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University students' intention to use e-learning systems

A study of higher educational institutions in Sri Lanka

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Abstract

Purpose – The purpose of this study was to investigate the factors that might influence the intention and use behaviour of e-learning systems by students in state universities in Sri Lanka

Design/methodology/approach – The theoretical model for this study was primarily drawn from unified theory of acceptance and Use of Technology 2 (UTAUT2). Exogenous variables included performance expectancy, effort expectancy, social influence, work life quality, hedonic motivation, internet experience and facilitating condition, and their influence on behavioural intention and use behaviour were studied. Instrument was developed using validated items from past literature. Data for this quantitative study were collected from undergraduate and postgraduate students from 15 Sri Lankan state universities by self-administering and Web-form during second quarter of 2018. Structural equation modelling was used to see the insights from the valid data using IBM's SPSS 25 and AMOS 22.

Findings – Results of the confirmatory factor analysis and subsequent evaluation of the structural model confirmed the proposed hypotheses, and it was found that constructs of UTAUT2 have a significant impact on and play an important role in behavioural intention to use and use behaviour of e-learning system by state university students in Sri Lanka.

Originality/value – The adoption of an e-learning system in Sri Lankan state universities is fairly low. Hence, investigation of what determinants might be contributing for adoption is important to enhance the learning experience of students and help them improve their knowledge. This paper contributes by delineating the factors that influence the acceptance and use of e-learning systems by students of state universities in Sri Lanka.

Keywords Structural equation modelling, UTAUT2, E-learning systems, Internet experience, Work life quality

Paper type Research paper

Introduction

As society has evolved to be technology-driven, vigorous development of information and communications technology (ICT) and its application in all facets of human life have seen immense changes in the landscape of education globally (Vidakis and Charitakis, 2018). This has led educational institutions to implement new technologies in teaching and learning processes.

Electronic learning (e-learning) is a powerful tool that transforms the traditional method of learning because it strengthens the capacity of teaching and learning (Alfraih and Alanezi, 2016) through provision of an efficient and effective channel for educational

institutions for teaching and learning among students, as well as efficient knowledge delivery. E-learning is defined as the delivery of learning materials and methods online by using information technologies to learn, teach or acquire knowledge anytime from anywhere (Turban *et al.*, 2015, p. 218). Learning processes can be online, offline or both (Al-Busaidi, 2013). In terms of time and location, e-learning provides learners convenience and flexibility. Learners acquire and make use of knowledge disseminated digitally (Tetteh, 2016). E-learning does not exclusively refer to Web-based learning; it also includes mobile-learning, where materials are delivered to wireless devices such as smartphones, tablets or other mobile devices; hence, the term e-learning covers a wide spectrum including computer-based training, computer-based instructions, online education and other terms, and it is useful to facilitate learning at educational institutions and to provide a conducive atmosphere for efficient and effective corporate training (Turban *et al.*, 2015). According to Driscoll (2010), e-learning was said to have strategic and technical benefits. E-learning helps people to keep themselves updated through lifelong learning in non-traditional ways of learning (Turban *et al.*, 2015).

According to Garrison (2011), e-learning allows students to learn from home; it also allows workers to learn and update knowledge and skills from even their workplaces, and this is reportedly known to reduce the time of teaching and learning by 50 per cent. E-learning also reduces the cost of teaching and learning by 50-70 per cent. Learners have the liberty to adjust the time, place and contents to learn; meanwhile, the learning system can deploy best instructors and deliver the contents supported by rich multimedia contents with latest updates. E-learning helps to deliver lectures to numerous learners, with an opportunity to engage and interact with experts and allow the expert to assess learners' progress at the same time. The e-learning system provides a platform for those who does not like to attend a face-to-face class or engage in interaction with teachers and colleagues in person. Despite these benefits and others that are not listed here, if the learners did not use e-learning system, the productivity of this wonderful tool will not be reaped (Tarhini *et al.*, 2017a); therefore, the success of implementation of e-learning system depends on students' acceptance of such system (Al-Qirim *et al.*, 2018). Although e-learning was reported to have assisted in reducing learners' drop-out rate and this is evident by its benefits and flexibility (Turban *et al.*, 2015), some studies (Dodge *et al.*, 2009; Patterson and McFadden, 2009) found that this system has a high drop-out rate than face-to-face programmes. Therefore, it is imperative to investigate the factors that influence students' adoption of e-learning systems such that all stakeholders could pay more attention to addressing these issues and assist students to learn better.

Several models have been used in the studies of e-learning to investigate factors that influence users' behavioural intention (BI) to use technologies. These studies used single model, such as technology acceptance model (TAM) by Davis (1989), theory of planned behaviour by Ajzen (1991), theory of reasoned action by Fishbein and Ajzen (1977), unified theory of acceptance and use of technology (UTAUT) by Venkatesh *et al.* (2003) UTAUT2 by Venkatesh *et al.* (2012). Other researchers used variables from these models and validated in different context. According to Tarhini *et al.* (2016), UTAUT and UTAUT2 are the most frequently used models in recent times to investigate BI to use information technologies including e-learning context. Hence, this study aims to investigate BI to use and subsequent actual use behaviour of e-learning systems by students in state universities in Sri Lanka by picking up most important variables primarily from UTAUT and UTAUT2.

Literature review
Adoption of e-learning in universities
In total, 15 state universities exist in Sri Lanka for higher education. According to Sri Lanka University's Statistics (University Grants Commission of Sri Lanka, 2017), there were 446,100 undergraduates, including those studying internal and external degree programmes and 40,637 postgraduate students in all streams. Out of these, for undergraduate courses 353 students and for postgraduate courses 665 students are from foreign countries. Many universities among these numbers use e-learning systems within their universities. E-learning success is dependent of the level of acceptance among university students, who are supposed to benefit from it. Many studies have found that most developing countries' higher education institutes that have already established e-learning systems are not successful because of some challenges (Makokha and Mutisya, 2016; Chawinga and Zozie, 2016; Queiros and de Villiers, 2016; Al-Azawei et al., 2016; Kisanga, 2016; Baloyi, 2014). Thus, it is very significant to investigate and identify the important factors that influence the acceptance of e-learning in higher educational institutions. A better knowledge of the factors assists university stakeholders to allocate the fund justly.

In addition, e-learning has advanced; thus, many Massive Open Online Course are geared towards collection of videos with a forum that uses some traditional distance learning models, but they are not promoting adaptive and personalized learning. These characteristics and the quality of the training process are part of the challenges e-learning is currently facing (Daniel et al., 2015).

Nevertheless, the three elements of cognitive presence, social presence and teaching presence played major roles in knowledge construction in the e-learning process. A matching relationship between cognitive presence, social presence and teaching presence was noticed, where the three elements had interacted in supporting knowledge construction. Overall, the findings of Karunanayaka et al. (2016) reaffirmed the significant role of instructors in educating the three presences within a peer-facilitated environment by enabling learners to engage with the content in a meaningful manner through appropriate course design, structure and leadership.

Some other scholar studies say that readers' type such as academic staff and students, the year of study of the students and user category (Lecturer, Senior Lecturer, Professor and students) have indicated a significant difference towards the attitude of usage of electronic information resources. However, gender, male and female readers, and age group have almost the same level of opinion, which is insignificant (Sivathaasan et al., 2014).

In the findings of Lwoga and Komba (2015) the actual usage of e-learning usage was determined by Self-Efficacy, while continued usage intentions of online-based learning systems were predicted by performance expectancy (PE), effort expectancy (EE), social influence (SI), self-efficacy. Challenges for using e-learning were related to ICT infrastructure barrier, e-learning user interface being not user-friendly, weak ICT policies, lack of management and technical support, limited skills, lack of awareness, resistance to change and lack of time to prepare e-content with the use of e-learning system.

The advent of e-learning technologies has led to a tremendous increase in the use of e-learning systems to enhance blended learning in universities by providing a mix of interface classroom teaching, live e-learning, self-paced e-learning and distance learning (Aguti et al., 2014).

Salloum et al. (2019) investigated the factors that affected university students' acceptance of e-learning systems. The study proposed a new model that investigated the impact of innovativeness, quality, trust and knowledge as major factors enhancing the acceptance of e-learning (Salloum et al., 2019).

A further study's result also mentioned that the adequacy of the model to analyse knowledge construction in different types of communication tools was lacking. The study later suggested the need to look at how learning is orchestrated and the importance of re-defining some aspects of the model in question (Lucas *et al.*, 2014).

Further, a previous study revealed that continuous learning and trying new methods of communication would aid improving learning and enhancing teacher-student respect and collaboration and value. There are effective techniques to present interface material in the online environment, which will allow students to achieve a higher level of satisfaction of learning and cognitive understanding of the course material (Tirziu and Vrabie, 2015).

Perception of e-learning

Cultural perceptions of Sri Lankans and Pakistanis revealed similar arrangements in their recognition that their cultures showed characteristics of high-power distance, collectivism and feminine values, while there were no definite dimensional perspectives from the Mauritians. The inability to define their own cultural context using bi-polar dimensions may reflect the sociocultural context of Mauritius. Their frameworks explained more traditional cultures like those in Sri Lanka and Pakistan; they were unlikely to be useful to define cultural characteristics when the society is diverse, multiethnic, multicultural and multilingual, like Mauritius. In a nutshell, e-learning and other forms of distance communication can assist to bridge the gap and correct the social cultural perception (Jayatilleke and Gunawardena, 2016).

Interestingly, another argument is that the format, duration and delivery of a course are most effective when the focus is to engage students actively in their learning. This idea should be at the heart of the course's design, development and delivery. The authors draw on their experiences of higher education in both the UK and Sri Lanka and across full-time, part-time, distance learning and work-based learning and illustrated the variety of formats and delivery approaches that are possible, but more critically, the programme must ensure that students are active learners not passive learners (Strachan and Liyanage, 2015).

Another interesting study was carried out on private cloud, e-learning system, that can be easily installed by using standard local computing resources, without the need of different hardware or external resources. This study illustrated the framework of Virtual Private Network (VPN), private cloud integration and resource sharing in the university environment. The study made us understand that the e-learning platform was also scalable and capable to interconnect other multi-platforms that were developed in different locations across the globe. The study framework solves the various challenges faced by e-learning, and increases the availability, reliability and scalability of cloud-based e-learning systems. (Jayasena and Song, 2017)

In addition, a study was carried out to investigate the factors that impacted e-government adoption, and the result revealed that government officials needed to pay attention to the dominant culture attitude, which is the most significant determinant of citizen intention. Citizen attitude is jointly determined by public value and ease of use. This pressing problem needs socio-technological, political and cultural perspectives. Another study validated TAM through the incorporation of a set of social, political, and cultural constructs such as trust, perceived public value and national culture. The results of many studies have managerial implications that the officials need to pay closer attention to influencing citizens' attitude towards using e-government services and from there gradually falling in connection with e-learning that is part of government initiatives to enhance the educational development in the country (Al-Hujran *et al.*, 2015).

E-learning was primarily meant and established for those who were interested in education pursuit but could not commute and also to relieve them of the four walls of classroom activities so that they could easily access contents in equality to those who could afford education in a classroom environment (Naidu, 2014).

The author considered the development of the Library Information System (LIS) profession in a changing environment and offers an understanding of the future direction of the LIS profession to enhance the different e-learning platform and invariably to achieve the goals and objectives of e-learning (Vassilakaki and Moniarou-Papaconstantinou, 2015)

Theoretical framework

Performance expectancy

PE is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh *et al.*, 2003) which means that the amount of belief an individual has about the use of particular information system; if used it there would be benefit in his or her job performance. When aligning PE with e-learning context, it can be seen that e-learning assists learners by helping them perform their learning activities instantly and conveniently, in addition to uplifting the learners' educational skills and performance. PE has been a predictor of intention to use a new system in different contexts such as internet banking (Alalwan *et al.*, 2014), mobile banking (Alalwan *et al.*, 2016), e-government (Sharma, 2015), social media (Sharma *et al.*, 2016) and e-learning (Ali *et al.*, 2018; Tarhini *et al.*, 2017a). This study refers PE as the degree to which a user believes that using an e-learning system would improve or increase the performance in education. According to existing literature, it can be seen that PE has a significantly positive association with BI to use e-learning system. Hence, the following was hypothesized:

H1. PE positively and significantly influences students' BI to use e-learning system.

Effort expectancy

EE is defined as "the degree of ease associated with consumers' use of technology" (Venkatesh *et al.*, 2012). It is the degree of comfort connected to the use of information systems (Venkatesh *et al.*, 2003) and the extent to which an individual believes that without extra effort, he or she can use a technology (Yadav *et al.*, 2016). It reflects the easiness the users experience at the time of using a technology. E-learning is still in its evolving stage, and hence, EE is seen to be one of the more important factors for deciding users' BI to use the system. Easiness and user friendliness of e-learning systems will have an impact on individuals' acceptance and intention to use such systems (Salloum and Shaalan, 2018). Many past studies (Sharma *et al.*, 2016; Zuiderwijk *et al.*, 2015) have shown that EE influences positively the intention to use a system, and it is one of the key determinant of intention to use e-learning systems (Tarhini *et al.*, 2017a; Mtebe and Raisamo, 2014). This study assumes that if the learner finds it easy to use an e-learning system, he/she is more likely to accept such system. Therefore, the following hypothesis was proposed:

H2. EE positively and significantly influences students' BI to use e-learning system.

Social influence

SI is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh *et al.*, 2003). It is the effect that others' opinion has on someone's intention to use an information system (Zhou, 2011). People tend to use a particular technology when they get recommendation from those who are important for them (Bagozzi and Lee, 2002). The SI is the extend that influences people to use a technology when they receive opinion from such families, relatives and colleagues (Riquelme and Rios, 2010). It is the degree of realization one has that how others feel that he or she should use a new information system. Venkatesh *et al.* (2003) proposed in UTAUT model that SI captures the role of social factors, image and subjective norms. SI has been validated in many studies (Alzeban, 2016) as a significantly influencing factor that determines people's intention to use technological innovations like e-learning systems (Ali *et al.*, 2018; Tarhini *et al.*, 2017a). The effect of SI is more in mandatory environment rather than in a voluntary setup (Venkatesh and Davis, 2000), and this study assumes that individuals' intention to use e-learning system is influenced by the belief of their lecturers, instructors and colleagues. Hence, it is proposed that:

H3. SI positively and significantly influences students' BI to use e-learning system.

Work life quality

Work life quality (WLQ) means the perception or the faith somebody has that when using a technology, their quality of work would improve; in this case, the usage of e-learning system is supposed to improve students' learning process by bringing savings for them in terms of time and cost when they download learning materials and literature or making communications with their colleagues or teachers (Ali *et al.*, 2018). While many studies (Tarhini *et al.*, 2014; Kripanont, 2007) on acceptance of technology have investigated the importance of work life quality, the number of studies that focuses on the area of e-learning is very less (Tarhini et.al. 2014); hence, this study attempts to test the impact of WQL on e-learning system acceptance, as done by Ali *et al.* (2018), in the Sri Lankan context. Past studies (Tarhini *et al.*, 2017b) have proved that WLQ has a significant impact on intention to use e-learning systems. Hence, it is evident that WLQ can be one of the better predictor of individual's intention to use e-learning systems. Therefore, the following hypothesis is proposed:

H4. WLQ positively and significantly influences students' BI to use e-learning system.

Hedonic motivation

Hedonic motivation (HM) is defined as "the fun or pleasure derived from using a technology" (Venkatesh *et al.*, 2012). It measures users' perceived enjoyment and perceived entertainment (Venkatesh *et al.*, 2012). This variable was added to the UTAUT2 model by Venkatesh *et al.* (2012) to see the role of intrinsic utilities. It is the pleasure of using a new system. The innovativeness found in a new system brings the HM's key influence (Venkatesh *et al.*, 2012). HM has been found by prior studies (Alalwan *et al.*, 2015) to play a key role in influencing users' intention to use technologies, especially in e-learning (Tarhini *et al.*, 2017a; Ain *et al.*, 2016). Therefore, when usage of an e-learning system keeps users joyful, then they are more inclined to use such system. Hence, the following hypothesis is proposed:

H5. HM positively and significantly influences students' BI to use e-learning systems.

Internet experience
Individuals' usage and experience of internet has significant relationship with technology acceptance (Ali *et al.*, 2015) and Internet experience (IE) is accepted to be included as one of the key factor determining technology acceptance by past studies (Ali *et al.*, 2015; Abbad *et al.*, 2011; Speier and Venkatesh, 2002). Individuals' perception of using electronic system is strongly built as far as the IE increases (Hackbarth *et al.*, 2003). A study conducted by Liao and Cheung (2001) to investigate users' intention to e-shopping revealed IE to be the most significant factor determining users' acceptance of such shopping and played a major role in the use behaviour of such system. Another study conducted by Anandarajan *et al.* (2000) has also stressed the significance of IE in technology-related studies. Despite the fact that previous studies on Web-based learning systems have paid less attention in considering IE as a key determinant (Ali *et al.*, 2018), this study attempts to include IE as an exogenous factor having influence on intention to e-learning systems. Therefore, the following hypothesis has been proposed:

H6. IE positively and significantly influences students' BI to use e-learning systems.

Behavioural intention to use
In this study's context, the BI determines users' wish to accept e-learning systems (Salloum and Shaalan, 2018). BI means the intention of individuals to use e-learning systems from existing method of learning to the future. It is considered as a precursor of use behaviour. It signals the indication of users' readiness to carry out a specific behaviour. Past studies (Venkatesh *et al.*, 2003; Venkatesh and Davis, 2000; Davis, 1989) have validated that individuals' actual use of electronic systems is directly influenced positively by the intention to use such systems and in the e-learning systems context (Tarhini *et al.*, 2017a, 2017b; Tarhini *et al.*, 2014; Liu *et al.*, 2010; Chang and Tung, 2008). Therefore, in this study, it is hypothesized that:

H7. Students' BI to use e-learning system positively and significantly influences use behaviour of e-learning system.

Facilitating conditions
Facilitating condition (FC) is the physical setting or the environmental factors that convince an individual to perform some activities (Salloum and Shaalan, 2018). It is an environmental factor affecting individuals' perception of how difficult or how easy it is to carry out a task. It is the availability of external resources needed to facilitate the execution of a particular behaviour (Ajzen, 1991). Individuals consider themselves to have FCs when technical and organizational infrastructure are available to strengthen them, and in this light, individuals are motivated to use e-learning systems. In a workplace setting, the availability of training and provision of support for employees are assumed to be part of FC (Tarhini *et al.*, 2017a). This study considers FC as the measure of perception of students if they can access necessary resources and can get enough support to use the e-learning systems. Individual assistance, training on usage, availability of materials to enhance knowledge and skills and accessibility of e-learning system are such facilitators (Salloum and Shaalan, 2018). Many studies (Teo, 2010) have investigated the impact of FC on the acceptance of technology, and it has been proved to influence the acceptance of e-learning systems (Tarhini *et al.*, 2017a; 2016; Sharma *et al.*, 2016). FC is considered to be one of the most influencing factors to determine individuals' usage of a technology (Venkatesh *et al.*, 2003). By the same token, this

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study assumes that FC has an influence on the use behaviour of e-learning systems. Based on this discussion, the following hypothesis is formulated:

*H8.* FCs positively and significantly influences students' use behaviour of e-learning system.

Based on the above discussion and proposed hypotheses, the conceptual model shown in Figure 1 has been developed.

Methodology

This study is a quantitative study based on a questionnaire survey (Appendix). Quantitative method enables the researchers to test the relationships between the variables identified in the model and thereby let them provide evidence to support or disprove the hypotheses (Carter and Bélanger, 2005). The studies that engage in hypothesis testing usually explain the nature of certain relationships or establish the difference among groups or the independence of two or more factors in a situation (Sekaran and Bougie, 2010). This study was developed with six hypotheses for testing, making it explanatory. The unit of analysis refers to the level of aggregation of the data collected during the subsequent data analysis stage (Sekaran and Bougie, 2010); this investigation studied university students; hence, the unit of analysis was individuals.

Participants and procedure

The population of this study included all undergraduate and postgraduate students in 15 Sri Lankan state universities. In Sri Lankan state universities, there are about 446,100 undergraduate and postgraduate students. As the population framework was not available, the study had to adopt convenient sampling method, which is of non-probabilistic type, as has been done in majority of empirical studies investigating acceptance of technology (Tarhini *et al.*, 2014). Questionnaire was printed and made available as an online survey using Google Forms. Printed questionnaires were self-administered among students
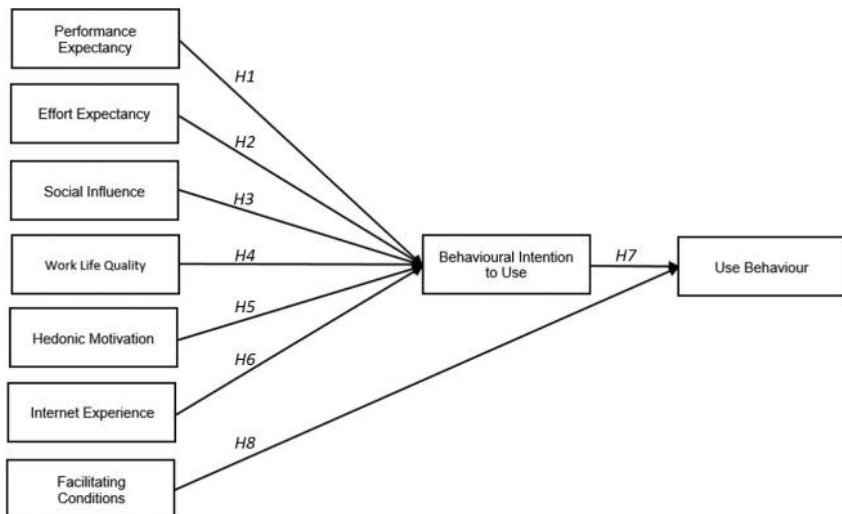
Figure 1.
Proposed model for this study

representing all universities in Sri Lanka, and responses were collected by hand. Web-form link was published in many WhatsApp groups and sent to Facebook messengers of many known undergraduate and postgraduate students and their friends representing these universities. E-mails were also sent to lecturers with the link to the Web-form to be circulated among their students. According to Hair *et al.* (1998), "each independent variable is expected to have ten data records"; as this study had six independent variables, 60 respondents would have sufficed. According to Sekaran and Bougie (2010) "sample sizes larger than 30 and less than 500 are appropriate for most research". According to Kline (2011), for studies that use structural equation modelling (SEM), the typical sample size must be at least 200. According to Arnold (1990), achieving a statistical power of at least 95 per cent is common in social science researches. Using the formula ($n = N/[1 + N(e)2]$) provided by Yamane (1967) and bearing a confidence level of 95 per cent and 5 per cent for margin of error, the appropriate sample size for this study was 400. However, responses were received well over this size. All participation in the survey was voluntary; no financial or other motives were offered. Responses of the printed questionnaires were fed into Excel. Web responses were also imported into the same Worksheet. After careful treatment of missing data and exclusion of incomplete responses, 502 cases were retained for data analysis.

Instrument

Items for the instrument of this study were drawn from previous literature where they had been proved to be reliable and valid to grasp the phenomena they were supposed to measure. The three constructs, PE, FC and BI (Venkatesh *et al.*, 2003) were measured using five questions. EE, SI (Venkatesh *et al.*, 2003) and WLQ (Kripanont, 2007) used four questions. HM and UB (Venkatesh *et al.*, 2012) used three items while IE used two items based on Liao and Cheung (2001). The constructs PE, EE, SI, HM, FC and BI used a seven-point Likert scale where respondents marked their agreement scaling from strongly disagree (1) to strongly agree (7). The seven-item UB construct was measured as UB1 ranging from not at all (1) to more than 7 times a week, UB2 scaled 1 for below 15 min to 7 for above 3 h and UB3 measured extremely infrequent as 1 to extremely frequent as 7. The seven-point IE constructs' two items; first measured frequency of Internet usage as Extremely Infrequent (1) to Extremely Frequent (7) and the second assessed duration of access with (1) for below 15 min through (7) for above 3 hours.

Data analysis

Data collected were analysed using IBM's SPSS and AMOS. Respondents' profile were obtained using descriptive statistics. To evaluate the measurement model and proposed research model, confirmatory factor analysis (CFA) and SEM were used.

Respondents' profile

Descriptive statistics was obtained to see the respondents' demographic details. According to Table I, out of the 469 respondents, 293 were male (62 per cent) and 167 were female (36 per cent). Respondents included those following postgraduate programmes, amounting to 53 (11 per cent), others were following undergraduate programmes of General type 117 undergraduates (25 per cent) and 296 were doing Special degree (04 years) programmes, which is 63 per cent of the respondents. Majority of the respondents were below the age of 26 years, which is 88 per cent of the respondents, and the balance 54, which is 12 per cent, were above 25 years of age.

Variable	Frequency	(%)
Gender		
Male	293	62
Female	167	36
Missing	9	2
Type of degree		
03 years	117	25
04 years	296	63
Postgraduate	53	11
Missing	3	1
Age group		
≤25 years	415	88
>25 years	54	12
Missing	0	0

Table I.
Demographic of
respondents

Structural equation modelling analysis

Two-stage SEM was used to validate the proposed model and test the hypotheses using AMOS 22. First, the measurement model was evaluated, and it was followed by the estimation of structural model (Byrne, 2016). Constructs' reliability and validity test and model fitness test were carried out to evaluate the measurement model. CFA and testing of the structural model are the main two phases of the SEM (Hair *et al.*, 2010). Relationship among variables and their measures are established using CFA. The hypothesized relationships between variables are tested in SEM.

Confirmatory factor analysis

Assessment of goodness-of-fit indices and construct validity test are used in CFA. There are some indices commonly used to assess a model's goodness-of-fit (Hair, *et al.*, 2010). Although χ^2 is used to the determine the fitness, it is not considered to be the best indicator as it is too sensitive to large sample size (Hu and Bentler, 1999); hence, the χ^2 ratio to the degrees of freedom is used (χ^2/df). According to Table II, CMIN/DF ($\chi2$/df) value is 1.929, which shall be between 1 and 3, showing the model as excellent (Hair *et al.*, 2010). The analysis assessed other fitness indices too. CFI = 0.954 ≥ 0.95; excellent, SRMR = 0.044 ≤ 0.08; excellent, RMSEA = 0.045 ≤ 0.06; excellent and PClose = 0.976 ≥ 0.05; excellent (Gaskin and Lim, 2016; Hu and Bentler, 1999). Hence, it is clear that as these fitness indices are within recommended ranges, the model proves to be fit.

Measure	Estimate	Threshold	Interpretation
CMIN/DF	2.087	Between 1 and 3	Excellent
CFI	0.949	>0.95	Acceptable
SRMR	0.045	<0.08	Excellent
RMSEA	0.047	<0.06	Excellent
PClose	0.905	>0.05	Excellent

Table II.
Model fit measures

Notes: CFI: comparative fit index; RMSR: root mean square residuals; RMSEA: root mean square error of approximation

Construct validity assessment
Whether the underlying concept of variables is represented well by the scales is checked by the construct validity (Bryman and Bell, 2011). Therefore, it is vital to validate the results of CFA through construct validity (Hair *et al.*, 2010). The measured model's psychometric properties' adequacy was evaluated using the discriminant validity and convergent validity. According to Malhotra and Dash (2011), composite reliability (CR) alone is enough to establish the reliability of constructs as average variance extracted (AVE) is often too strict. Factor loadings above 0.5 (Hair *et al.*, 2010), CR above 0.7, AVE above 0.5 (Hu and Bentler, 1999) and maximum shared squared variance (MSV), which refers to the maximum amount of variance shared by a latent variable with another latent variable, being less than AVE are the indicators to validate. According to Table III, it can be seen that loadings for items are above 0.5.

Table IV shows that the CR values for the constructs are well above the threshold of 0.7, AVE values are greater than 0.5 and MSVs are less than AVE values. Hence, the reliability and validity of the model is established.

Items	PE	EE	SI	WLQ	HM	IE	FC	BI	UB
PE2	0.885								
PE1	0.885								
PE5	0.853								
PE4	0.852								
PE3	0.827								
EE1		0.916							
EE2		0.909							
EE3		0.725							
EE4		0.638							
EE5		0.631							
SI1			0.975						
SI2			0.973						
SI4			0.955						
SI3			0.875						
WLQ1				0.946					
WLQ2				0.927					
WLQ4				0.925					
WLQ3				0.886					
HM1					0.928				
HM3					0.883				
HM2					0.715				
IE2						0.912			
IE1						0.757			
FC1							0.949		
FC3							0.858		
FC2							0.714		
BI4								0.964	
BI5								0.924	
BI3								0.814	
BI1								0.780	
BI2								0.713	
UB1									0.917
UB2									0.903
UB3									0.841
UB4									0.781

Table III.
Factor loadings

Structural model and hypotheses testing
The researchers used path estimate, *t*-values and *p*-values to test the proposed hypotheses. Variables' relationships are considered to be significant when their *t*-value is above 1.96 and *p*-value is below 0.05.

Table V displays the results of path estimates of eight hypotheses proposed in this study. As the *t*-values are above the minimum cut off and the *p*-values signify at <0.001, <0.01 and <0.05 for all hypotheses, they are found to be statistically significant. The relationships between PE, EE, SI, WLQ, HM, IE and BI to use e-learning system were found to be statistically significant with considerable β values and acceptable *t*-values and *p*-values. The relationships between the variables FC and UB and between BI and UB were also found to be statistically significant. Hence, *H1-H8* were found to be supported in this study.

Discussion and recommendations
This study was conducted with the main objective of investigating important factors that might influence or deprive the adoption or continuous use of e-learning systems by undergraduate and postgraduate students in Sri Lankan state universities. The conceptual framework of this study was developed based on UTAUT2 with two additional factors, WLQ and IE, incorporated. According to the findings of this investigation, UTAUT2 has been proved to be a useful technology acceptance framework to understand students' acceptance of e-learning systems in the Sri Lankan context empirically.

As shown in Figure 2, EE, SI, PE, WLQ, IE and HM influenced students' BI to use e-learning systems in their order of influence and explained 63.9 per cent of variance in such intention to use e-learning systems. BI and FCs influenced use behaviour of e-learning

Constructs	CR	AVE	MSV	PE	EE	SI	WLQ	HM	IE	FC	BI	UB
PE	0.915	0.741	0.14	*0.827*								
EE	0.874	0.620	0.112	0.011	*0.842*							
SI	0.963	0.893	0.036	0.042	0.008	*0.931*						
WLQ	0.701	0.849	0.060	0.017	0.245	0.024	*0.612*					
HM	0.824	0.717	0.140	0.374	0.016	0.045	0.024	*0.783*				
IE	0.928	0.703	0.390	0.017	0.005	0.081	0.013	0.054	*0.93*			
FC	0.797	0.715	0.390	0.068	0.017	0.118	0.003	0.083	0.625	*0.764*		
BI	0.743	0.712	0.125	0.040	0.334	0.190	0.239	0.01	0.018	0.094	*0.652*	
UB	0.755	0.743	0.125	0.012	0.164	0.110	0.124	0.083	0.078	0.062	0.353	*0.661*

Table IV.
Model validity measures

Hypotheses	Relationship	Estimate	*t*-values	*p*-values	Results
H1	BI ← PE	0.371	7.708	0.01	Supported
H2	BI ← EE	0.461	10.227	***	Supported
H3	BI ← SI	0.392	11.818	***	Supported
H4	BI ← WLQ	0.288	6.136	0.02	Supported
H5	BI ← HM	0.175	3.824	***	Supported
H6	BI ← IE	0.210	5.341	***	Supported
H7	UB ← BI	0.257	11.925	***	Supported
H8	UB ← FC	0.205	7.237	***	Supported

Notes: Estimate = Standardized regression weights; *** = $p < 0.001$

Table V.
Standardized regression weights for the proposed model
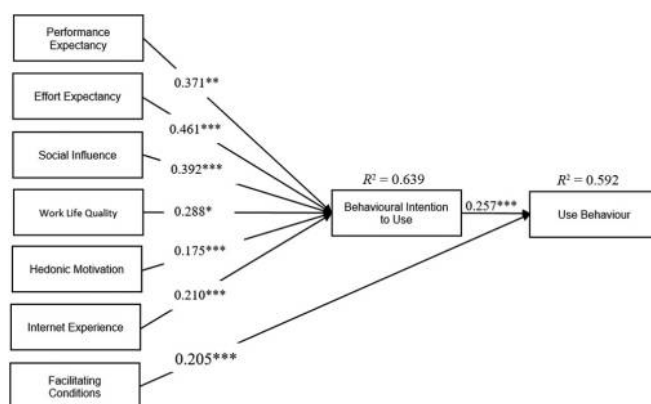
Notes: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$

Figure 2.
Path coefficient
results

systems in their order of influence and explained 59.2 per cent of variance of this use behaviour.

According to this study, EE was the most influencing determinant of BI to use e-learning system. While being an essential factor to influence intention to use online systems (Alalwan *et al.*, 2015), this construct was found to be an essential factor in determining students' BI to use e-learning systems (Tarhini *et al.*, 2017a; Mtebe and Raisamo, 2014). The results of this study indicates that students who already use technologies need not to be given extra training to use e-learning system. They perceive that using e-learning system needs less effort or does not need extra skills to operate these systems. At the same time, decision makers should take into account those who are less skilled, because indifferent to the usefulness of this e-learning system, they would find that using these systems would need extra effort and skill. Hence, those who design or customize such e-learning system should ensure the easiness in using them.

SI, which refers how a person perceives that others expect he/she is to use a system, is the second influencing factor in this study. For an undergraduate, how his/her colleagues opine can have impact. Also, how lecturers or instructors influence the use of e-learning systems will also have impact. The finding of this study on the influence of SI is in alignment with previous works (Tarhini *et al.*, 2017a, 2017b; Tarhini *et al.*, 2014; Masa'deh *et al.*, 2016). Hence, lecturers and instructors should persuade their students to use e-learning systems and students should be encouraged to motivate their colleagues to use these systems.

Next determinant to influence BI to use e-learning systems was PE, meaning that if university students believe that their learning process will be more efficient or their performance would improve if they use e-learning systems, they would be will to use them. Therefore, lecturers and instructors should make sure that the contents in the system are much worthy and up to date, catering the needs of students better. This finding is in agreement with previous findings of e-learning studies (Ali *et al.*, 2018; Tarhini *et al.*, 2017a, 2017b; Tarhini *et al.*, 2014).

WLQ is another construct to influence students in their BI to use e-learning system, implying that when they use e-learning system, the quality of their educational life will improve in terms of saving money, time, etc. (Ali *et al.*, 2018). This finding is consistent with the findings of Ali *et al.* (2018) and Tarhini *et al.* (2014) in Lebanon and first in the Sri Lankan

context. IE is another factor influencing students' BI to use e-learning systems, meaning that more the experience they have in using internet, duration of their stay in each access and frequency of their visit to internet, the more likely that they would use e-learning system. Hence, it is recommended that lecturers and instructors should encourage students who have less experience in internet to use e-learning system. Further, they should ensure the availability of free internet access to students so that their experience and inclination to use internet would increase indirectly, resulting in more adopters of e-learning systems. This finding is also in agreement with the findings of Ali *et al.* (2018). HM has also proved to be a crucial factor in influencing students' BI to use e-learning systems. When the use of this system becomes one of students' habits and the more they enjoy using the system, more likely they are to use the system. This is consistent with previous findings in other contexts (Tarhini *et al.*, 2017a; Masa'deh *et al.*, 2016).

The findings also reveal that FCs and BI significantly influence students' use behaviour e-learning system. This finding is consistent with past studies (Ali *et al.*, 2018; Masa'deh *et al.*, 2016). Hence, authorities can take various steps. They can improve the technical infrastructure such upgrading Internet bandwidth and installing more Wi-Fi access points within campus. The can facilitate students to use e-learning systems by making arrangements with smartphone and tablet vendors to provide students these devices on installment or loan-basis. Can negotiate with mobile network operators in the country to introduce low-rate Internet data packages with dedicated dongles for university students. All these would encourage students' usage of e-learning systems. Hence, the overall findings reveal that students who are facilitated with skills and encouragement to use e-learning systems as well as integration of e-learning systems with the existing traditional environments would ensure that these systems would be used by students massively.

Contribution of the study

This study contributes to the theory and practice. In Sri Lankan higher educational sector context, little is known on the adoption of e-learning systems. Past studies have contributed with segmented variables, but this study has attempted to incorporate the wholistic adoption model, which has synthetized many adoption theories. From the theoretical perspective, the conceptual model validated in Sri Lankan context provides better understanding about the factors that influence students' BI and use behaviour of e-learning systems. UTAUT2 has been extensively used in non-educational context (Tarhini *et al.*, 2017a), but this study has contributed to the learning context in Sri Lankan domain as was emphasized by Venkatesh *et al.* (2012), to be validated in diversified context. This study extended UTAUT2 by adding two constructs, namely, IE and WLQ, covering more perspectives of individuals' behaviour towards e-learning technology adoption. This study has attempted to provide a clear direction for the practitioners. For example, the outcome of this study would be of great benefit for South Eastern University of Sri Lanka, where the researcher of this investigation serves as a key member of e-learning Implementation and Training team. The findings would pinpoint the right places where more attention should be paid to make the adoption process a success. This study provides high ranking people in universities and those who govern and make strategic decisions so as what to do in Sri Lankan universities. It provides them more understanding of the attributes of university students in the case of e-learning system adoption and what these students would like to see and have in their technology assisted learning process so that future deployments and existing installations can be better customized to fit the needs and expectations of these students. For vendors of such e-learning systems, this investigation offers hints on what to

focus when it comes custom-making such systems for universities and higher educational institutions in Sri Lanka.

Limitations of the study and future direction

As with other studies, this investigation also has some limitations to underline. The sampling method adopted was non-probabilistic convenient sampling. Therefore, the sample of this nature should not be treated as a pure representation of the entire student population of Sri Lankan state universities. Findings of this investigation are confined to Sri Lankan context, and care must be taken when it comes to generalizability because of the sample size, and future research should increase the sample size to include more responses. Time horizon of this study was cross-sectional considering the limited resources available for carrying out this investigation, and approach was quantitative; had these been longitudinal and mixed approach, the results would have brought in depth perspectives to light. Future studies could incorporate more constructs, especially culture and trust and moderating effects of demographic characteristics, adopting probabilistic sampling, using mix method and making it a longitudinal study, to better comprehend students' acceptance and adoption of e-learning systems. Moreover, future studies can see the learning effectiveness of university students where e-learning systems are in use.

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Furthe reading

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Appendix. Measurements

Performance expectancy

- I would find the e-Learning system useful in learning.
- Using the e-Learning system enables me to accomplish learning tasks more quickly.
- Using the e-Learning system increases my effectiveness in learning.
- Using the e-Learning system makes it easier to learn course contents.
- If I use the e-Learning system, I will increase my productivity.

Effort expectancy

- My interaction with the e-Learning system would be clear and understandable.
- It would be easy for me to become skillful at using the e-Learning system.
- I would find the e-Learning system easy to use.
- Learning to operate the e-learning system is easy for me.

Social influence

- My lecturers think that I should use the e-Learning system.
- My colleagues think that I should use the e-Learning system.
- Administration of my Department of Studies is helpful in the use of the e-Learning system.

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- In general, the university has supported the use of the e-Learning system.

Hedonic motivation

- Using e-Learning system is fun.
- Using e-Learning system is enjoyable.
- Using e-Learning system is very entertaining.

Work life quality

- Using the e-Learning system helps me to have more time for a creative thinking.
- Using the e-Learning system helps me to have more time for leisure.
- Using the e-Learning system helps me to save money such as I can get materials freely.
- Overall, using the e-Learning system helps improving my quality of learning.

Internet experience

- How frequently do you use Internet?
- How long do you use Internet on each access?

Facilitating condition

- I have the resources necessary to use the e-Learning system.
- I have the knowledge necessary to use the e-Learning system.
- When I needed help to use the e-learning system, guidance was available to me.
- The technology necessary (computers and networks, etc.) for the Internet and e-Learning system use in my university are modern and updated.
- A specific person (or group) is available for assistance with system difficulties.

Behavioural intention

- I intend to use the e-learning system for preparing for the exam and course work.
- Given the chance, I intend to use the e-learning system to do different things, from downloading lecture notes and participating in chat rooms to learning on the Web.
- I predict I would use e-learning system in the next semester
- In general, I plan to use e-learning system frequently for my coursework and other activities in the next semester
- I intend to engage in e-learning routinely

Use behaviour

- How many times do you use e-Learning system during a week?
- How long do you use e-Learning system?
- How frequently do you use e-Learning System?

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