Does the Lecturer's Innovativeness Drive VLE Adoption in Higher Education Institutes? (A Study Based on Extended UTAUT)

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Abstract

The focus of this study is on lecturer's use of online technology in the higher education context. Precisely, this study aims to understand the effect of personal innovativeness in IT (PI) in determining technology adoption behavior of lecturers in the higher education institutes in Sri Lanka. In this study, the variable of personal innovativeness in IT is integrated with the UTAUT framework and thereby the causal paths which effects VLE adoption intention of individuals is examined. Literature suggests that domain-specific innovativeness is a crucial factor in determining an individual's adoption of technological innovations. Therefore, understanding the multifaceted effects of this factor along with other significant factors can help higher education institutes to effectively endorse online technology among lectures, generating productive payoffs in the long run. The quantitative method was used for data collection, which yielded # 1253 responses through the Question Pro online survey tool. The targeted respondents were the registered lecturers in higher education institutes of Sri Lanka, selected based on simple random sampling method. Structural equation modelling (SEM) procedure was employed for data analysis using IBM SPSS (ver.21) and AMOS (Ver.26). The structural path analysis resulted in partial mediation, confirming that "lecturer's innovativeness in IT" exerts its influence on VLE adoption intention by altering the mediators set in the study. Further, the study validated a unique set of factors that determine lecturer's acceptance of VLE in a higher education setting.

Introduction

In an era where Information and Communication Technology (ICT) has progressively turned into a fundamental requirement of Higher Education (HE), most global HE institutes attempt to improve their quality of teaching and standards of students through ICT integration (Nanayakkara, 2017; S. Palvia et al., 2018). On the other hand, students of this epoch, (identified as "digital natives") are increasingly demanding for higher education opportunities through online mediums (Márquez-Ramos & Mourelle, 2018). The needs of digital natives are quite different to students of analog days Purani, Kumar, and Sahadev (2019); they are keen on achieving multiple skills and knowledge within a short period to better arrange their life after education (Iorgulescu, 2016). Consequently, traditional teaching and learning methods are not suitable for modern-day students in higher education (Thomas & Brown, 2011). Thus, ICT based technological advancements are necessary for institutes in HE to help students to be ahead of others (Hariri & Roberts, 2015). Most HE institutes are in search of cost optimization mechanisms that explore the potential benefits of online learning solutions (Tidd & Bessant, 2018).

Virtual Learning Environments (VLE) provide healthier learner interactions and promote a highly accessible learning environment for students (Arkorful & Abaidoo, 2015). Similarly, academics benefit using performance improvement, time-saving, course management, student tracking, are to name a few (Trust & Horrocks, 2017). Therefore, VLE is a feasible solution to certain critical issues faced by HE institutes today; such as rapid growth in student numbers, budget restrictions, Industry competition, and lecturers' performance standards that are necessary to maintain (Laurillard, 2016; Sarveswaran, Nanayakkara, Perera, Perera, & Fernando, 2006). In an environment where the use of technology is not compulsory, the use of technology is often upon the discretion of the academic staff Mozelius and Hettiarachchi (2017).

The notion of technology acceptance has been an undying research interest among scholars since the inception of the internet and related technologies. Alongside, many theories have evolved to explain an individual's adoption to new technologies. TAM (Davis, 1986) TAM2 (Venkatesh & Davis, 2000), IDT (Rogers, 1983), UTAUT (Venkatesh, Morris, Davis, & Davis, 2003), UTAUT2 (Venkatesh, Thong, & Xu, 2012) are few of such theories that explain factors affecting individual technology adoption. In particular, the UTAUT model (Venkatesh et al., 2003) has gained wider acceptance among scholars in numerous disciplines due to its supremacy in explaining the concept of technology acceptance.

The personal innovativeness in IT (PI), refers to a personality trait of an individual to try out new technologies (Agarwal & Prasad, 1998). Although PI has been a widely discussed variable in individual's technology acceptance, its role in determining HE lecturer's technology acceptance is not yet clear. Many past studies provide empirical evidence to

signify the importance of PI in individual's technology acceptance decision (Ahmad, Madarsha, Zainuddin, Ismail, & Nordin, 2010; Jackson, Mun, & Park, 2013; Lokuge, Sedera, & Nanayakkara, 2018; Oliveira, Thomas, Baptista, & Campos, 2016; Van Raaij & Schepers, 2008).

Thus, this study aims to understand the effect of personal innovativeness in IT (PI) within the UTAUT framework in determining VLE adoption by lecturers in HE institutes. In achieving this goal, the variable personal innovativeness in the domain of IT (PI) is theorized into the UTAUT model.

Subsequently, the following research question will be answered in this study.

1) Is the lecturer's innovativeness in IT (PI) a significant direct determinant of VLE adoption?
2) Does PI have any effect on performance expectancy or effort expectancy?
3) Does performance and effort expectancy mediate the relationship between PI and intention to use VLE?
4) What are the other factors significant in predicting VLE adoption intentions of lecturers?

Sri Lankan higher education sector sets the background for this study. Sri Lanka is a developing country, in which a collective cultural environment persists. Due to an ever-increasing demand for HE, the government is concerned about sector expansion through ICT integration. Therefore, this study would bring about significant theoretical, methodological and practical contributions to the authorities and practitioners involved in higher education sector developments in the country. Further, the findings of this study would be generalizable to the HE sectors in other developing countries.

The structure of this paper is as follows. In the next section, the critical aspects of the literature are reviewed. In this, the underpinning theory (UTAUT) is introduced along with the proposed external variable PI. The literature review leads to building the theoretical framework for the study followed up by hypotheses development and research methodology. Subsequently, analysis and findings are presented. Finally, a discussion on research implications is presented. Limitations and direction for the future are identified.

Literature review

Virtual Learning Environments

By 2025, online education will be the mainstream of instruction delivery (S. Palvia et al., 2018). Rapid growth in ICT accelerated the use of online education, making it a global trend (Palvia, Baqir, & Nemati, 2018). The emergence of online educational tools such as virtual

learning environments (VLE) set new rules for the process of teaching and learning (Watanabe, Naveed, & Neittaanmäki, 2017).

VLE is a tool that uses ICT & multimedia with a specific end goal to enhance educational support and assistance for both teachers and students (Khidzir, Daud, & Ibrahim, 2016). VLEs offer number of solutions to overcome typical limitations (i.e. space and time bounds, instructions delivery quality, learner' soft skills) in the traditional classroom-based teaching environment (Tarhini, Hone, & Liu, 2014). Therefore, despite digital divide and gaps, virtual learning has flourished in third world countries today (Ramorola, 2018).

Most Sri Lankan HE institutes keep weight on blended learning is practices. (Gamage & Fernando, 2016; Nanayakkara & Kusumsiri, 2013). Blended learning integrates advanced features of virtual learning into the aspects of traditional teaching (Akkoyunlu & Soylu, 2008).Literature suggests that the successful adoption of a VLE in a blended learning environment relies upon instructors' acceptance of technology (Mozelius & Hettiarachchi, 2017).

UTAUT Framework

Given the fact that use of virtual learning environments (VLEs) is an innovative behavior of an individual using ICT technology, the unified theory of technology acceptance (UTAUT) by Venkatesh et al. (2003) is used as the underpinning theory of this study. This selection is justified by the global approach taken by the UTAUT authors, by incorporating eight well established IS acceptance models into it. It is assumed that UTAUT has a superior predictive power of technology acceptance over other IS models (as claimed by its authors).

The UTAUT model entails four (4) constructs, namely, Performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). The former three (PE, EE, SI) drives intention to use (BI), mediate the relations between the said determinants and technology use (UB). Facilitating conditions (FC) is a direct determinant of the technology use.

The UTAUT framework has confirmed its robustness in predicting technology acceptance in multiple, multi-cultural settings (Alshehri, Drew, & AlGhamdi, 2013; Bawack & Kamdjoug, 2018; Celik, 2016; Shen & Shariff, 2016; Šumak & Šorgo, 2016; Tarhini, El-Masri, Ali, & Serrano, 2016). Due to these reasons, the UTAUT framework gained its popularity in examining technology acceptance since its launch in the early 2000s. However, to test the robustness of a model, it should be tested in various cultures, contexts, considering different perspectives to technology adoption (Khechine & Lakhal, 2018).

Other salient factors affecting lecturer's technology adoption

Review of the literature suggests that the following variables would play a significant role in predicting lecturer's acceptance of technology. For instance, personal traits (Barnett, Pearson, Pearson, & Kellermanns, 2015), Personal innovativeness in IT (Lopez-Perez, Ramirez-Correa, & Grandon, 2019), ICT competency (Aslan & Zhu, 2018) , attitude (Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2017), anxiety (Maican, Cazan, Lixandroiu, & Dovleac, 2019); self-efficacy (Long, Cummins, & Waugh, 2018), experience (Dedeoglu, Bilgihan, Ye, Buonincontri, & Okumus, 2018) were the commonly used UTAUT extensions in educational environments., HE lecturer's adoption of VLE is explored in this study. Therefore, the variable "personal Innovativeness in IT" was selected as an independent construct extending UTAUT framework to reach the objectives set in this study.

Personal Innovativeness in IT and technology adoption

Literature suggests that personality traits play a crucial role in decisions regarding technology adoption decision (Maican et al., 2019). Studying individual responses to innovation adoption, Rogers (1983) defined personal innovativeness (PI) as a personality trait that makes a person comfortable with unfamiliar situations or willing to take high risks. However, Goldsmith and Hofacker (1991) opined that the global innovativeness (PI) has less predictive power in determining specific innovation adoption decision. Therefore, the notion of domain-specific innovativeness was introduced. Later Agarwal and Prasad (1998) operationalized a definition for personal innovativeness in the domain of Information technology (PIIT), as the willingness of an individual to experiment IT innovations. Confirming this view, (Dai, Luo, Liao, & Cao, 2015; Schillewaert, Ahearne, Frambach, & Moenaert, 2005) stated that individuals with innovative personalities are those who eagerly accept technological innovations.

In this study, the notion of Personal Innovativeness in IT has been the primary focus as the authors believe it is a very relevant factor in determining lecturer's adoption decision to education technology in a voluntary setting.

This variable (Personal Innovativeness in IT) will be measured as a general discernment rather than being VLE specific; A four-item PIIT scale will be adapted from Agarwal and Prasad (1998) to operationalize the variable.

Numerous researchers have found that Personnel Innovativeness in IT is significantly affecting technology adoption (Jackson et al., 2013; Xu & Gupta, 2009; Yang, Lu, Gupta, Cao, & Zhang, 2012; Zarmpou, Saprikis, & Vlachopoulou, 2011).

The significance of personal innovativeness in IT on technology acceptance has not generated consistent results. For instance, Lu, Yao, and Yu (2005) tested the significance of Personal Innovativeness in IT and social influence in adopting to wireless technology through mobile technology and found that PIIT was not significant in that prediction. Similarly,

Agarwal and Karahanna (2000) tested the effect of PIIT on perceived usefulness and perceived ease through a multi-dimensional construct called cognitive absorption towards using the world wide web. Although PIIT had a significant effect on cognitive absorption, there was no significant effect on perceived usefulness or ease of use.

Research Framework

This study relies upon the UTAUT framework, Venkatesh et al. (2003) to test the multifaceted effects of lecturer's innovativeness in IT (PI) in predicting VLE adoption in the HE environments. In particular, the direct, anteceding effects of PI on the UTAUT variables as well as the indirect effects of PE and EE on the PI to BI relationship would be assessed in this study. For this purpose, below theoretical framework is proposed.
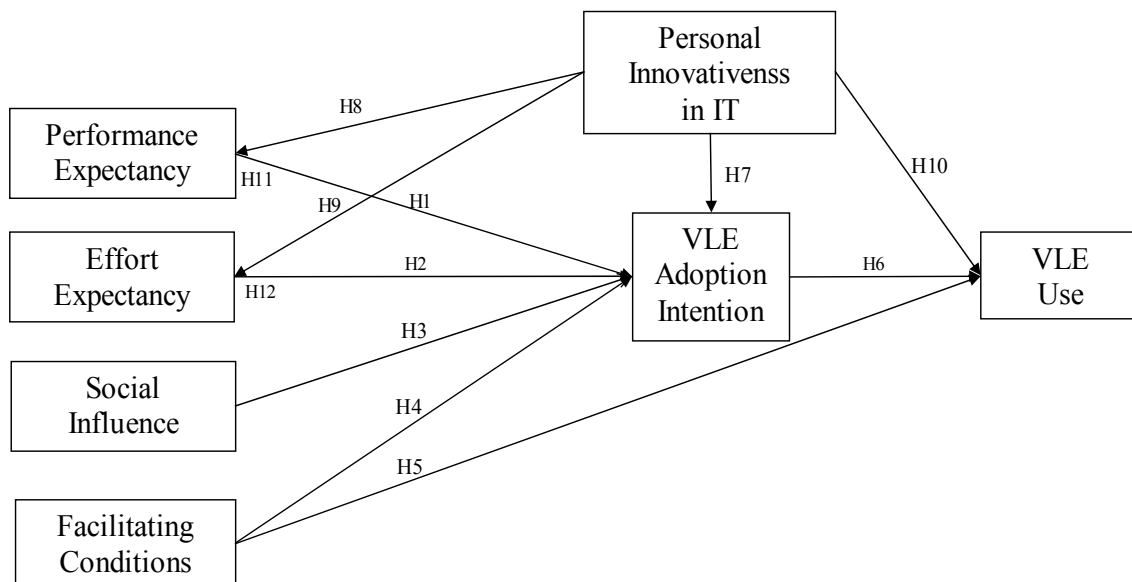

Figure 1. PI integrated UTAUT model in determining VLE adoption

Hypotheses Development

- ***Performance Expectancy (PE)***

In the UTAUT, PE is defined as a belief construct that measure user perception about the utilitarian benefits offered by a particular technology to improve his or her performance (Venkatesh et al., 2003). Many scholars in multiple arrays of studies have empirically validated the significance of PE in determining BI (Al-Awadhi & Morris, 2008; Bervell & Umar, 2017; Lopez-Perez et al., 2019; Maican et al., 2019; Rosen, 2005). Particularly, Bervell

and Umar (2017) highlighted the significance of PE in understanding a lecturer's acceptance of the technology. In a HE environment, VLEs' can assist lecturers in effectively managing course material, tracking student performance even in a large class, obtaining time and place flexibility, work collaboration, and sharing resources. Consequently, if lecturers believe that by using VLE, they gain such performance improvements; it is likely to have a higher acceptance of the technology. Therefore, we hypothesized that;

HI: Performance Expectancy (PE) has a direct positive effect on lecturer's intention to use VLE.

- ***Effort Expectancy (EE)***

In the UTAUT, EE is defined as the perceived easiness in using a particular technology (Venkatesh et al., 2003). Many scholars have validated the significance of EE on lecturer's acceptance of the technology (Ayad, 2018; Bervell & Umar, 2017; Lopez-Perez et al., 2019; Maican et al., 2019; Rosen, 2005). In the HE context, this would mean the perceptions of lecturers about the easiness in using VLE. The EE in VLE is likely to occur due to various reasons such as easy navigation, user-friendly system menus, in-build help options. If lecturers believe that VLE is easy to use; its acceptance is likely to be higher. Therefore, it is hypothesized that;

H2: effort expectancy (EE) has a direct positive effect on lecturer's intention to use VLE.

- ***Social Influence (SI)***

SI refers to the extent to which a person believes that his friends, family, colleagues or social networks influences his perceptions about technology use (Venkatesh et al., 2003). Although many studies have confirmed the significance of SI in predicting BI (Ain, Kaur, & Waheed, 2016; Lopez-Perez et al., 2019; Nandwani & Khan, 2016) certain other studies have failed to verify same (Maican et al., 2019; Shaw & Sergueeva, 2019; Teo, Milutinović, & Zhou, 2016). Typically, in an HE setting, department's heads, senior academic staff and peers would influence the lecturers on decisions such as the use of ICT in delivering their program. Based on these findings it is hypothesized that;

H3: Social Influence (SI) has a direct positive influence on lecturer's intention to use VLE.

- ***Facilitating Conditions (FC)***

FC is the extent to which a person believes that resources are available for him to use a particular technology (Venkatesh et al., 2003). Although the effect of FC on BI was not established in the original UTAUT, it was verified in UTAUT2 (Venkatesh et al., 2012). Further, this relationship was confirmed by many other scholars (Farooq et al., 2017; Lopez-

Perez et al., 2019; Raman & Don, 2013). According to (Gamage & Fernando, 2016), all HE institutes in the country are geared to facilitate technology-based learning. These facilities would include support services, network equipment, computers and infrastructure, to name a few. Lecturers are expected to make more use of VLE when the required infrastructure is already available at the HE institutes. Therefore, it is hypothesized that;

H4: Facilitating Conditions (FC) has a direct positive effect on a lecturer's intention to use VLE

H5: Facilitating Conditions (FC) has a direct positive effect on a lecturer's use behavior of VLE.

- ***Behavioral Intention to Use (BI):***

BI is defined as the willingness of an individual to use a particular technology (Venkatesh et al., 2003). In theories of technology adoption, BI is presented as the first sign of adoption instigating use behavior short after, (Leong, Ooi, Chong, & Lin, 2013). In HE environment, a lecturer having a high intention of using VLE is likely to adopt the system sooner than others. Therefore, it is hypothesized that;

H6: Behavioral intention to use (BI) has a direct positive effect on lecturer's use behavior of VLE.

- ***Use Behavior (UB)***

UB refers to the actual usage of an technology that is captured as the self-reported frequency of use (Venkatesh et al., 2003). For this study, use is measured through five items scale covering the aspects of usage frequency, duration and system interaction.

- ***Personal Innovativeness in IT (PI)***

PI is the willingness of an individual to try out innovations in the domain of information technology (Agarwal & Prasad, 1998). The effect of personal innovativeness in IT is recognized as an essential antecedent of technology adoption intention of the individual (Agarwal & Prasad, 1998), and empirically validated by many scholars (Lopez-Perez et al., 2019; Purani et al., 2019; Rosen, 2005; Yang et al., 2012; Yi, Fiedler, & Park, 2006). Further, (Agarwal & Prasad, 1998) opined that individuals with high personal innovativeness in IT tend to develop positive perceptions of technological innovations than others. Therefore, it is plausible to assume that such positive perceptions would reflect their beliefs about utilitarian benefits offered by the VLE and ease of using the VLE. Previous studies have confirmed the anteceding effect of Personal innovativeness in IT on usefulness and ease of use (Akar, 2019;

Lopez-Perez et al., 2019; Purani et al., 2019; Rosen, 2005; Yang et al., 2012). Therefore, it is hypothesized that;

H7: Personal Innovativeness in IT (PI) has a direct positive effect on lecturer's intention to use VLE.

H8: Personal Innovativeness in IT (PI) has a positive effect on lecturer's perceived performance expectancy of VLE.

H9: Personal Innovativeness in IT (PI) has a positive effect on lecturer's perceived effort expectancy of VLE.

H10: Personal Innovativeness in IT (PI) has a direct positive effect on lecturer's use behavior of VLE.

The mediation effects of PE and EE on the relationship between PI to BI has been verified in the past studies (Purani et al., 2019; Rosen, 2005; Yi et al., 2006) Therefore we hypothesize that;

H11: Performance Expectancy mediates the positive relationship between lecturer's Innovativeness in IT (PI) and behavioral intention (BI) to use VLE.

H12: Effort Expectancy (EE) mediate the positive relationship between lecturer's Innovativeness in IT (PI) and behavioral intention (BI) to use VLE.

Research Design and Methodology

In this study, the deductive strategy; quantitative methodology, survey technique was employed. This approach allows the researcher to test the research model using the hypotheses and find answers to research questions. The first step was to develop the measurement tool (questionnaire) covering all components in the research model. For this purpose, the scales of previous studies were reviewed. For instance, the scale of UTAUT by Venkatesh et al. (2003) was used for PE, EE, SI, FC, BI, UB constructs. PIIT scale of Agarwal and Prasad (1998) was employed for the PI scale. Certain scale items were modified to fit the local HE context.

The questionnaire was made of three sections. The first section was designed to capture demographic data such as age, gender and background information of the respondents. The second section included statements measuring constructs of the proposed framework. In this section, 33 scale items (5 item scales for PE, SI, FC, BI and UB; four item scales for PI and EE) were listed in a 7-point Likert scales. The last section intended to capture, usage related information and other comments related to VLE usage. The questionnaire was developed in English since targeted respondents (lecturers of HE institutes) were literate to communicate and comprehend in English. Based on the expert comments obtained from three MIS

specialists in the academia, terminology, clarity, logical consistency and relevance of the questionnaire was further improved. Then as the next logical step, the questionnaire was pre-tested with a conveniently selected set of lecturers (#30) and made further enhancements. Finally, it was pilot tested with #75 randomly selected sample of respondents for reliability and validity of the tool. Analysis of Cronbach's alpha scores confirmed ($\alpha > 0.7$) high reliability of the scales. Thus, the questionnaire was ready for primary data collection.

The survey population consisted of #7891 lecturers attached to #23 HE institutes of Sri Lanka. Simple random sampling was used for sample selection covering licensed HE institutions (23) in the country. The sample respondents were from various academic disciplines, experiences, ethnicities and geographic locations. This characterization improved the generalizability of the Sample. The minimum sample size was #364 (Krejcie & Morgan, 1970). However, #3000 questionnaires were distributed using an online survey (*question pro*) tool keeping a buffer for non-response error. In the end, #1281 responses were returned, affirming a 42.7% response rate. Responses were captured into an excel file. #17 incomplete responses (a large chunk of missing data) were removed from the sample. Remaining records (#1264) were selected for the statistical analysis.

Further cleansing of data detected certain other records with few missing values was imputed with mean values. During the outlier detection process, no univariate outliers were detected; however, 11 multivariate outliers were detected and removed. For data analysis, Structural equation modelling (SEM) procedure was employed using IBM SPSS (ver.21) and AMOS (Version 26) software.

Analysis and Interpretation

In the next section, the procedure used for data analysis is explained. First, a descriptive analysis of the sample is presented using frequencies (counts) and percentages. Then, a step by step procedure to SEM for hypotheses testing is explained.

Demographics Analysis

The sample is comprised of (51%) male and (49%) female. The sample Mean value of the age was 40.6 years. About 30% of the sample had had over 20 years of experience in lecturing, and another 28% were with less than 5 years of HE lecturing experience. Considering their academic rank, the sample consisted of 20% professors, 50% senior lecturers, 26% lecturers and 4% assistant lecturers. 50% of sample respondents were PhD holders. Further, various academic disciplines represented the sample (23% Arts, 17.6% Management and commerce, 17.6% medicine and so on). Sample comprised of 51% users, 33% non-users, and 15% lapse users. Sample statistics indicated a fair illustration of the population.

Table 1. Descriptive Statistics of the Sample

Descriptive	Category	Count	%
Gender	Male	638	50.9
	Female	615	49.1
Age	Younger (<41 yrs)	662	52.8
	Older (>=41 or more)	591	47.2
Period of Service	<5 years	353	28.2
	6 -10 years	220	17.6
	11-15 years	153	12.2
	16 -20 years	141	11.3
	21-25 years	180	14.4
	>25 years	206	16.4
Academic Rank	Assistant Lecturer	38	3.0
	Lecturer	343	27.4
	Senior Lecturer	628	50.1
	Professor	244	19.5
Highest Academic Qualification	Bachelor's degree	154	12.3
	Master's Degree	337	26.9
	MPhil	137	10.9
	PhD	625	49.9
Current Computer Knowledge	Poor	20	1.6
	Moderate	298	23.8
	Good	561	44.8
	Very good	374	29.8
Usage status (Self Reporated)	Registered User	642	51.2
	Registered Non user	195	15.6
	Non user - aware of VLE	336	26.8
	Non user - Not aware	80	6.4

Test of Reliability and Validity

The reliability of constructs was established through Cronbach alpha (α) and composite reliability (CR) values in which the test ran for each item in the measurement scale (Hair Jr, Hult, Ringle, & Sarstedt, 2016). Results indicated that all values were above the cut off ($\alpha >0.7$) and CR>0.5, confirming a high reliability in scale items (refer table 2). The findings were consistent with previous studies that employed similar scales. (Farooq et al., 2017). The convergent validity and discriminant validity of the constructs were examined. As depicted in

table 2 below, convergent validity was achieved through Average Variance Extracted (AVE) with values above 0.5 (Fornell & Larcker, 1981).

Table 2. Analysis of Reliability and Validity

Construct	Measures	Mean	SD	Cronbach's Alpha (α)	CR	AVE
Performance Expectancy (PE)				0.939	0.940	0.759
PE 1	I would find VLE useful in my job.	3.78	1.13			
PE 2	VLE would enable me to accomplish my tasks more quickly.	3.68	1.09			
PE 3	Using VLE would increase my productivity.	3.60	1.12			
PE 4	Using VLE will increase my chances of getting a reward/benefit.	3.64	0.94			
PE 5	Using VLE would make it easier to do my job.	3.78	1.12			
Effort Expectancy (EE)				0.890	0.895	0.682
EE1	I would find VLE easy to use.	4.87	1.60			
EE2	Learning to operate VLE is easy for me.	5.05	1.54			
EE3	It would be easy for me to become skillful at using the VLE system.	4.79	1.70			
EE4	My interaction with the VLE would be easy, clear and understandable.	5.19	1.87			
Social Influence (SI)				0.955	0.955	0.811
SI1	People who influence my behavior think I should use VLE.	4.47	1.61			
SI2	People who are important to me think that I should use the VLE.	4.50	1.60			
SI3	In my university, lecturers who use VLE have more prestige than others.	3.88	1.68			
SI4	The higher administration of this university has influenced me to use VLE.	4.23	1.83			
SI5	In general, the university policies, administration encourage me to use VLE.	4.37	1.67			
Facilitating Conditions (FC)				0.888	0.888	0.613
FC1	I have the necessary resources to use the VLE.	5.38	1.21			
FC2	I have the knowledge necessary to use the VLE.	4.96	1.25			
FC3	The VLE is compatible with other systems I use for my job.	4.95	1.24			
FC4	Technical help (specific person or group) is available for assistance.	5.11	1.22			
FC5	University has provided the release time to learn and use VLE.	4.90	1.25			
Personal Innovativeness in IT (PI)				0.933	0.934	0.780
PI1	If I heard about new information technology, I would look for ways to experiment with it.	4.79	1.73			
PI2	Among my peers, I am usually the first to try out new information technologies.	4.15	1.63			
PI3	In general, I am hesitant to try out new information technologies.	4.64	1.71			
PI4	I like to experiment with new information technologies	4.79	1.76			
Behavioral Intention to Use (BI)				0.928	0.928	0.721
BI1	I Intent to use the VLE during this semester.	5.19	1.55			
BI2	I intend to learn to use the VLE	5.20	1.50			
BI3	I intend to integrate VLE and useful functions for my lecturers	5.15	1.49			
BI4	I predict I would use VLE in the next semester as well	5.09	1.39			
BI5	I plan to use VLE regularly from next semester	5.16	1.49			
Use Behaviour (UB)				0.954	0.954	0.806
UB1	I use VLE in the university environment	5.32	1.59			
UB2	I use at least basic features of VLE for lectures	5.44	1.50			
UB3	VLE is part and partial for my daily work	5.30	1.48			
UB4	I have been interacting with VLE in the past six (6) months.	5.40	1.54			
UB5	I try to learn new things that I can do with VLE.	5.39	1.54			

Discriminant validity was achieved by comparing the square root of AVE against the inter-item correlation between constructs (Fornell & Larcker, 1981). As presented in table 3, results confirmed discriminant validity of the scale.

Table 3. Analysis of Discriminant Validity

Construct	AVE	MSV	MaxR(H)	1	2	3	4	5	6	7
1. Performance Expectancy (PE)	0.759	0.712	0.946	**0.871**						
2. Effort Expectancy (EE)	0.682	0.679	0.905	0.798	**0.826**					
3. Social Influence (SI)	0.811	0.057	0.961	0.178	0.239	**0.901**				
4. Facilitating Conditions (FC)	0.613	0.389	0.889	0.585	0.624	0.191	**0.783**			
5. Personal Innovativeness (PI)	0.780	0.394	0.941	0.580	0.628	0.166	0.475	**0.883**		
6. Behavioral Intention to Use (BI)	0.721	0.712	0.931	0.844	0.824	0.174	0.612	0.611	**0.849**	
7. Actual Usage (UB)	0.806	0.454	0.955	0.625	0.667	0.143	0.574	0.492	0.674	**0.898**

Measurement Model and CFA

As the first step, the measurement model was built in AMOS V.26. In this, all constructs were considered as reflective variables, and each scale item was linked to its respective latent variables. Secondly, a confirmatory factor analysis (CFA) was performed, and the goodness of fit (GOF) was obtained (Hair Jr et al., 2016).
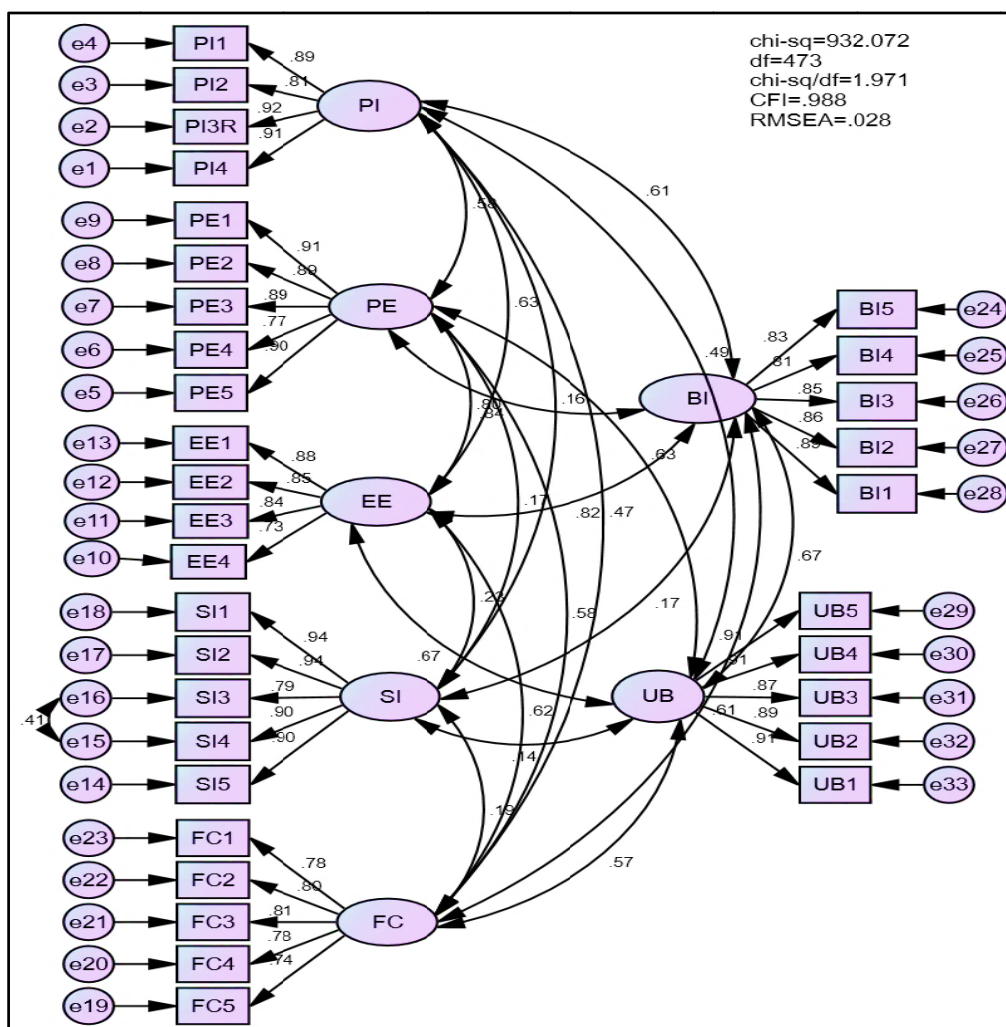

Figure 2. The Measurement Model

Fit indices were within recommended cut off levels ($GFI = 0.957$, $PGFI = 0.807$, $RMSEA = 0.028$, $AGFI = 0.949$, $SRMR = 0.024$, $CFI = 0.988$, $NFI = 0.976$, $TLI = 0.987$, $CMIN = 932.072$, $DF = 473$, $\chi^2/df = 1.971$, $NPAR = 121$) Moreover, it was found that all the factor loadings were above the cut off of 0.7 and significant at ($P < 0.01$). Results indicated the suitability of the hypothesised model for hypotheses testing. The reflective measurement model is presented in figure 2.

Structural Model & Path Analysis

The structural model was created in AMOS V.26 by linking exogenous variables with endogenous variables through single-headed arrows. Proposed framework one consisted of three exogenous variables (PI SI, FC), three mediating variables (PE, EE, BI) and an endogenous variable (UB) were identified. As suggested by Hair Jr, Babin, and Krey (2017) goodness of fit (GOF) indices of the structural model was assessed and all indices were within the accepted level ($CMIN = 1774.727$, $df = 481$, $\chi^2/df = 3.69$, $AGFI = 0.906$, $PGFI = 0.788$, $RMSEA = 0.046$, $SRMR = 0.10$, $CFI = 0.967$, $TLI = 0.964$, $NFI = 0.955$) indicating the model suitability for hypotheses testing. Finally, the significance of each hypothesised structural path was tested using standard path coefficients and the p-values. The structural model is shown in figure 3.
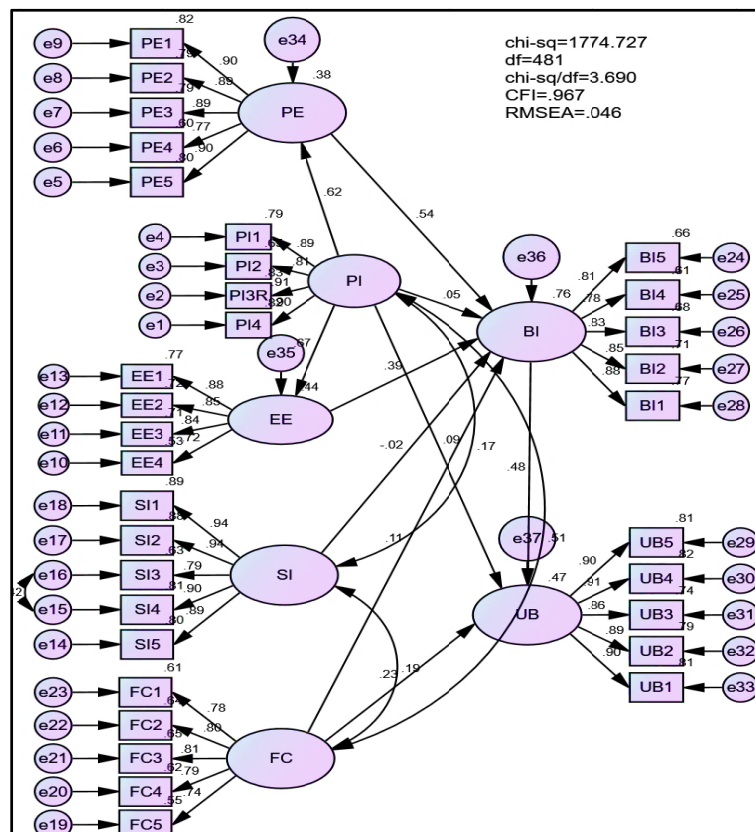

Figure 3. The Structural Model

Based on the results, 47% ($R^2 = 0.47$) of variance in technology use behaviuor (UB) is explained by behavioural intention (BI), facilitating conditions (FC) and personal innovativenss in IT (PI).Thus, the theorized model confirms its nomological validity (R^2 value> 0.10) in explaining lecturer's VLE adoption intentions in the local HE context (McKenna, Tuunanen, & Gardner, 2013). Table 4 present the results of path analysis of direct hypotheses along with their p-values.

Table 4. Results of hypothesized path analysis

Path (Hypothesis)	Standardized path coefficients (Beta)	S.E.	C.R.	p	Hypothesis test result
PE ---> BI (H1)	0.540	0.023	20.541	***	Supported
EE ---> BI (H2)	0.390	0.024	13.652	***	Supported
SI ---> BI (H3)	-0.022	0.014	-1.228	0.22	Not Supported
FC ---> BI (H4)	0.109	0.027	4.925	***	Supported
FC ---> UB (H5)	0.230	0.042	7.965	***	Supported
BI ---> UB (H6)	0.483	0.042	13.479	***	Supported
PI ---> BI (H7)	0.048	0.023	1.499	0.134	Not Supported
PI ---> PE (H8)	0.619	0.022	23.208	***	Supported
PI ---> EE (H9)	0.666	0.026	21.394	***	Supported
PI ---> UB (H10)	0.089	0.03	2.483	0.013	Supported

As depicted in table 4 above, the output of the path model reveals that eight of ten hypotheses are supported. Performance expectancy (PE); effort expectancy (EE) and facilitating conditions (FC) showed direct positive significant effects on lecturer's behavioral intention (BI) to use VLE, thus supported H1, H2 and H4 respectively. Similarly, facilitating conditions (FC), and behavioral intention to use (BI) significantly predict use behavior (UB) supporting H5 and H6, respectively. Although PI has a positive correlation with UB at 95% CI supporting H10, the extent of the impact is small.

Also, it was found that PI has significant effects on performance expectancy (PE) and Effort Expectancy (EE) confirming H8 and H9. The social influence (SI) and personal innovativeness in IT (PI) were not significant determinants of behavioral Intention (BI) in the study context. Thus, H3 and H7 were not supported.

Mediating effect of PE and EE on the PI – BI relationship

In this study, the mediating effects of PE and EE on PI to BI relationship is hypothesized as H11 and H12 (refer thermotical framework in figure 1), and the bootstrapping procedure was used to examine the indirect effects (Hair Jr et al., 2017). The bias-corrected confidence interval at 95% level was calculated using 2000 bootstrap samples. The mediation effect size was calculated using the standardized effect approach (Mallinckrodt, Abraham, Wei, & Russell, 2006). PI demonstrates a significant direct effect on BI with and without mediation

(refer to table 5). Further, a significant indirect effect was found in both paths (PI→PE→BI and PI→EE→BI) reflecting partial mediation.

In summary, both PE and EE have an indirect effect on the relationship between PI and BI. Therefore, H11 and H12 are supported.

Table 5. The mediating effect of PE, EE on PI to BI relationship

Hypothesis	Std. direct effect without mediation	Std. direct effect with mediation	Std. Indirect Effect	Mediation Type
H11: PI→PE→BI	0.078(0.001)	0.059 (0.042)	0.327 (0.001)	Partial Mediation
H12: PI →EE →BI	0.078(0.001)	0.057 (0.051)	0.253 (0.001)	Partial Mediation

Discussion

In this study, Personal Innovativeness in IT (PI) was employed as an independent variable along with UTAUT constructs to understand how PI exerts its effects on the UTAUT factor and alters them in determining VLE acceptance and use of HE lecturers in Sri Lanka.

Thus, the first research question was set to explore the direct effect of personal innovativeness in IT (PI) on BI and UB. Results (refer to table 4) confirmed the direct effect of PI on BI ($\beta = 0.05$, $p < 0.01$) and UB ($\beta = 0.08$, $p < 0.05$) although the effect size is not great. Similar results have been found in previous studies (Farooq et al., 2017; Yi et al., 2006).

Answering the second research question set in this study, results revealed a strong positive relationship between personal innovativeness in IT (PI) with each mediator, PE ($\beta = 61.9, p < 0.001$), and EE ($\beta = 66.6$, $p<0.001$), which provided evidence to the fact that PI is an essential antecedent to both these mediators. Many other previous studies have validated this effect of PI in anteceding PE and EE (Akar, 2019; Lopez-Perez et al., 2019; Purani et al., 2019).

Further, the results disclosed that the direct effect of PI on BI is significantly reduces (refer to table 5) in the presence of hypothesized mediators, confirming the existence of partial mediation in each structural path (PI→PE→BI and PI→EE→BI). Accordingly, the third research question was answered.

Then, this study identified three UTAUT factors significantly affecting the acceptance and use of VLE by HE academics. Performance expectancy (PE) appeared to be the most significant factor in determining BI to use VLE ($\beta = 54.0, p < 0.001$), followed by effort expectancy (EE) ($\beta = 39.0, p < 0.001$), thirdly, facilitating conditions showed a positive direct effect on BI ($\beta = 0.11, p < 0.001$) finally. However, social influence was not significant in determining BI ($\beta = 0.05$, ns) in this context. Similar results were observed in previous UTAUT based studies conducted in voluntary settings (Khechine & Lakhal, 2018). The fourth and final research question was answered when the findings revealed that PE, EE, FC have significant positive effects on the BI to use VLE. Further, it was found that BI

($\beta = 48.3$, $p < 0.001$), FC ($\beta = 23.0$, $p < 0.001$), and PI ($\beta = 0.09$, $p < 0.05$), collectively predict lecturers' use behavior of VLE.

The theoretical framework that integrated PI into the UTAUT confirmed mediating effects of PE and EE on PI and accounted for 38% of the variance of performance expectancy, 44% variance of effort expectancy, 76% variance of intention to use VLE, a and 47% variance of VLE use behaviour. This finding is a demonstration of high explanatory power set out by the theorised relationships in this study. The resulted R^2 values exceeded the variance explained by most previous studies (Jackson et al., 2013; Purani et al., 2019).

Implications

In this study, Personal Innovativeness in IT (PI) proved its significance in determining the lectures' acceptance of technology in higher education (HE) sector in Sri Lanka.

The results confirmed that the effect of PI on BI to adopt VLE is lessening in the presence of mediators, PE and EE. This result implies that PI exerts part of its influence on behavioral intention via PE and EE, which indeed is the main contribution of this study, to the theory of academic's IS acceptance in a voluntary usage setting.

Further, this study empirically validates the UTAUT model in a new social-cultural setting (R^2 of UB is 0.47), which ultimately resulted in a unique set of factors (PE, EE, PI, FC) significantly determining academic acceptance of VLE.

Also, the findings underline the importance of altering a technology acceptance theory to explain user adoption to technology in a voluntary usage setting.

Often, technological innovations fail due to a lack of user adoption. Therefore, organizations need to attract a larger base of users to trial technological innovation. Literature suggests that individuals with innovative behaviors are often early adopters to IS innovations (Rogers, 1983). Therefore, HE institutes may identify such potential users to try out VLE and eventually make them opinion leaders who convince and support others to use the VLE system. In this manner, administrators of higher education institutions could promote the VLE system among a larger academic audience ensuring faster diffusion. Also, it is essential to provide support and facilities, staff training, introduce user-friendly VLE interfaces to ease of use, constant reminders about VLE utilitarian benefits and so on, to encourage higher VLE uptake among HE lecturers.

Limitations and Future Research

The scope and nature of this study have resulted in certain limitations. First, the surveyed sample consisted of 51% (current) users and 33% lapse users of VLE. It is possible for such users to be biased in their innovative perceptions due to their experience with the technology. Therefore, it is recommended for future researches to validate the theorized model with individuals newly adapting to technological innovations.

This study established four predictors of behavioral intention to use VLE technology (performance expectancy, and effort expectancy, facilitating conditions, and personal innovativeness in IT). However, the literature suggests many other factors potentially affecting the academic acceptance of online technology (i.e., attitude, compatibility, self-efficacy, and so on).

Further, future researches should examine the significance of other potential mediators of PI beyond performance expectancy and effort expectancy.

Finally, the nature of the study was cross-sectional, which employed a quantitative survey method; thus, perceptions of individuals were restricted to a particular period, and deep-rooted insights were missed out. However, perceptions change over time, with experience (Venkatesh et al., 2003). Therefore, it is recommended for future researches to focus on longitudinal studies using the mixed method of data collection to avoid such limitations.

Conclusion

The primary focus of this research was to examine the multifaceted effects of personal innovativeness in IT in predicting lecturers' acceptance of VLE technology in higher education institutes of Sri Lanka. For this purpose, the variable PI was integrated with the UTAUT model, forming a new theoretical framework which was validated in this study.

The authors examined the causal paths of the proposed structural model by testing the direct effects (PI→BI; PI→UB), and indirect effects (PI→PE→BI); (PI→EE→BI). The results demonstrated partial mediation effects in both theorized paths resulting in a weak direct relationship between PI to BI. However, results confirmed the importance of PI in predicting lecturer's acceptance of online educational tools (VLE) in a local higher educational context.

Furthermore, the effects of performance expectancy (PE), Effort expectancy (EE) and facilitating conditions were also found to be significant predictors of behavioral intention, which in turn significantly predicted VLE use behavior.

Results indicate that innovative personalities should be identified at the institution level for faster dispersal of positive word of mouth about VLE benefits. Further, they are the opinion leaders who subsequently help others to confidently use VLE technology within the Sri Lankan higher education setting. Furthermore, all lecturers should be given awareness about VLE benefits, improved design features for ease of use, providing necessary facilities and infrastructure for academics are some recommendations for higher academic adoption of VLE technology.

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