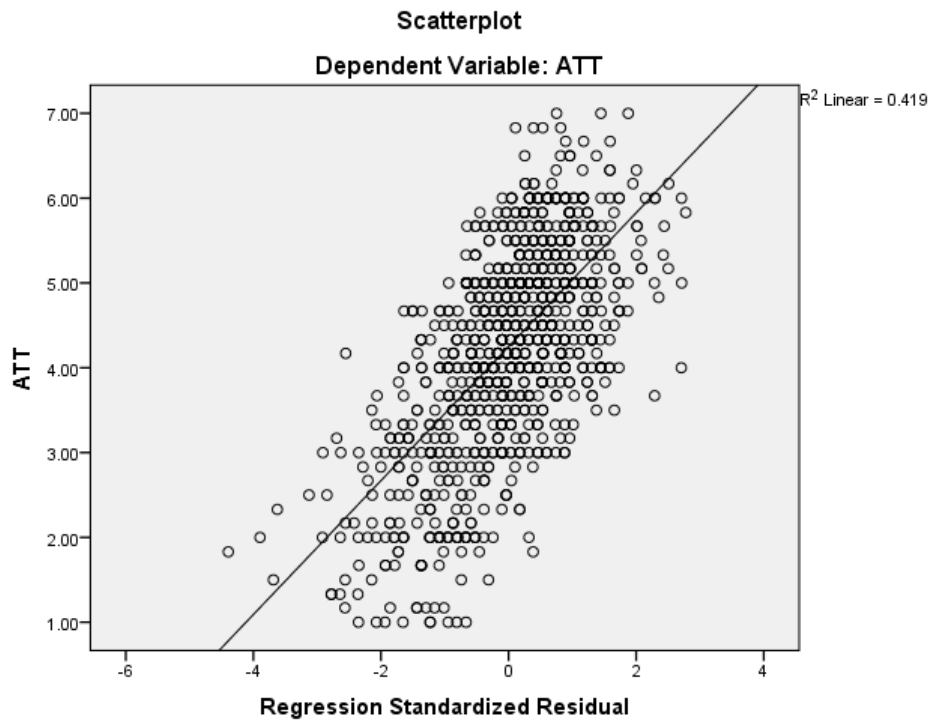
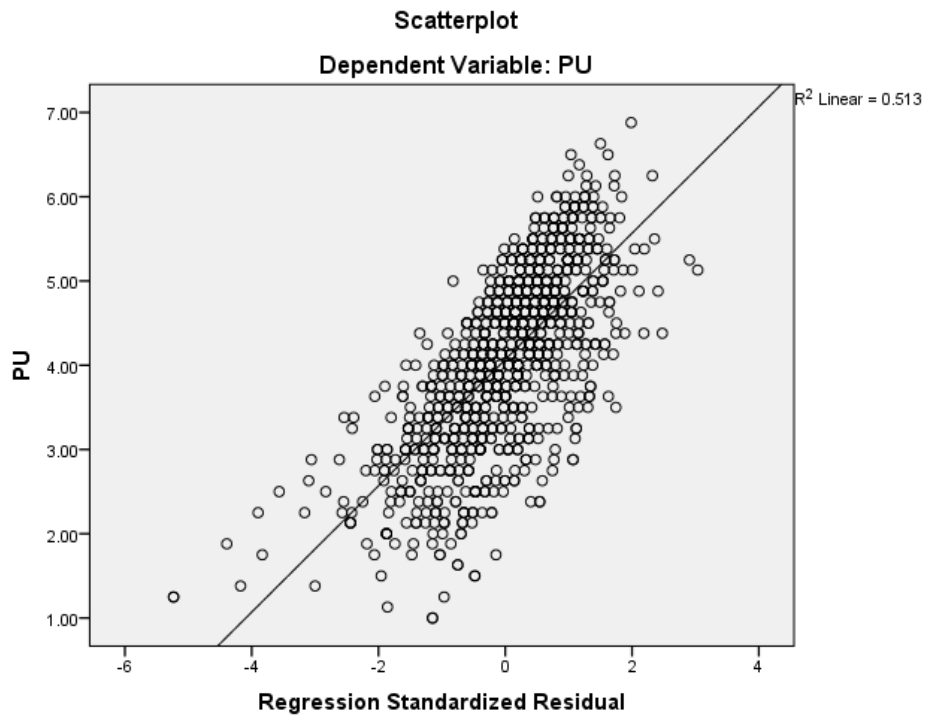
	b	z	p-value
Skewness	6.233487	1109.56060	0
Kurtosis	112.930309	42.53941	0

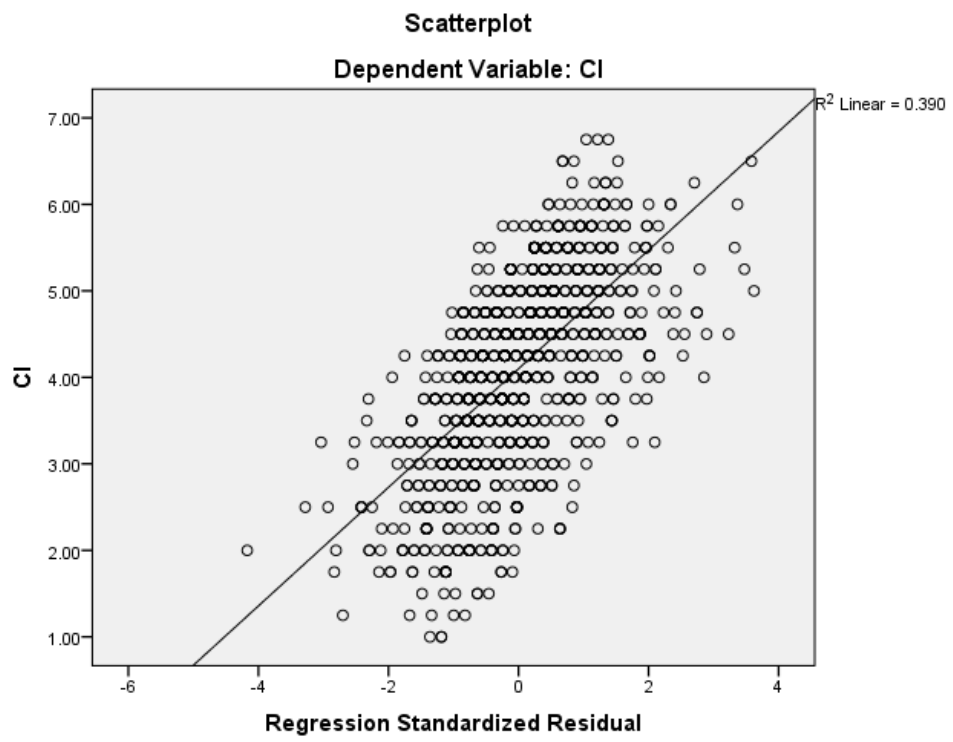
ATT = Attitude Towards Using VLE; CI = Continuance Intention; EC = Experienced Control; IN = Investment of the self; K = Knowledge; PEU = Perceived Ease of Use; PO = Psychological Ownership; PU = Perceived Usefulness

Appendix I

Scatterplots for Endogenous Constructs







Appendix J

Unrotated Factor Analysis

Total Variance Explained

Items	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.885	47.856	47.856	24.885	47.856	47.856
2	3.802	7.311	55.168			
3	2.288	4.401	59.569			
4	1.917	3.687	63.255			
5	1.386	2.665	65.921			
6	1.252	2.407	68.328			
7	1.091	2.098	70.425			
8	.997	1.918	72.343			
9	.916	1.761	74.104			
10	.833	1.602	75.706			
11	.799	1.537	77.243			
12	.752	1.446	78.690			
13	.705	1.357	80.046			
14	.639	1.229	81.275			
15	.608	1.169	82.444			
16	.537	1.033	83.477			
17	.483	.928	84.405			
18	.470	.904	85.309			
19	.449	.863	86.172			
20	.397	.763	86.936			
21	.378	.727	87.663			
22	.364	.699	88.362			
23	.341	.656	89.018			
24	.328	.630	89.648			
25	.314	.603	90.251			
26	.301	.579	90.830			
27	.295	.567	91.397			
28	.272	.523	91.921			
29	.257	.494	92.415			
30	.247	.476	92.890			
31	.239	.460	93.351			
32	.236	.454	93.805			
33	.229	.441	94.246			
34	.220	.423	94.669			
35	.213	.409	95.079			
36	.199	.383	95.462			
37	.194	.373	95.835			
38	.183	.351	96.186			
39	.178	.343	96.529			
40	.176	.339	96.868			
41	.174	.334	97.203			

Items	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
42	.164	.316	97.518			
43	.156	.300	97.818			
44	.151	.290	98.109			
45	.148	.285	98.394			
46	.146	.281	98.676			
47	.138	.266	98.941			
48	.130	.251	99.192			
49	.121	.232	99.425			
50	.114	.220	99.645			
51	.107	.205	99.850			
52	.078	.150	100.000			

Extraction Method: Principal Component Analysis.

Appendix K

List of Publications associated with the Thesis

- Yim, J. S. C.,** Moses, P., & Azalea, A. (2019). Predicting teachers' continuance in a virtual learning environment with psychological ownership and the TAM: a perspective from Malaysia. *Educational Technology Research and Development*, 67(3), 691-709. (WoS-SSCI indexed)
- Yim, J. S. C.,** Moses, P., & Azalea, A. (2018). Effects of psychological ownership on teachers' beliefs about a cloud-based virtual learning environment. *Research and Practice in Technology Enhanced Learning*, 13(13), 1-19. (Scopus indexed)
- Yim, J. S. C.,** Moses, P., & Azalea, A. (2017). Participation and psychological ownership on teachers' beliefs of a cloud-based VLE. In W. Chen (Ed.), *Proceedings of the 25th International Conference on Computers in Education* (pp. 946-954). New Zealand: Asia-Pacific Society for Computers in Education. (Scopus indexed)
- Yim, J. S. C.,** Moses, P., & Azalea, A. (2017). Modeling teachers' continuance intention in a cloud-based VLE: The role of Psychological Ownership. Paper presented at *5th International Research and Innovation Submit, Langkawi, Malaysia*.