

Does Gender Moderate the Behaviour of Sri Lankan State University Lecturers in Using Virtual Learning Environment (VLE)

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Abstract:

This research paper sets out to investigate the factors influence the adoption of VLE by the academicians of Sri Lankan national universities. It is intended to accomplish this by using the Technology Acceptance Model together with a few empirical inputs as extension. Questionnaire was used collect data from 357 academics working in 15 national universities that are under the purview of the University Grants Commission. A systematic, proportionate, stratified sampling technique was applied to represent all universities and various categories of staff. Statistical Package for the Social Sciences (SPSS) and Analysis of Moment Structures (AMOS) version 23 were used to analyse the data. Through Structural Equation Modelling, the model fit was tested and the associations between variables were examined through path analysis. This study's results show that perceived usefulness, subjective norm and computer self-efficacy have positive associations with behavioural intention whilst perceived ease of use and university support did not have associations. Behavioural intention is positively associated with actual usage. These findings suggest that usefulness of system, computer self-efficacy of academics, and the normative factor influence the actual usage of the VLE. Gender moderates the relationship between behavioural intention and perceived ease of use, subjective norm and computer self- efficacy.

Keywords: Computer self-efficacy, E-learning behaviour, Online learning, Technology Acceptance Model, Virtual Learning Environment, Gender, Structural Equation Modelling.

1. Introduction

Due to the tremendous advances in information and communication technologies (ICT), various types of devices have been utilized for effecting transactions and delivering services. Education is not an exception and so it has embraced such changes. Introduction of the e-learning (e-l) system is the most remarkable paradigm shift in the education sector and it has been brought about by the emergence of ICT. Digital learning technologies

open a key strategic dimension in the education sector, especially in the teaching and learning process. Different types of e-learning portals have emerged and these are currently utilized across the globe. Some of them are commercial software such as Blackboard and Desire2Learn, while an open source system is known as Moodle. A Virtual Learning Environment (VLE) is one developed by using open source software. "A virtual learning environment (VLE) is a web-based platform that

allows students to learn at a personally defined place, time and pace" (Abdullah Melissa Ng Lee Yen, 2018). However, it is more than just a web-based system, as it is described as being capable of providing "a more collaborative learning practice in which students can view themselves not only as passive recipients of knowledge but also as active information providers who receive a unique and intensive educational experience" (McBrien *et al.*, 2009 as cited in Hu *et al.*, 2010). WhatIsdot.com described the VLE as cited in Weller, 2007 as follows. "The principal components of a VLE package include curriculum mapping (breaking curriculum into sections that can be assigned and assessed), student tracking, online support for both teacher and student, electronic communication (email, threaded discussions, chat, web publishing), and Internet links to outside curriculum resources." VLE is a term used interchangeably with Learning Management System (LMS), Course Management System (CMS), and Managed Learning System (MLS). However, both VLE and LMS are synonymous and are defined as, "a software system that combines a number of different tools that are used to systematically deliver content online and facilitate the learning experience around that content" (Weller, 2007).

Usage of the virtual learning environment has generated a great deal of interest among researchers involved in education and information systems due to its proliferation and ubiquity in developed countries over the last two decades. Similar attention is now being given in the context of developing countries too. In Sri Lanka, VLE is being implemented by using MOODLE, which is the system installed in the National Universities. The VLE is sophisticated enough to be used with both synchronous and asynchronous learning techniques. In addition, VLE has various value added features that could yield advantages in learning and teaching activities, according to Azevedo *et al.* (2009a) as cited in Abdullah Melissa Ng Lee Yen (2018). It was

reported that, "86 percent of respondents from UK higher education (HE) institutions mentioned the presence of a VLE in their institution" (Brown & Jenkins 2003 as cited in Weller, 2007). Though pedagogic practices have changed a lot from the earlier teacher centred learning to student centred learning, as well as from face-to-face method to electronic mode, still the procrastination in adoption is observed (Browne *et al.*, 2006; Jimoyiannis & Komis, 2007; Rienties *et al.*, 2012, 2016; Sanchez-Franco, 2010). Disappointingly, usage of the Virtual Learning Environment (VLE) for teaching and learning purposes is not taking off in Sri Lanka, even after various initiatives were taken to popularise it. Therefore, an in-depth study is necessary to investigate the various factors that have contributed to this situation. The same situation prevails in Sri Lanka, too (Ratnapala, 2014; Suraweera, 2014).

Preliminary discussions with professors at the University Of Colombo School Of Computing revealed that all national universities in Sri Lanka have installed VLE and the persons in charge of this system in every university have been trained by the School of Computing, University of Colombo. Despite the availability of this system, there still seems to be a poor usage of the facility even though there is a big demand for higher education opportunities from many students who are qualified to enter universities but are unable to do so due to lack of lecture halls, etc. To quench the thirst of such students, the national universities can increase their student enrolment by introducing distant or virtual courses, provided the VLE is properly and extensively utilized. As the usage of the installed VLE system is low, the country struggles to boost its lagging knowledge economy. Further, the current degree programmes at these universities conduct few transactions through VLE because the majority of programmes continue to depend on the conventional method of teaching (Gunasinghe, 2019). This results in the graduates being less able

to fit the global labour market requirements (Samaraweera, 2009; Warnapala, 2009). Therefore, the academicians should promote the utilization of VLE in order to produce more graduates with enriched learning experiences to face the challenges related to the job market and to expand the higher education opportunities. Factors responsible for the poor usage of VLE should be investigated and further measures should be planned and implemented to encourage VLE usage among the academicians in Sri Lankan national universities. Therefore, the main aim of this research is to examine the elements influencing the usage of VLE among the academicians attached to the national universities in Sri Lanka. Specific objectives are as follows:

1. To determine the TAM factors associated with behavioural intention and VLE usage of academicians
2. To determine the associations of computer self-efficacy (CSE) and university support (US) with behavioural intention (BI).
3. To investigate the direct and indirect contributions of the variables towards actual VLE usage
4. To study the mediating role of behavioural intention between exogenous and endogenous variables
5. To examine the moderating effect of gender on the behavioural intention and actual behaviour of academicians

2. Literature Review

There are three important factors influencing VLE usage. First is the technology acceptance factor, second is the computer self-efficacy of academicians and third is the support provided by the institutions. Technology acceptance of the academicians is a highly important determinant according to several studies in the extant literature (Ali *et al.*, 2018; Al-Gahtani, 2016; Tarhini, Hone, & Liu, 2015; Šumaket *al.*, 2011), which arrived at this conclusion after

testing this by using the Technology Acceptance Model (TAM) developed by Davis (1989) and Davis, Bagozzi and Warshaw (1989). Though many studies are available on technology acceptance of academicians on a global basis, very few studies have been carried out in the Sri Lankan context. To the best of the knowledge of the researcher, even these studies did not cover the entire national university system of Sri Lanka. Therefore, this particular study attempts to fill the research gap by exploring the factors influencing the VLE usage of academicians at every Sri Lankan university under the control of the UGC.

The second important factor this research deals with is the computer self-efficacy of academicians. In addition to the system related factors, computer literacy level of individuals may also determine their behavioural intention and usage. Hence, we have added computer self-efficacy as one more variable. According to Adeyinka and Mutala (2008), computer literacy can be viewed as the possession of basic skills involved in using the computer; for example, to save and open a file, use a word processing program, and send and receive email. Computer literacy was operationalized as computer self-efficacy, which was originally developed by Murphy, Coover and Owen (1989) as cited in Rex and Roth (1998). Computer self-efficacy (CSE) can be defined as “a judgement of one’s ability to use a computer” (Compeau & Higgins, 1995). These definitions clearly enunciate that ICT literacy and digital literacy are important for knowledge creation and dissemination, and for a person to function effectively in a knowledge society. Therefore, CSE is an empirical input to this study with TAM related factors.

2.1 Technology Acceptance Model (TAM)

TAM was first introduced by Davis in 1989 as an adaptation of the Theory of Reasoned Action (TRA), (Fishbein & Ajzen, 1967). According to TAM, “behaviour is determined by behavioural

intention, which is in turn determined by belief* (Davis, 1989). Belief is contributed by the three variables 'Perceived Ease of Use' (PEOU), 'Perceived Usefulness' (PU), and 'Subjective Norm' (SN). 'Behavioural Intention' (BI) plays a mediating role and the dependent variable is Adoption or Use. TAM was used to evaluate the technology acceptance level of users of various systems (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008; Park, 2009). The development of several other theories and studies carried out all across the globe on technology acceptance has led to many more models, such as Theory of Planned Behaviour (TPB), Decomposed Theory of Planned Behaviour (DTPB), Information System Success (ISS) model, and Unified Theory of Acceptance and Use of Technology (UTAUT). In some instances, researchers have combined some more theories and models in order to suit their respective study objectives (Santos & Okazaki, 2015; Suraweera, 2014; Asiriet al., 2012; Pinpathomrat et al., 2015; Kriek & Stols, 2010). However, TAM has been widely used to study the adoption behaviour in respect of several types of technology. It has been claimed that the TAM is more suitable, relevant and explanatory for assessing technology acceptance than other models (Tarhinet al., 2013, 2014; Park, 2009; Venkatesh & Bala, 2008; Ali et al., 2018). It has been used to test educational technology adoption studies, too (Al-Alak & Al-Nawas, 2011; Ali et al., 2018; Napitupulu et al., 2018; Wenget al., 2018; Tan, 2019).

Al-Alak and Al-Nawas (2011) used TAM in Jordan to evaluate the adoption of e-portal by academicians and found that PU, PEOU, computer knowledge, computer anxiety, and management support influenced the intention to adopt, but normative pressure did not. Similarly, an extended version of TAM was used to study e-learning adoption/usage (Okazaki & Santos, 2012; Al-Busaidi, 2013; Tarhini, Hone, & Liu, 2015; Al-Gahtani, 2016; Napitupulu et al., 2018; Wenget al., 2018; Tan,

2019). They tested some more variables in addition to the TAM factors. The influence of the variables PEOU and PU have been regularly revealed in educational backgrounds (Sanchez-Franco, 2010; Sjørebøet al., 2009). They found that PU and PEOU were positively related to the use of a VLE.

However, when considering the usage of various ICT related systems, TAM has a critical shortcoming in demarcating the variables. Whilst this model tests the system related factors such as PU and PEOU as well as social or normative factors in terms of subjective norm, it does not posit any variable to examine the computer self-efficacy of the user as well as the organizational support that the person receives when using the system. Based on this gap, our research tested two empirical variables as extensions of TAM. They are computer self-efficacy and organizational support, which include facilitating conditions related to resources, technical support and work norms of the university. The following section deals with the conceptual framework and the variables. Ali et al. (2018) have tested work life quality, computer self-efficacy and facilitating conditions as empirical inputs with TAM for e-l system usage by students in Pakistan. Their research study revealed that with the new constructs TAM has explained the acceptance of e-learning system by students reasonably well. Work-life quality was not tested in our study, as the subjects are academicians who generally possess a good sense of work-life balance.

2.2 Conceptual Framework and Hypotheses

This research utilizes a TAM with two empirical variables selected from the reviewed literature. This TAM was employed to assess the use of new technology in the national university context of Sri Lanka. Constructs of TAM such as PU, PEOU and subjective norms were tested along with CSE and US. Both of these variables were tested previously in a study conducted at Karachi University in Pakistan. CSE has been assessed in some other

studies, too (Kisanga&Iresan, 2015; Jaiyeoba&Iloanya, 2019). However, it is highly important to test them in the Sri Lankan context, as so far none of the studies conducted here have considered these variables.

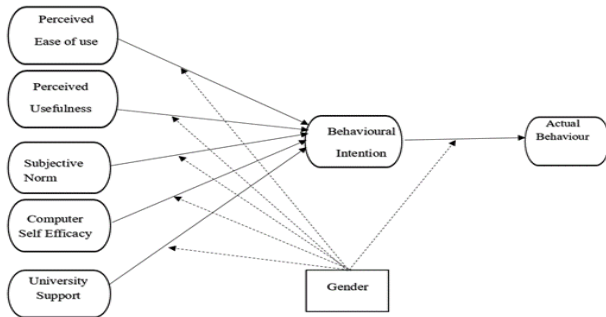


Figure 1: Conceptual framework of the study, adapted from Davis (1989)

2.2.1 Perceived Ease of Use (PEOU)

PEOU is the perception of system users regarding the user-friendliness of a particular system. This is one of the main constructs of the original TAM. This variable was tested and proven as the key determinant of behavioural intention, which in turn would influence the actual behaviour/ usage (Davis, 1989; Ali *et al.*, 2018; Al-Gahtani, 2016; Tarhini *et al.*, 2015; Al-Busaidi, 2013). On the other hand, Martinez-Torres *et al.* (2008) found that all variables except PEOU significantly affected the user's behavioural intention. Surprisingly, PEOU did not posit any significant impact on users' attitude and intention towards usage of e-learning tools. This result may vary in different contexts with different samples and data. Though the results could turn out to be inconsistent, we still wanted to test it in the Sri Lankan national university context. The same finding resulted from the study of Jaiyeoba and Iloanya (2019), too. Though the result is inconsistent, we need to check the variable in the Sri Lankan context. Therefore, we proposed the following hypothesis.

H1: PEOU has a direct and positive association with behavioural intention

2.2.2 Perceived Usefulness (PU)

Just as PEOU, PU is also another major determinant of behavioural intention in the TAM model (Davis, 1989; Ali *et al.*, 2018; Al-Gahtani, 2016; Tarhini *et al.*, 2015; Al-Busaidi, 2013). Their regression weights may vary in different studies based on the particular sample and data. In a few studies, PU proved to be a more crucial predictor than PEOU in determining behavioural intention (Tarhini *et al.*, 2014; Liu *et al.*, 2010). Though the weight of their association varies from study to study, in most of the studies PU has shown significant relationships with intention. Hence, we propose the following hypothesis.

H2: PU has a positive and significant relationship with behavioural intention

2.2.3 Subjective Norm (SN)

SN is considered as a fundamental determinant of the intention to use, as in the case of the extensions of TRA. In our model, the focus is on identifying the lecturers' influence in using VLE in the broadest sense, such as the social relations of a group and its superiors, or other external influences that can define acceptable parameters of behaviour. Identifying and measuring this type of influence is also crucial. In this sense, several authors have suggested the effect of the influence of colleagues or peers on attitudes towards the use of e-learning (Bhattacharjee, 2000; Roca *et al.*, 2006). Bandura (1986) highlights such social pressure in social cognitive theory, by observing that normative beliefs exert an influence on organizational behaviour. "Subjective norms emerge from the need or motivation to satisfy the expectations of important people about certain behaviours" (Ajzen, 1991). Previous studies on E-L found that SN exerted a significant effect on BI (Venkatesh & Morris, 2000; Bhattacharjee, 2001; Lee, 2006; Santos & Okazaki, 2015; Lai, 2017; Tarhini *et al.*, 2016; Ali *et al.*, 2018). However, this relationship was found to be insignificant in a few studies (Davis *et al.*, 1989;

Mathieson, 1991). Lecturers who participate in face-to-face or virtual courses may be influenced by the behavioural guidelines of their department or faculties. This might influence their intention to use the system; hence, the following hypothesis was proposed.

H3: SN will have a direct and positive relationship with BI

2.2.4 Computer Self-Efficacy

Bandura (1997) has defined self-efficacy as “an individual’s perception and belief about his/ her achievements to hypothesize and apply a plan of action as required.” In this study, rather than assessing self-efficacy, the researchers wanted to assess the CSE, as it is an important factor in the context of working in a web-based content system. Marakaset *al.*(1998) defined CSE as, “an individual’s judgement of efficacy across multiple computer application domains.” It was identified as an individual’s perception regarding his/her ability to perform computer related tasks. “E-learning can only be built on a set of basic computer literacy skills” (Gunawardena, 2005). Aboderin (2019) stated that the computer literacy level of academics influences their academic performance, too. The importance of computer literacy in adopting e-learning is also emphasized by Eke (2009). Lack of computer literacy was identified as a barrier to e-learning usage in many studies (Eke, 2009; Kisanga&Iresan, 2015; Jaiyeoba&Iloanya, 2019). This variable has not been treated adequately in the extant literature. Therefore, we have developed the following hypothesis.

H4: CSE is significantly and positively related to attitude

2.2.5 University Support

Organizational factors are referred to as the individual’s perception of technical infrastructure that supports VLE usage, as described by Venkateshet *al.*(2003).They are also considered as

resource infrastructure by Tarhinet *al.*(2014). Broadly, organizational support is viewed as a facilitating condition in those studies, but we use the term ‘organizational support’ to include measures related to work norms and institutional policy within the construct. Facilitating condition was identified as a key determinant of behavioural intention in several technology acceptance studies (Khasawneh, 2015; Taarhinet *al.*, 2015; Al *et al.*, 2018) but rarely is it included with TAM (Venkateshet *al.*, 2003; Tarhinet *al.*, 2014). These studies revealed a significant contribution of facilitating conditions towards behavioural intention. Therefore, this study proposes ‘university support’ as one of the exogenous variables and formulated the following hypothesis.

H5: UniversitySupport has a direct and positive effect on the actual usage of e-learning system

2.2.6 Behavioural Intention (BI)

Behavioural Intention (BI) is the most important predictor of performance, as any system usage is dependent on the intention of individuals. TAM is exemplary when compared with TRA due to the addition of this actual behaviour/ usage, which is determined by behavioural intention. The association between BI and actual behaviour has been proven in extant literature that utilized TAM (Davis, 1989;Taylor & Todd, 1995;Venkateshet *al.*, 2003;Tarhinet *al.*, 2004, 2016;Ali *et al.*, 2018). At the same time, behavioural intention mediates the relationship between the main constructs, such as PEOU, PU and SN and the actual usage (Taylor & Todd, 2001). Therefore, the following hypotheses were proposed.

H6: BI has a direct and positive association with actual behaviour

H7: BI mediates the relationship between exogenous and endogenous variables

2.2.7 Gender

There is a controversial issue related to the masculine and feminine characteristics in system usage. Still the debate is in existence across the globe. Research studies have indicated that gender plays important role in system usage and acceptance of students for several years. Even in this era of gender equity and equality raising up, it is evidenced that gender inequality exists in various aspects of system usage of the students Yang C, Hsieh T-C (2013) Tarhini A, Hone K, Liu X (2014). On the other hand, a few studies have proven that there is no gender differences in accepting and using e-learning, Chu RJ-c. (2010), Hung M-L, Chou C, Chen C-H, Own Z-Y. Based on the controversy of various research results based on gender, this study also wish to analyze the gender effect in a geographically and culturally distinct sample of Sri Lankan public university academics. This Moderating variable may alter the strength of the causal relationship between independent and dependent variables. The following two hypotheses were formulated to examine the moderating effect of gender.

Hypothesis 8: Gender moderates the association between exogenous and mediating variables

Hypothesis 9: Gender moderates the association between BI and Actual Behaviour

3. Methodology

Data was collected from 357 university academics serving in 15 national universities functioning under the oversight of the UGC. These universities have all installed VLEs as their learning management system or e-learning portal. Population size was 5399 and that included all faculties and all categories of academicians. To represent all categories such as professors, senior lecturers and lecturers according to the population ratio, we used a systematic stratified sampling technique to select the sample. Research instrument was a questionnaire that was first used in a pilot survey. Pilot study resulted in good Cronbach alpha values for all

constructs, as they were higher than 0.7. Face validity was also carried out with the help of two professors from Malaysia and two from Sri Lanka. Then the self-reported questionnaire was administered to the sample population to collect the data.

Data was screened to eliminate any miscoded or unsuitable inputs, odd values, missing data and outliers. After carefully scrutinising the miscoded and odd values, missing data were examined. According to Churchill (1995), a figure of less than 5 percent missing data is considered acceptable. Hence, there was no requirement to assess the pattern of the missing data. It was ensured that there was no missing data in the data sheet, after which 314 respondents from the sample were retained for further analysis.

The next step was examining the outliers. "Outliers are cases displaying unreasonable characteristics, which are distinctively different from the rest of the dataset" (Kline, 2005). An outlier can influence the result by pulling the mean away from the median. Chinna (2015) described that Stem and leaf plot, box and whisker plot and Histogram methods can be used to check the outliers in a dataset. We found 10 outliers in our data and these were removed. Finally, 304 respondents out of the final sample were retained for analysis. At last, the normality, linearity and multicollinearity of the data were assessed, and the data subjected to explorative and confirmatory factor analysis.

4. Results and Discussions

4.1 Demographic characteristics of respondents

Out of the 357 questionnaires distributed, only 314 completed ones were received, indicating a response rate of 87.95%. Of these, only 44.4% admitted that they have experience in using LMS. Considering the profile of the respondents, majority (31.3%) of them were from the Science and Technology field, and

41.4 % were lecturers; 52.6% were males and 44.4% were below the age of 35.

Table 1: The demographic characteristics of respondents

Variable	Frequency	%
Discipline		
Arts & Humanities		
Business and Management	62	20.4
Science & Technology Engineering	82	27.0
Medicine and Dental Sciences	95	31.3
Law	20	6.6
Education	36	11.8
Veterinary Medicine	2	0.7
	3	1.0
	4	1.3
Position held		
Professor	35	11.6
Senior Lecturer	143	47.0
Lecturer	126	41.4
Gender		
Male	160	52.6
Female	144	47.4
Age		
25-30	60	19.7
31-35	75	24.7
36-40	49	16.1
41-45	39	12.8
46-50	36	11.8
51 and above	45	14.8

4.2 Normality

Normality of data was tested by using descriptive statistical analysis. For this purpose, mean score of constructs, skewness and kurtosis values were noted. The skewness and kurtosis values were mainly considered for assessing normality. Skewness refers to the degree of asymmetry in a normal distribution, where symmetry refers to the balance between the number of observations that are above the mean and

below the mean (Hardy, 2004). If most of the cases are below the mean the data show a positive skew whereas negative skew indicates that most of the cases are above the mean (Kline, 2005; Tabachnick & Fidell, 2007). Kurtosis shows whether the distribution is very peaked around the mean, or whether it is relatively flat (Chinna, 2015). A variable can have significant skewness, kurtosis, or both. Normality test was done for all variables, and the results of both skewness and kurtosis values were within the recommended levels. As Chinna (2015) suggested, these values should not exceed +1 or -1. The skewness and kurtosis values obtained indicate the univariate normality of the data.

4.3 Scale Reliability and Validity Testing

Reliability and consistency of the multiple-item scale for this study were measured by examining the Cronbach alpha, using SPSS software version 23. This value should be more than 0.7 to accept a construct's reliability (Hair *et al.*, 2010; Nunnally, 1978). Cronbach alpha values for all constructs were above 0.7, which is posited in Table 2. Therefore, it was accepted that internal consistency was attained by all constructs.

Table 2: Results of Reliability Analysis

Variables	No. of items	Cronbach Alpha
1. Perceived Ease of Use	4	0.914
2. Perceived Usefulness	8	0.903
3. Subjective Norm	4	0.848
4. Computer Self-efficacy	5	0.879
5. University Support	4	0.817
6. Behavioural Intention	4	0.900
7. Actual Usage/ Behaviour	4	0.817

4.4 Exploratory Factor Analysis (EFA)

All constructs were examined by using SPSS for inter-item correlation first. According to Chinna (2015), if the inter-item correlations between items fall within the range 0.3–0.9, all items correlate adequately in the construct. Kaiser-Meyer-

Olkin(KMO) and Bartlett’s Test of Sphericity for sample adequacy were performed. The threshold value for KMO is 0.7 (Hair *et al.*, 2010). As a rule of thumb, p-value of Bartlett’s Test of Sphericity should be less than 0.05 to continue with factor loadings. All items in the constructs have met the inter-item correlation value within the range 0.3-0.9, and the factor loading values were more than 0.5. Similarly, all constructs have attained KMO value of more than 0.7 and pvalue of less than 0.001. Thereby, the construct validity was established.

Table 3: Results of Construct Validity

Variables	Inter-item correlation range	KMO value	Bartlett's test of sphericity (p-value)	Factor Loadings range
Perceived Ease of Use	0.684 – 0.779	0.846	0.000	0.800 – 0.90
Perceived Usefulness	0.413 – 0.717	0.912	0.000	0.590 – 0.86
Subjective Norm	0.531 – 0.601	0.807	0.000	0.803 – 0.843
Computer Self-efficacy	0.551 – 0.773	0.849	0.000	0.782 – 0.871
University Support	0.450 – 0.630	0.783	0.000	0.735 – 0.876
Behavioural Intention	0.631 – 0.782	0.837	0.000	0.837 – 0.911
Actual Usage	0.451 – 0.633	0.795	0.000	0.728 – 0.836

After retrieving the acceptable level of values, reliability and construct validity were confirmed and further analysis could be continued.

4.5 Confirmatory Factor Analysis (CFA)

AMOS version 23 was used to examine the relationship between constructs of our hypothesised conceptual framework. Model fit indices were estimated using the maximum likelihood method. The model fit was evaluated by using

multiple goodness-of-fit indices. The seven fit indices used were, Goodness-of-Fit Index, CMIN/DF, RMR, GFI, Comparative Fit Index (CFI), Root Mean Square Residual (RMR), Root Mean Square Error of Approximation (RMSEA), Composite Reliability (CR), and Average Variance Extracted (AVE) as proposed by Hair *et al.* (2010) and Kline (2005). The following values were used for model fit evaluation: Chi-square/df<3, RMR<0.5, GFI>0.9, AGFI>0.9, CFI>0.9, and RMSEA<0.08 (Hair *et al.*, 2010).

Unidimensional analysis for model fit was performed for each construct separately to establish the model fit. After that, the total measurement model was drawn and examined for goodness of fit indices. The results show a good model fit; Chi-square/df is 1.676<3, TLI and CFI are 0.939 and 0.946>0.9 and RMSEA is 0.047<0.08. According to Bryne(2010), this indicates that CFA seemed to be at an acceptable level and fitted the sample data between unobserved and observed variables. The overall measurement model is shown in Figure 2.

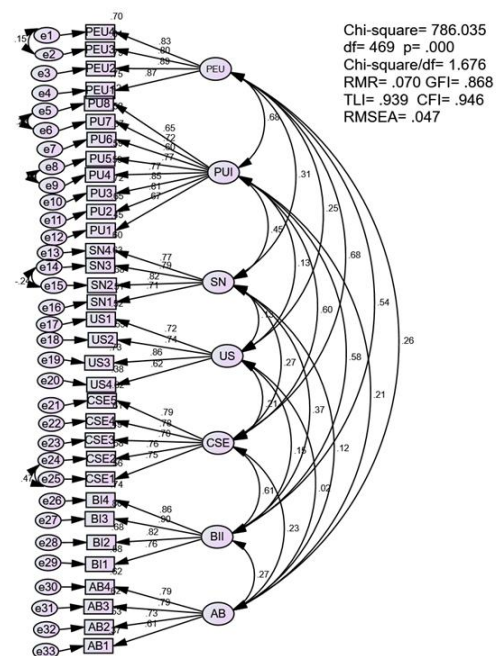


Figure 2: Overall measurement model of the study

In addition to the model fitness and reliability, convergent validity and discriminant validity were

examined to determine the psychometric properties of the measurement model. Composite Reliability (CR) and Average Variance Extracted (AVE) were examined for this purpose. As a rule of thumb, CR value should be 0.60 or above and the AVE value should be 0.5 or above. At the same time, CR values of all measures should be greater than their AVE values. Therefore, this confirmed adequate reliability and convergent validity. The discriminant validity

was calculated using the formula of Fornell and Larcker(1981).Accordingly, the square root of AVE should be greater than the correlation of each construct. Table 4 shows the discriminant validity of all constructs, which show attainment of minimum cut off values. In the table, diagonal values are the AVE and the off diagonals are square roots of the inter-construct correlations, which assure the discriminant validity between constructs.

Table 4: Discriminant validity of the variables in the model

	PEU	PU	SN	US	CSE	BI	AB
PEU	0.721						
PU	0.469	0.539					
SN	0.094	0.203	0.603				
US	0.064	0.017	0.018	0.545			
CSE	0.462	0.355	0.073	0.042	0.573		
BI	0.289	0.340	0.140	0.024	0.372	0.701	
AB	0.069	0.044	0.014	0.000	0.054	0.071	0.535

4.6 Structural Model

Measurement model was then converted into structural model with the objective of examining the hypothesised relationship between constructs. Before estimating the path analysis, model fit indices were examined and it was found that the overall structural model had attained the threshold values. All the criteriarelating to goodness of fit indices of a measurement model are applicable to the structural model, too.

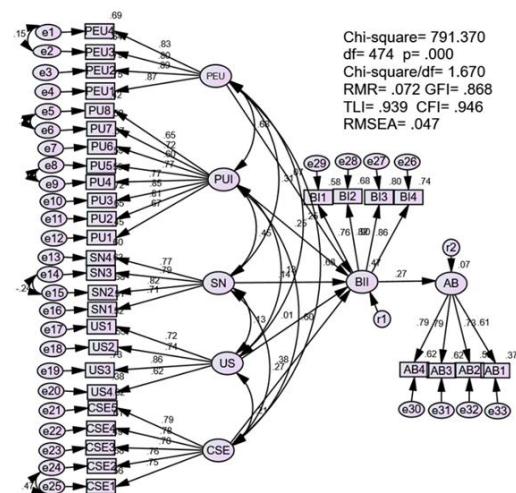


Figure 3: Overall Structural Model

As shown in Figure3, Chisquare/ df is 1.676<3, TLI and CFI are 0.939>0.9 and 0.946>0.9 respectively, and RMSEA is 0.047<0.08. Then the hypotheses were tested. Out of the six hypotheses, four were supported by the data and two were not supported.

Table 5 shows the result. Robert, Ho (2016) recommended that the CR value should be more than 1.96 at 0.05 significance level and the beta value (standard regression estimate) should be >0.2. According to this threshold, the conclusion was arrived at based on the path analysis results.

Table 5: Regression Weights of Conceptual Model

Path	Hypotheses	Unst. Reg. weight	S.E.	Standard Reg. weight	C.R.	Sig. level	Conclusion
PEU <--- BI	H1	0.071	0.086	0.410	0.823	0.410	Not supported
PU <--- BI	H2	0.324	0.110	0.247	2.946	0.003	Supported
SN <--- BI	H3	0.115	0.049	0.139	2.379	0.017	Supported
US <--- BI	H4	0.006	0.039	0.007	0.140	0.889	Not Supported
CSE <--- BI	H5	0.411	0.090	0.378	4.570	0.000	Supported
BI <--- AB	H6	0.324	0.079	0.273	4.083	0.000	Supported

Table 5 depicts the hypothesized relationship between the variables. There were no positive direct effects between PEU and BI as well as between US and BI as the p values were 0.410 and 0.889, respectively. Therefore, H1 and H4 were rejected. Perceived ease of use was usually given greater importance in the reviewed research papers (Chang & Tung, 2008; Peng *et al.*, 2009; Tarhinet *al.*, 2014; Ali *et al.*, 2018), though a few were found to be weak as well as having insignificant relationships (Davis *et al.*, 1989; Venkateshet *al.*, 2003; Santos & Okazaki, 2015). It can be interpreted that the academicians working at universities at present might be digital natives or digital immigrants; hence, perception about ease of use is not an important factor in respect of system usage. In addition, the majority of them (44.4%) are under 35 years of age. Therefore, using any innovative technology based system will not be a tough task for them. Similarly, university support by way of resources, technology and administrative level assistance is not expected by these system users.

The other hypotheses, H2, H3, H5 and H6 were supported by the data. The greatest direct positive effect was found between CSE and BI (Standard regression weight was 0.378, p value 0.000).

Though perceived ease of use is not significantly associated with behavioural intention, CSE plays a significant role in determining the behavioural intention. “High computer self-efficacy would encourage the teachers to use blended learning in their teaching and learning processes while teachers who had low computer self-efficacy would create obstacles for themselves and the students by avoiding the use of blended learning in their classrooms” (Noh, Abdullah, Teck, & Hamzah, 2019).

The association between BI and AB (Standard regression weight is 0.273, p value is 0.000) is also a strong direct predictor of actual behaviour.

4.7 Mediating effect of BI

Behavioural intention may mediate the relationship between exogenous variables and endogenous variables. It was tested by using 1000 bootstrap.

Table 6: Indirect Effects - Two Tailed Significance

	CSE	US	SN	PU	PEU	BI	AB
BII
AB	0.010	0.788	0.020	0.010	0.420

Table 7: Indirect Effects - Lower and Upper bounds

	Indirect Effects - Lower Bounds							Indirect Effects - Upper Bounds						
	CSE	US	SN	PU	PEU	BI	AB	CSE	US	SN	PU	PEU	BI	AB
BII	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB	0.063	-0.017	0.009	0.037	-0.050	0.000	0.000	0.222	0.025	0.073	0.192	0.075	0.000	0.000

The results indicate that between the lower and upper bounds of CSE (0.063, 0.222), SN (0.009, 0.073) and PU (0.037, 0.192), a zero does not fall (Memonet *al.*, 2018). Therefore, BI mediates the relationships between computer self-efficacy and actual VLE usage, perceived usefulness and actual usage, as well as subjective norm and actual usage. However, BI did not mediate university support (-0.017, 0.025), perceived ease of use (-0.050, 0.075) and the actual usage of VLE, because in between the upper and lower bounds a zero falls in both cases.

4.8 Moderating effect of Gender

To examine the moderating effect, a multi-group analysis was done, through which data were split into groups according to the moderator that has already been defined. This multi-group analysis can be carried out for the overall model or for any individual path. As a rule of thumb, if the unconstrained model is better than the measurement residual model, then it can be concluded that a moderating effect is present (Hair et al., 2010). Fit indices of models for both male and female groups were examined and it was decided that the models were fit enough to continue further analysis. Then, a multi-group CFA was performed to compare the two groups to find out if the variant model (unconstrained) differs from the invariant (measurement residual) model. Table 4.8 indicates that the measurement residual X2 is greater than the unconstrained X2 based on ΔX^2 (CIMIN)= 133.529 (1658.605 – 1525.076); Δdf = 87 (1035-948); p = 0.000. The unconstrained model was found to be better than the measurement residual model based

on the indices. Therefore, there is a moderating effect of gender on the determinants of actual behaviour in the overall model. The indices of the measurement residual and the unconstrained model are shown in Table 8 and Table 9, respectively.

Table 8: The Moderation Test Result using Gender Group Data

Model	NPA R	CMIN	DF	P	CMIN/ DF
Unconstrained	174	1525.076	948	.000	1.609
Measurement weights	148	1553.852	974	.000	1.595
Structural weights	142	1560.869	980	.000	1.593
Structural covariances	127	1588.524	995	.000	1.597
Structural residuals	125	1589.920	997	.000	1.595
Measurement residuals	87	1658.605	1035	.000	1.603
Saturated model	1122	.000	0		
Independence model	66	7204.122	1056	.000	6.822

Table 9: Moderation Effect of Gender on Overall Model

Model	D F	CMIN	P	Decision
Measurement weights	26	28.776	.321	
Structural	32	35.793	.29	

weights			5		
Structural covariances	47	63.448	.05		
Structural residuals	49	64.844	.06		
Measurement residuals	87	133.52	.00	Significant	
		9	1		

Table 9 shows that the measurement residual model has a significant p-value of 0.001 < 0.05. Hence, a significant moderating effect of gender was present in the overall model. This led to the testing of the moderating effects of individual paths. The results of the moderation effect of gender on relationships between the determinants of BI and actual behaviour (AB) are presented in Table 10.

Table 10: Regression Weight Estimates for Unconstrained

			Estimate(β)	S.E.	C.R.	P	Decision
BI	<---	PEOU					
		Male	.233	.123	1.899	.058	Moderation
		Female	-.021	.147	-.145	.885	
BI	<---	PU					
		Male	.289	.133	2.171	.030	No moderation
		Female	.429	.225	1.903	.057	
BI	<---	SN					
		Male	.084	.074	1.136	.256	Moderation
		Female	.124	.066	1.875	.061	
BI	<---	CSE					
		Male	.239	.156	1.531	.126	Moderation
		Female	.476	.105	4.535	.000	
BI	<---	OS					
		Male	.038	.073	.524	.600	No moderation
		Female	.004	.048	.078	.938	
Actual Behaviour	<---	Behavioural Intention					
		Male	.289	.105	2.767	.006	No moderation
		Female	.399	.118	3.372	.000	

In this study, path moderation is present if the following criteria (as defined by Hair et al., 2010) are met.

- If beta for group one is significant and beta for group two is insignificant

- If beta for both groups is significant but one group is positive and the other group is negative

Based on Table 10, it can be observed that gender acted as a significant moderator between behavioural intention and PEOU; in the male group with $\beta = 0.233$ and p-value = 0.056 while for female

group $\beta = -0.021$ and $p\text{-value} = 0.885$. As β value of female group is insignificant at 0.05 level and is also negative, gender moderates the association. Similarly, moderation effect of gender exists between behavioural intention and SN (β value of 0.084 at 0.256 significance level and β value of 0.124 at 0.06 significance level for male and female, respectively). For BI and CSE, β value was 0.239 at 0.126 significance level for male group and β value was 0.476 at 0.000 significance level for female group. In the case of BI and OS, β value was 0.038 at 0.600 significance level for male group, while for female group β was 0.004 at 0.938 significance level. According to Hair et al. (2010), "if beta for group one is significant and beta for group two is insignificant, a moderation effect exists."

Therefore, we can propose hypothesis H7: It is partially accepted that gender moderates the association between exogenous variables and BI

On the other hand, BI and PU (β value 0.289 at 0.030 significance level and β value 0.429 at 0.057 significance level for male and female, respectively) and BI and AB (β value 0.289 at 0.006 significance level and β value 0.399 at 0.000 significance level for male and female, respectively) were not moderated by gender as these two causal effects were significant in male and female paths. As both these paths were significant, gender did not moderate the effect of BI and AB.

Hence, we can propose hypothesis H8: Gender does not moderate the association between BI and Actual Behaviour as this is not supported by the data

It is interesting to note that BI and PEOU, BI and SN, and BI and CSE of the female group are significantly moderated by feminine characteristics but it is not so for the male group. Though female group has the intention, feminine traits might influence the usage behaviour.

5. Conclusions

The first specific objective of our study was to identify the association of TAM related factors with behavioural intention. It was found that perceived usefulness and subjective norm are positively and directly associated with behavioural intention (so H2 & H3 are accepted), whilst perceived ease of use is not; hence, H1 is not supported. Behavioural intention has a direct and positive effect on actual usage, and therefore, H6 is accepted. It can be concluded that variables of TAM, excluding perceived ease of use, are the influencing factors behind VLE usage intention. However, perceived ease of use should be altered with a suitable variable that could match the requirements of digital natives and digital immigrants, as perceived ease of use is not an issue for this cohort of users. The second specific objectives dealt with empirical variables such as computer self-efficacy and organizational support. Computer self-efficacy has a strong positive influence on behavioural intention so H5 is accepted, whilst organizational support does not have any influence on BI and so H4 is not supported by the data. Therefore, it is concluded that computer self-efficacy is an important factor that influences behavioural intention. On the other hand, organizational support is not expected by these users. The third specific objective is to identify the direct and indirect effects of these variables on actual usage. According to the conceptual framework, direct effect was established only with behavioural intention and actual usage. From the regression table it was clear that BI has a strong and positive association with actual usage. However, when considering the indirect effect of exogenous variables, the indirect effect of two-tailed significance was examined and it was found that PEU, PU, SN, US and CSE have the significant values of 0.420, 0.010, 0.020, 0.788 and 0.010. Therefore, PU, SN and CSE have indirect associations with actual usage whilst PEU and US do not have any. The fourth specific objective was to

test the mediation effect of Behavioural Intention on actual usage. The results indicated that the indirect associations between perceived usefulness, subjective norm and computer self-efficacy with actual usage were mediated by behavioural intention but not perceived ease of use and organizational support. Considering the moderating effect of gender which is the main focus of this study; gender moderates the overall model, but considering the individual paths of interest in this study, gender moderates Behavioural Intention and Perceived Ease of Use, Subjective Norm, and Computer Self Efficacy in the female group significantly, but no moderation effect was found between behavioural intention and Perceived Usefulness as well as Behavioural Intention and actual behaviour.

6. Practical implications

The results of this research study allow us to make several inferences. Primarily, these results reveal that academicians will use VLE when they perceive themselves as possessing enough computer self-efficacy as this variable has a significant positive relationship with behavioural intention with a total effect of 37.8%. This means the abilities of academicians at using a computer is the most important determinant of behavioural intention, as this enhances the actual usage behaviour. The second is their perception regarding the usefulness of the system. If they perceive VLE as being truly useful, they would readily use the system as perceived usefulness has a significant association with a total effect of 24.7%. The third is that though SN has a statistically significant association with BI, this relationship is comparatively weaker than BI's association with the aforementioned two variables. This can be interpreted to mean that the peers, superiors or students do not have much influence on the VLE adoption of academicians or that the academicians do not worry much about the social factors. Behavioural intention has a total effect of 27.3% on the actual behaviour. This research study confirms that PU, CSE and SN

contribute to BI, which in turn indirectly influences the actual behaviour. The empirical input of this study has the two variables CSE and organizational support, of which only CSE has a positive and direct association with BI. Though US is not supported by the sample data, this can still be tested using some other sample and context. PEOU has no significant association with BI, and this has been demonstrated in several other studies, too (Martinez-Torres *et al.*, 2008; Jaiyeoba & Iloanya 2019). Therefore, even in future studies testing of this variable may not be effective. Therefore, it is highly recommended that TAM developers replace PEOU with new variables such as CSE.

7. Recommendations for future research

This study deals with only variables of TAM and two more empirical inputs to test the actual behaviour of academicians. Future studies should focus on various other important variables such as facilitating conditions (Venkatesh, 2003), computer anxiety (Gunasingheet *al.*, 2019), personal innovativeness (Al-Busaidi, 2013; Gunasingheet *al.*, 2019), and work life quality (Ali *et al.*, 2018). As this study deals with a human sample and self-reported data, a quantitative method alone would not yield a better result. Therefore, future studies should use the mixed method approach, as a qualitative approach is important to validate the results. This study considered only national universities under the control of the UGC. It is recommended to include private institutions too in future studies. In addition, it is important to explore the behaviour of students in VLE usage.

Disclosure statement

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