School Authority Supports and Teacher's Continuous Intention to Use Virtual Learning Platforms: A Multi-Group Analysis

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Abstract: The transformation of schools toward educational excellence involves the intervention of school authorities. In line with the Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013-2025, the Frog VLE platforms were implemented in Malaysia as a mega-investment to connect over 10,000 elementary and secondary schools, covering over 5 million students, 500 000 teachers, and 4.5 million parents nationwide.Despite this development, usage of this platform is still quite low. In this regard, a multi-group analysis was conducted to evaluate the school authority's support in determining teachers' continued intention to use VLE platforms in primary schools. A mix of methods was used for this study. In the northern area of peninsular Malaysia, 96,748 teachers are overseeing a total of 7,418 schools. Consequently, more than 384 teachers should be included in the sample size for this study (Krejcie& Morgan, 1970) and (Salkind, 2010). For data collection, simple random sampling was applied. Based on the determined sample size, 85 schools were carefully chosen using the random calculator. From every school, ten teachers were picked as respondents. This generated 850 of the sample (85*10 = 850). Seven hundred nineteen were returned or about 84.0% response rate out of 850 distributed questionnaires. Analysis was carriedout through PLS-SEM measurement and structural analyses as well as the Multi-Group Analysis (PLS-MGA). The results showed high school authority support at mean = 3.82 and standard deviation = 0.29. The findings also found a significant correlation between the support of school leaders and the willingness of Islamic education teachers at r = 0.37. Hence, it is recommended that school leaders increase the encouragement level through motivation, monitoring and activating the Islamic Education teachers to use Frog VLE frequently so that this application will be consistent and expanded.

Keywords: *School leader, Frog VLE application, Islamic Education Teacher.*

1.   Introduction

Since information and communication technology (ICT) has been incorporated into education, the globe is experiencing significant changes in teaching and learning methods (Ghavifekr et al., 2014). As a result, many countries have quickly enhanced their ICT policies, support mechanisms, and infrastructure provisions (Hinostroza et al., 2018). This has led to the effective adoption of educational ICT projects in several contemporary countries, including Australia, the United States of America (US), the United Kingdom (UK), and

Japan (Khan et al., 2015).Nevertheless, the gap between industrialized and developing countries has gotten wider due to this phenomenon. Most developing nations are still working to maintain ICT use, particularly among teachers (Cheok et al., 2017; Ibieta et al., 2017). Initiatives to incorporate ICT in education in specific nations run a high chance of failing without good planning and evaluation.In many educational environments, such as higher education institutions and schools, a virtual learning environment is a form of e-learning technology used (Mueller &Strohmeier, 2011). It is an online resource emphasizing various educational activities, including online classes, tests, and teaching and learning (Abdelhag& Osman, 2014; Jain, 2015). VLE typically uses Web 2.0 technology to provide blended and remote learning (Abdelhag& Osman, 2014). The use of VLE technology in education is viewed as a promising innovation by its users, who are often made up of parents, students, and teachers, due to its capacity to promote dynamic learning and erase the obstacles of time and place (Nor Fadzleen et al., 2013; Uzunboylu et al., 2011).

The literature has pointed out a few advantages of using VLE. First, it offers an easy learning experience by incorporating conventional and virtual learning methods (Awang et al., 2020). For example, the quizzes and assessments can be conducted anytime and anywhere, unlike traditional classroom-based learning. Hence, it gives the teachers and students flexibility while simultaneously motivating both sides. Second, VLE provides a better platform for a parent to supervise a student's learning activity, allowing parents to communicate with teachers and monitor school activities (Rosemaliza et al., 2016). Third, the VLE also offers a great medium for collaborations, including from teachers to teachers, teachers to parents, and teachers to students (Nor Fadzleen et al., 2013). The ability to discuss, collaborate and share resources are probably among the most interesting parts of VLE that will further lead to enhancement of intellectual composition, as well as improvement of pedagogical practices toward more captivating and interactive methods.

The implementation of VLE technology in Malaysian schools was officially started with the use of Frog VLE in late 2012 (Norazilawati et al., 2013). The main objective of Frog VLE is to transform the Malaysian education platform while at the same time reducing the digital divide between urban and rural schools by connecting them via a virtual learning community. The Frog VLE is expected to be used for at least 13 years in conjunction with Pelan Pembangunan Pendidikan Malaysia (PPPM) 2013-2025 (Cheok & Wong, 2014). However, despite the ambitious vision of the Ministry of Education, Malaysia (MOE) to digitalize Malaysian education, the low level of VLE usage, especially among teachers, has surprisingly ended up being an unresolved issue (Bahagian Teknologi Pendidikan, 2017; Kementerian Kewangan Malaysia, 2014). Therefore, in June 2019, MOE announced the termination of Frog VLE implementation, and it was replaced with Google Classroom as an official VLE platform for Malaysian schools (Kementerian Pendidikan Malaysia, 2019). The justification behind this is unclear, but it seems possible that the decision was taken due to many serious drawbacks in Frog VLE implementation, which caused resistance, especially among teachers (Cheok &Wong, 2016; Norazilawati et al., 2013; Thah, 2014). It has been recently evidenced that the overall level of teacher's intention to continue using Frog VLE is moderate (Awang, Zahurin, Yaakob, et al., 2018). Unfortunately, the study also discovered an alarming finding, which showed that the low-intention users are approximately higher in number (28.9%) compared to high-intention users (15.1%). This is probably due to several issues that deter them from adopting it in teaching and learning routines, such as poor service and system quality (Cheok & Wong, 2016), as well as the heavy workload carried by the teachers (Awang, Zahurin, & Wan Rozaini, 2018). Despite the huge investments, the VLE would be deemed as a failure if it is not fully utilized by the teachers or did not produce the expected benefits (Ramayah et al., 2010). In this sense, the previous evaluation studies should provide strong evidence for MOE in deciding whether to retain or terminate the use of the platform (Hamilton & Chervany, 1981a, 1981b). Therefore, it is acceptable to discontinue the usage of Frog VLE to avoid a greater complexity of the problem and to decrease the loss of investment.

The core elements of the entire discipline of 21st-century learning are student-centered collaboration, communication, creativity, positive values and critical thinking. Interestingly, VLE offers many advantages to support these elements over conventional classroom teaching approaches (Al-Maroof & Al-Emran, 2018). Google Classroom is a type of VLE that was initiated in 2014 as a platform for either distance, online or blended

learning (Al-Maroof & Al-Emran, 2018; The University of Wales, 2015). The basis of this system is how it gives users the flexible power to teach and learn without much consideration for normal obstacles such as time, distance and location, as it allows asynchronous pedagogy where the teachers and students no longer have to be physically present at the same moment and place. In Malaysia, the Google Classroom implementation has taken place to compensate for the termination of the previous VLE platform, Frog VLE,which has ended the contract recently (Kementerian Pendidikan Malaysia, 2019).

In comparison, both platforms are functionally identical and offer similar features such as assignment, communication, collaboration and information dissemination.Nonetheless, from the teacher's perspective, unlike the licensed Frog VLE, Google Classroom is a free web service that is easier to use, especially for Google application users (Beaumont, 2018). This VLE platform is capable of creating an interactive and information-rich educational environment with the integration of other Google applications such as Google Drive, Gmail, YouTube and many more (Bondarenko et al., 2018). As familiar as it sounds, Google Classroom should provide a more convenient and easier platform for Malaysian teachers to engage their students in creative and pleasant ways.

Furthermore, it is hoped that the teachers' previous experience dealing with Frog VLE will facilitate the acceptance of Google Classroom. However, knowing the benefits and familiarity with the technology would not guarantee its success (Cheok et al., 2017). Indeed, the most reliable success indicator for a voluntary type of IS such as Google Classroom should be its extent of usage (Awang, Wan Rozaini, et al., 2018; Awang, Zahurin, Wan Rozaini, et al., 2018). Therefore, the more important thing to do is to strategize the sustainable implementation, especially at the school level, where the Google Classroom will be utilized.

Intention to use is the extent of teachers' intention to continue using the VLE platform, which will lead to its continuous usage. However, factors that lead to intention to use are often difficult to recognize due to their complex interrelationships (Mahmood, Burn, Gemoets& Jacquez, 2000). Despite that, we still need to examine school authority, teacher's intention to use and their beliefs about teaching, learning and technology. As aptly put by Marcinkiewicz (1994), integrating computers into the educational system will never be possible without reconciliation between school authority and teacher's intention to use computers. To encourage teachers to use computers, we need to study teachers and what makes them use computers. Research into the factors that predict intention to use could shed light on what school authorities and education policymakers need to focus on to encourage and increase continuous intention to use. The success in implementing VLE in teaching and learning depends on the continuous intention to use by teachers.

It is observed that the issue of VLE low usage has been consistently debated and discussed among previous researchers (Cheok et al., 2017; Ibieta et al., 2017; Rolando et al., 2013). Additionally, the empirical studies that investigate the contributing factors of this issue are also found in abundance (Cheok & Wong, 2016; Copriady, 2015; Kihoza et al., 2016; Solar et al., 2013; Surif et al., 2014). Nonetheless, a shortage of studies found on the role of school authority supports in determining the VLE continuous usage. This implies that the existing literature on VLE lies in insufficient research in terms of the internal factor, while over-attentions were given to the issue and its antecedents. The aforementioned trend of research indicates an urging call for further empirical investigations.

Related works

Although studies have demonstrated abundance advantages of VLE (van Raaij&Schepers, 2008; Herrador-Alcaide& Hernandez-Solis, 2016; Awang et al., 2018; Sanchez &Hueros, 2010; Alabdulkareem, 2015), there is an audit report which shows that the rate of using Frog VLE among teachers is still low with only 0.01% and 4.69%teachers who only use ICT less than an hour a week (MOF, 2014; Awang et al., 2018). However, this phenomenon can cause individuals to be unable to benefit from implementing this innovation if they do not use it (Ewing, Leberman, Mendelsohn, & Milner, 2012). Consequently, the government cannot recover its investments in the VLE platform if teachers do not use it continuously (Setterstrom, Pearson, &Orwig, 2012). Numerous IS intention-to-use studies haveinvestigated the implementation of VLE in various forms (Limayem,

Hirt, & Cheung, 2007; Polites&Karahanna, 2013; Venkatesh, Thong, & Xu, 2012). For example, Ajzen (1991) argued that the establishment of a link between prior and future behavior involving a certain innovation does not contribute to the theoretical understanding of post-adoption research because it just reflects the stability in consumers' usage behavior over time. In another study, Limayem et al. (2007) also criticized that there is "a lack of convincing argument and a sound theoretical base" for the indirect effect of individual habit on technology use via behavioral intention.

Some of thisresearch haslargely focused on the psychological construct of behavior, which refers to the extent to which people intend to use the technology automatically because of learning (Limayem, Hirt, & Cheung, 2007; Polites&Karahanna, 2013; Venkatesh, Thong, & Xu, 2012). Past literature mainly focuses on prior individual usage behavior of certain IS innovationsand their intention to use. For example, Despite the huge investments, the VLE would be deemed as a failure if it is not fully utilized by the teachers or did not produce the expected benefits (Ramayah et al., 2010). In order to bridge the gap mentioned above, we view VLE's intention to use from the information systems (IS) ecosystem perspective and adopt DeLone and McLean IS Success Model (D&M) of success as the theoretical background. IS ecosystem refers to "a subset of the IT landscape that are related to one another in a specific context of use (Adomavicius, Bockstedt, & Gupta, 2008, p. 783)". IS innovations are often mutually dependent on interaction and usage (Swanson, 1994). This coincides with success models. This study investigates how school authority support affectsteacher's intention to use the VLE platform.Based on the discussion above, this study aims to understand the school authority support in determining teacher's intention to use the VLE platform. Thus, it is of great importance to explore how external factors such as school authority support affect teachers' intention to use the VLE platform.

School Authority Support

By definition, school authority support is the extent towhich teachers deem that the administrators are committed to promoting the adoption of VLE in their schools (Lai & Chen, 2011). In light of this, the school administrators could be but not limited to principals, headmasters, assistant principals and others. The situations now have allowed schools to explore various types of available VLEs and are not restricted to the Google Classroom platform. Hence, the type of support provided that is required by teachers might be different. Roughly speaking, school authority support is not something new and could be something dull to be investigated by academic research. Meanwhile, many available studies highlighted the importance of school authority technical and moral support in ensuring the successful implementation of any ICT initiatives, including VLE (Cheok et al., 2017; Cheok & Wong, 2016; Hew & Kadir, 2016; Hew & Syed Abdul Kadir, 2016; Lai & Chen, 2011; Venkatesh & Bala, 2008; DeLone & McLean, 2003; Venkatesh et al., 2003; Venkatesh & Bala, 2008; Nur Hazirah & Masayu, 2020). For example, Nur Hazirah and Masayu (2020) argued that without proper support in training, implementation strategies, and observation, incompetency could lead to another worse phenomenon of ICT resistance.Cheok and Wong (2016) argued that school authorities should work on this matter to alleviate VLE acceptance. Karahanna et al. (1999)have evidenced that top management support affects adoption judgments as it most probably would lessen risks and implementation uncertainties. Huang et al. (2009)statethat the level of facilitating conditions that are also related to technical or motivational supports would determine teachers' intention to continuously use VLE platforms. A study by Hew and Syed Abdul Kadir (2016) was conducted to develop an instrument to measure VLE acceptance based on Self Determination Theory (SDT) and Channel Expansion Theory (CET).Accordingly, they have successfully produced a valid and reliable instrument for VLE acceptancemeasurement. Moreover, one of the constructs in their instrument is school support,which is measured using four self-rating items.

Empirically, ICT resistance or any kind of confrontation towards technological innovations has been identified as one of the influential factors that could lead to the failure of particular initiatives in schools (Hirschheim & Newman, 1988; Klaus & Blanton, 2010; Laumer & Eckhardt, 2010). Moreover, previous research has revealed that top management support plays a crucial part in the adoption of ICT innovations, which is also applicable in the context of school education. As stressed earlier, the type of support that can be provided to teachers is

limitless. But most of the time, the support would be in the form of technical and moral reinforcement. Technical support could be in kind of equipment, ICT facilities, technical assistance, training and others. On the other hand, moral support could be delivered in the way of counseling, observation, monitoring, peer support programs and others. But how that kind of support could be different from facilitating conditions (Venkatesh et al., 2003) and service quality (DeLone & McLean, 2003)? Well, actually, it can be said that facilitating conditions are part of school authority support. The broad use of the term 'facilitating condition' is most of the time equated with the extent to which teachers believe that school management support and technical infrastructure are there to assist them in adopting certain innovations like VLE (Venkatesh et al., 2003). The keywords here are school management support and technical infrastructure. Thus, although the definition sounds similar, this study believes that school authority support could cover more than that. Aspects like peer support and professional learning community engagements, which could not be covered by facilitating conditions, are also parts of school authority support programs. Moreover, these activities are indirectly influential in promoting VLE usage among teachers. As for the service quality, the dimension only focuses on technical support, which is usually provided by the service provider (DeLone & McLean, 2003). They could be in the form of helpdesks, hotlines, technical assistance, and others. Most of the time, service quality overlooks the aspect of soft support, such as moral improvement and motivation among teachers. Nevertheless, that is not the focus of this study, as it is not going to dig down that deep. In this study, the model will be compared based on whether teachers receive support from the school authorities or the opposite.A considerable amount of literature has been published on VLE and most of these studies produced the anticipated results. Furthermore, there are a few studies that empirically tested this concept in the context of VLE and E-Learning. As envisaged, the findings indicated that there are significant relationships between school authority supports and other VLE adoption factors like motivation (Lai & Chen, 2011), and decisions (Venkatesh & Bala, 2008). Thus, the generalizability of much-published research on this issue is at a fingertip. But wait! All these studies only examined direct relationships from school authority supports to other factors, but how about the differences between teachers that receive support and those who did not? Although the literature analysis is far from extensive, this study believes that it is either does not exist or very few. Therefore, this study aims is to fill this knowledge gap by examining the moderating role of school authority supports in determining teachers' VLE continuous usage.

This is because this issue could be easily captured by common sense. As a result, it has gained very little attention among researchers, either in the education or IS field. Perhaps this is due to the fact that people could simply guess its effect if tested in the direct relationship to other variables like motivation (Lai & Chen, 2011) and decisions (Venkatesh & Bala, 2008). However, this study believes that this careless perception is somehow not accurate. Certain aspects, like how school authority support moderates some relationships in the IS adoption model,are still interesting to be investigated.

Theory and Research Model

Continuous usage during the phase of post-implementation is more important to determine the IS success compared to the initial usage during the pre-implementation (Bhattacherjee, 2001). In the context of this study, the continuous usage that is associated with user resistance is considered a serious issue, as depicted by the low usage of VLE (Kementerian Kewangan Malaysia, 2014; Md Nor & Rashita, 2011). Although most of the teachers possess prior experience, the present finding reveals their refusal towards the continuous utilization of VLE (Ummu Salma & Fariza, 2014), which reflects that the system is not on the right track to success. From the literature, this study observed the possibility of examining this issue with the aid of the Updated DeLone and McLean IS Success Model (D&M). It has been proven by previous studies that this model matches all the measurements for IS success evaluation (Al-Debei et al., 2013; Mohammadi, 2015). In addition, the application of D&M should have a contextual consideration of IS that is being investigated (DeLone & McLean, 2003). Thus, the enhancement and refinement of the model by future researchers in order to soothe the existing variations of IS research fields are encouraged (DeLone & McLean, 2003). This has inspired the study to utilize the D&M as the theoretical foundation while testing the role of school authority supports as the categorical moderator.

To examine the issue of VLE continuous usage, this study uses both Intention to Use (ITU) and Use (U) dimensions. Even though the ITU was introduced as an alternative measurement for U (DeLone & McLean, 2003), separating these two dimensions will improve the explanatory power of D&M (Agarwal & Prasad, 1997; Mardiana et al., 2015). Comprising seven interdependent determinants of continuous usage, this conceptual model theorizes that the Information Quality (IQ), System Quality (SYQ), Service Quality (SEQ), Net Benefits (NB) and User Satisfaction (US) would significantly influence the Intention to Use (ITU). Furthermore, this is expected to lead to heavier Use (U) of VLE. At the same time, the School Authority Support (SAS) is also predicted to moderate the relationships between all the constructs. Figure 1 illustrates the conceptual model of this study.
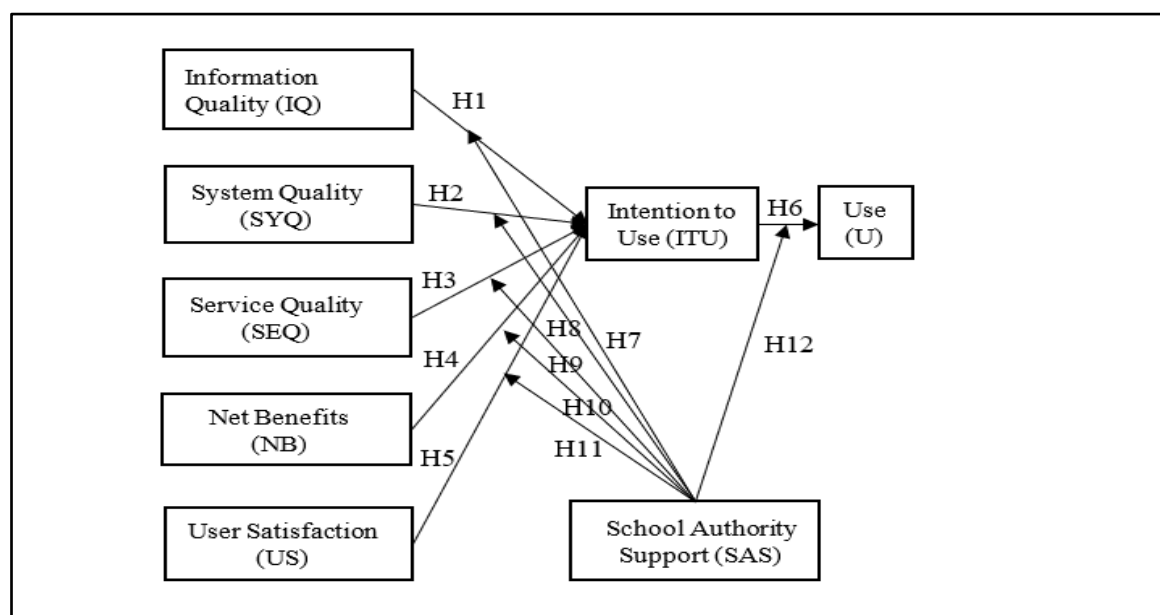

Figure 1.Challenges and Factors Influencing the Use of Virtual Learning Environment

2. Research Methodology

Based on the problem statement and the objectives, the mixed methods approach based on the explanatory sequential design was applied in this study. This design uses a qualitative approach to validate or explain the quantitative results (see Figure 2). As for this case, the quantitative phase is the core of the study, where the hypotheses testing was done. In addition, the qualitative approach was applied to validate the quantitative finding. We have proposed 12 hypotheses, which include a categorical moderator to examine its influence on the proposed model. A cross-sectional quantitative survey was deployed in the first stage of this study. This was followed by a qualitative open-ended survey during the second stage to refine the quantitative findings. Finally, the research process was ended by summarizing and drawing a conclusion from both findings.

Quantitative Survey

This study involved quantitative data collection and analysis. Accordingly, data collection and analysis activities were carriedout as described in the following sub-sections.

Instrument Development

We employed a structured questionnaire that comprised a set of statements that were adapted and reformulated to suit the current perspective. It is formulated to measure the eight VLE continuous usage determinants, in particular, IQ, SYQ, SEQ, US, NB, ITU, and U. In addition, the instrument is also designed to capture information on the availability of authority support in the schools. To ensure validity and reliability, several procedures, such as a pilot study, factor analysis, face validity and content validity, were performed. The

measurement scale for every construct is a seven-point Likert Scale, which ranges from '1' [extremely disagree] to '7' [extremely agree].

Sampling Procedure

The target population of this study is the school teachers in the northern region of Peninsular Malaysia. There are 7,418 schools, which are run by 96,748 teachers in the region. Thus, the sample size for this study should be more than 384 teachers (Krejcie & Morgan, 1970). Nonetheless, to reimburse any possible risks of the low response rate, incomplete responses, or case exclusion during data cleaning, it is advisable to collect at least 40% higher than the minimum sample size (Salkind, 2010). Another consideration is the minimum number of 300 samples required for the advanced analysis, such as Partial Least Squares-Structural Equation Modeling (PLS-SEM) (Dwivedi et al., 2010). In addition, that kind of data analysis needs at least ten times the largest number of structural paths directed to a particular construct (Hair et al., 2011). With these considerations in mind, 850 samples were collected for further statistical analysis.For data collection, simple random sampling was applied, where the randomizing procedure was conducted based on the list of schools as the sampling frame. Based on the determined sample size, 85 schools were carefully chosen using the random calculator. From every school, 10 teachers were picked as respondents. This generated 850 of sample (85*10 = 850). Table 2 encapsulates the number of respondents for each state of the northern region.

Table 1Summary of Respondents for the Study

State	Total Teachers	Respondents
Perlis	4,817	170
Kedah	31,965	260
Penang	20,395	180
Perak	40,326	240
TOTAL		**850**

Data Analysis

The IBM SPSS Statistics (SPSS) was utilized for data preparation. Then, PLS-SEM was employed for hypotheses assessment. This study aimed to predict the moderating role of SAS, which is deduced as an exploratory study. Therefore, the PLS-SEM is apt to be applied, although the data are normally distributed (Hair et al., 2014). In fact, the normally distributed data will provide a more accurate result, even for non-parametric analyses such as PLS-SEM (Tabachnick & Fidell, 2007). Nevertheless, the normality analysis during the data cleaning procedure has revealed that the data of this study is not normally distributed, which leaves no option but to use PLS-SEM for model testing.

Table 2 Measurement Model Analysis

Construct	Indicator	Factor Loading	α	CR	AVE	Construct Reliability	Convergent Validity
IQ	IQ1	0.894	0.965	0.971	0.825	Achieved	Achieved
	IQ2	0.905					
	IQ3	0.924					
	IQ4	0.922					
	IQ5	0.932					

	IQ6	0.904					
	IQ7	0.876					
SYQ	SyQ1	0.867	0.959	0.966	0.804	Achieved	Achieved
	SyQ2	0.91					
	SyQ3	0.873					
	SyQ4	0.900					
	SyQ5	0.906					
	SyQ6	0.909					
	SyQ7	0.910					
SYQ	SeQ1	0.913	0.976	0.979	0.839	Achieved	Achieved
	SeQ2	0.922					
	SeQ3	0.938					
	SeQ4	0.935					
	SeQ5	0.913					
	SeQ6	0.928					
	SeQ7	0.94					
	SeQ8	0.892					
	SeQ9	0.863					
ITU	ITU1	0.942	0.953	0.966	0.876	Achieved	Achieved
	ITU2	0.958					
	ITU3	0.911					
	ITU4	0.932					
US	US1	0.968	0.969	0.978	0.916	Achieved	Achieved
	US2	0.963					
	US3	0.961					
	US4	0.935					
U	U1	0.868	0.960	0.966	0.757	Achieved	Achieved
	U2	0.854					
	U3	0.863					
	U4	0.886					
	U5	0.855					
	U6	0.881					
	U7	0.883					

	U8	0.865					
	U9	0.874					
NB	NB1	0.914	0.974	0.980	0.907	Achieved	Achieved
	NB2	0.959					
	NB3	0.971					
	NB4	0.969					
	NB5	0.947					

Fornell-Larcker criterion is the second test in establishing the discriminant validity. In this study, only construct U did not achieve the Fornell-Larcker criterion with a small difference of 0.07. On the contrary, the other constructs exhibited √AVE greater than the values of other constructs, indicating the discriminant validity (see Table 4).

Table 3 Fornell-Larcker Criterion

	IQ	ITU	NB	SEQ	SYQ	U	US
IQ	0.908						
ITU	0.761	0.936					
NB	0.787	0.839	0.953				
SEQ	0.765	0.736	0.740	0.918			
SYQ	0.858	0.785	0.838	0.828	0.896		
U	0.758	0.789	0.855	0.737	0.794	0.872	
US	0.807	0.835	0.908	0.768	0.860	*0.884*	0.957

Although U did not achieve the Fornell-Larcker criterion with a very small value, this study has conducted the HTMT criterion to affirm the discriminant validity. As shown in Table 5, all HTMT values are below 1.0. Therefore, the discriminant validity is confirmed (Henseler, 2017).

Table 4 HeterotraitMonotrait Ratio

	IQ	ITU	NB	SEQ	SYQ	U	US	
IQ								
ITU	0.793							
NB	0.811	0.869						
SEQ	0.788	0.762	0.758					
SYQ	0.891	0.818	0.865	0.855				
U	0.786	0.821	0.882	0.759	0.824			
US	0.834	0.868	0.935	0.789	0.89	0.914		

HTMT inference > 1.0

After the CFA that was done during the measurement model analysis, the structural model was examined. Several criteria were examined, including collinearity assessment, the significance and relevance of the structural model's relationships, coefficient of determination (R^2), f^2 effect size, predictive relevance (Q^2) and q^2 effect size. To examine the significance of the path coefficient (ß), this study applied a standard bootstrapping procedure with 5,000 samples and 643 cases (Hair et al., 2017). Table 6 summarizes the result of the structural model analysis.

Table 5 Structural Model Analysis

Hypothesis		ß	t Values	p Values	95% CI	Result
H1	IQ -> ITU	0.132	2.610	0.01***	0.035, 0.238	Supported
H2	SYQ -> ITU	-0.005	0.085	0.93[NS]	-0.101, 0.099	Returned
H3	SEQ -> ITU	0.145	3.818	0.00***	0.077, 0.228	Supported
H4	US -> ITU	0.270	4.357	0.00***	0.152, 0.388	Supported
H5	NB -> ITU	0.386	6.859	0.00***	0.266, 0.496	Supported
H6	ITU -> U	0.789	47.626	0.00***	0.750, 0.817	Supported

1.65 (*p < 0.10), 1.96 (**p < 0.05), 2.58 (***p< 0.01), NS (Not Significant)

Based on the path weight analysis, it was revealed that ITU is significantly affected by IQ (β=0.132, t=2.062, p<0.05), SEQ (β=0.145, t=3.818, p<0.01), US (β=0.270, t=4.357, p<0.01) and NB (β=0.386, t=6.858, p<0.01). In addition, ITU is also significantly influenced by U (β=0.789, t=47.262, p<0.01). Therefore, hypotheses H1, H3, H4, H5 and H6 are accepted. In contrast, there is no significant relationship found between SYQ and ITU (β=-0.005, t=0.085, p=0.93). Thus, hypothesis H2 is returned.

Next, the Coefficient of Determination (R^2) was examined based on the threshold values of 0.25 as weak, 0.50 as moderate, and 0.75 as high (Hair et al., 2017). In this study, there are two endogenous variables, which are ITU and U. In terms of R^2, ITU (0.797) achieved high predictive accuracy, while U (0.678) is rather at the moderate level, although the value is close to high. Therefore, it is assumed that the model consists of good predictors to explain the VLE continuous usage among teachers. To examine the contribution capacity of each predictor, this study assessed the f^2 effect size based on the following indications:0.02 (small), 0.15 (medium) and 0.35 (large) (Cohen, 1988). As a result, NB (0.103) has been discovered to generate the most outstanding f^2 effect size in producing ITU's R^2, although it is just at a moderate extent. On the other hand, other predictors, IQ (0.021), SEQ (0.031), SYQ (0.002) and US (0.041), only contribute a small f^2 effect size in producing the R^2 of ITU. Finally, ITU (2.105) contributes a high f^2 effect size in producing U's R^2, most probably because it is the only predictor for that endogenous variable. Moreover, this study progressed with the analysis of the model's predictive relevance based on Stone-Geisser's Q^2. The model is said to have predictive relevance if it produces a value of Q^2 that is above zero (Chin, 1998). However, to facilitate the interpretation, the values of 0.25, 0.50 and 0.75 are respectively considered as small, medium and large Q^2(Hair et al., 2017). As for this study, ITU (0.618) achieved medium while U (0.439) achieved a small yet close to high Q^2 value. Finally, to examine the q^2 effect size, a similar blindfolding procedure was repeated by removing specific exogenous variables in a one-by-one procedure. Then, the calculation was manually done using the following formula:

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

Using the following indicators: 0.02 (small), 0.15 (medium) and 0.35 (large) (Cohen, 1988), the result has shown that the US (1.62) has the most outstanding and large q^2 effect size in producing ITU's Q^2. This is followed by NB (0.05), SEQ (0.01) and IQ (0.008), which contribute small and very small q^2 effect sizes in producing the Q^2 of ITU. On the contrary, SYQ (0.00) did not contribute to the model's predictive relevance.

Multi-Group Analysis

The moderating analysis of School Authority Supports in the conceptual model was done using PLS Multi-Group Analysis (PLS-MGA) (Hair et al., 2017). The p-value for MGA should be below 0.05 or above 0.95 to be considered significant (Henseler, 2017; Valaei & Nikhashemi, 2017). The dataset was separated into two groups, which are Supported (504 cases) and Not Supported (138 cases).
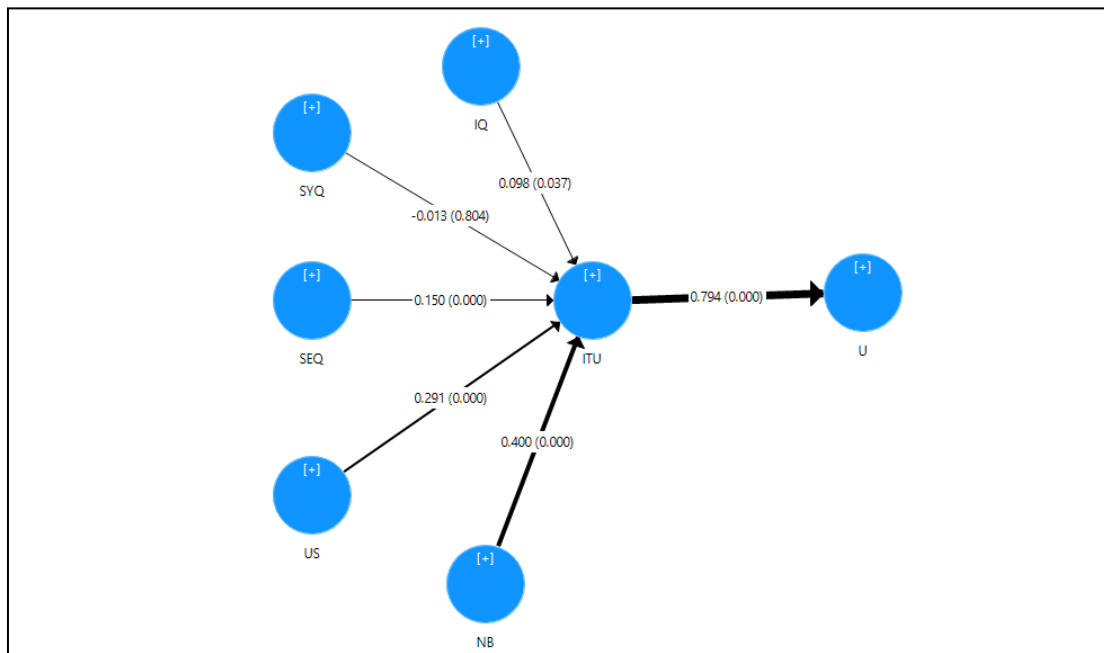

Figure 2. Model of Not Supported Group

The small differences in those two groups require further analysis of PLS-MGA. As a result, it is observed that the moderating effect of SAS only applies to the relationship between IQ and ITU (β=-0.529, t=2.627, p<0.01). Therefore, H7 is accepted, while H8, H9, H10, H11 and H12 are returned. Table 7 summarizes the result of the PLS-MGA analysis in this study.

Table 6 Multi-Group Analysis of School Authority Supports

Hypotheses		Group 1 Supported		Group 2 Not Supported		Group 1 vs. Group 2		
		$β^{(1)}$	SE $β^{(1)}$	$β^{(2)}$	SE $β^{(2)}$	$β^{(1)}$- $β^{(2)}$	p	Sig.
H7	IQ->ITU	0.098	0.049	0.628	0.192	-0.529	0.008	***
H8	SYQ-> ITU	-0.013	0.052	0.120	0.268	-0.133	0.570	NS
H9	SEQ -> ITU	0.150	0.041	0.017	0.132	0.133	0.327	NS
H10	US -> ITU	0.291	0.063	-0.053	0.230	0.344	0.172	NS
H11	NB -> ITU	0.400	0.061	0.225	0.208	0.176	0.402	NS

| H12 | ITU -> U | 0.794 | 0.018 | 0.727 | 0.079 | 0.067 | 0.417 | NS |

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

The Final Model

The final version of the VLE Continuous Usage Model only emphasizes the significant exogenous and endogenous variables as well as moderators, as depicted in Figure 5. Solid lines characterize the significant relationships, while dotted lines represent the non-significant relationships.
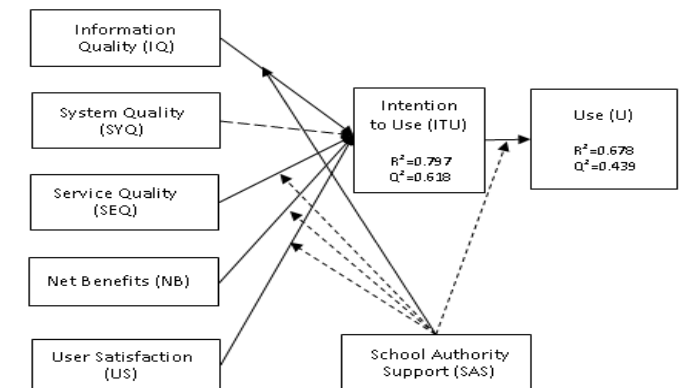

Figure3. VLE Continuous Usage Model

Summary of Overall Findings

Generally, the findings in both stages of this study may help to understand the role of SAS in determining VLE continuous usage among teachers. Although some of the proposed hypotheses are not significant, the follow-up qualitative investigation has successfully explained the reasons behind those unexpected findings. In this explanatory sequential mixed-methods study, all findings have doubtless been much scrutinized. An immediately dependable conclusion from those findings is that the role of school authorities in shaping the successful implementation of VLE in schools is by all means important.

Research Achievements and Future Directions

In an attempt to provide the answers to the research questions, this study has empirically investigated the moderating role of SAS in the relationships between several antecedents and consequent factors of VLE continuous usage. Figure 9 presents an overview of the achievements of this study.
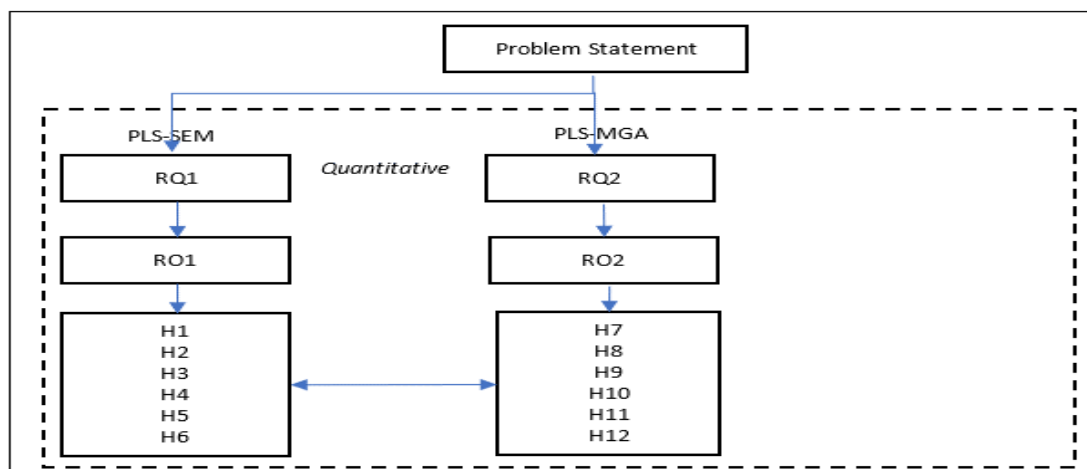

Figure 4. Illustration of Research Achievements

To summarize, this study has developed three research questions based on the pre-determined problem statement. Research Question 1: *What are the factors that determine VLE's continuous usage among Malaysian teachers?* This is answered by Research Objective 1: *To propose the VLE Continuous Usage Model.* In doing this, the quantitative analysis using PLS-SEM to test hypotheses H1, H2, H3, H4, H5 and H6 was done. Next, Research Question 2: *Does the school authority support moderate the VLE Continuous Usage Model?* This is answered by Research Objective 2: *To investigate the moderating role of the school authority support in the VLE Continuous Usage Model.* This is done using PLS-MGA analysis to test hypotheses H7, H8, H9, H10, H11 and H12. Finally, Research Question 3: *How to validate quantitative findings?* This is answered by Research Objective 3: *To validate the quantitative finding using a qualitative approach.* To achieve this objective, the qualitative approach is adopted by using thematic analysis to strengthen some findings of quantitative analysis.

Although this study has successfully achieved all its objectives, there is plenty more room for improvement that can be done in the future. Due to some limitations, the ability to generalize the findings of this study might be limited. For example, the samples were only taken from three states in the northern region of Peninsular Malaysia. Thus, it would be appealing if more extensive coverage could be done in the future to capture various socio-cultural disparities in Malaysian educational settings. Another limitation of this study is it was done on a single point of time or cross-sectional. Although it is cost-effective and fast, this kind of study is subjected to a recall bias. Therefore, future researchers are encouraged to extend this study by conducting it at multiple points in time using a longitudinal approach. The result should be more interesting, and richer data could be obtained to explain how SAS could change teachers' continuous intention to use VLE platforms over some time.

3.   Conclusion

This explanatory sequential mixed-methods study is conducted to examine the moderating role of SAS in determining teachers' intention to continuously use VLE platforms. During the quantitative phase, the conceptual model was developed based on the updated D&M model and was analyzed using PLS-SEM and PLS-MGA analyses. Furthermore, the quantitative findings were validated using thematic analysis during the qualitative phase. In conclusion, the findings of this study should be beneficial for both researchers and practitioners. Theoretically, this study provides many opportunities for further explorations, as discussed in the previous section. As for practitioners in the education field, especially school authorities, whether principals or headmasters, the findings of this study should guide them to better implement VLE in their respective schools. For instance, the model produced in this study could be a good starting point for preparing a VLE implementation strategy for schools.

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