



Learning Management System Usage among Undergraduates in a Developing Context: An Extension to the Technology Acceptance Model

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Why are students in developing countries reluctant to effectively and efficiently participate in Learning Management Systems (LMSs)? Many researchers have conducted focusing on validating existing theories in developing contexts. This article aims to extend the knowledge about the Technology Acceptance Model (TAM) by incorporating external variables - subjective norms, experience in the internet and computer, self-efficacy, technical support, and anxiety - which will lead to an efficient and effective LMS usage in developing contexts.

Keywords: LMS; undergraduates; technology acceptance model (TAM); developing contexts; E-learning.

1. INTRODUCTION

The novel advancements of information and communication technologies (ICTs) have

undoubtedly produced a drastic impact on various aspects of human society in today's world and the influence of commerce, politics, and education in this backdrop is also noteworthy

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[1]. As a result, man has not been hesitant to term the present society as the “global village”, “information society” and “knowledge society” which is a symbol of the rapid changes in modern society and the new realities the society has to face [1]. They led the institutions of tertiary education to a consistent endeavor in delivering quality education to the student community [2], [3], [4], [5].

The term ‘Electronic learning’ which is abbreviated as ‘E- learning’ has been provided with various definitions by different authors. In its broadest sense E-learning refers to any learning that is electronically enabled and in a slightly narrower sense, it is learning enabled by the application of digital technologies [6]-[8]. Another feature of E-learning technologies is that they can control the content, learning structure, pace of learning, time, and media, allowing the students to tailor their experiences to meet their personal learning requirements [9], [10], [11]. E-learning has confirmed that the technologies in E-learning have been developed in line with theories of effective learning and teaching [11], [3], [12].

This rigidity makes it possible for some types of learners, such as disabled people or workers to benefit from this closed form of education [12], [6]. Despite the benefits E- learning can offer, there are some preconditions for learners to benefit from technology-based learning, especially in developing countries [6], [13], [14]. It is also noted that there is a growing disparity in the use of IT between developed and developing countries [13], [14], [15], [16], [17], [18]. When the developed countries use Information Technology (IT) to develop operations in industries, developing countries, on the other hand, do not seem to have the capabilities or the urge to do so [13], [14], [15], [16], [17], [19], [20], [21].

What is explained today as the “digital divide” is the disparity in existence in access to and use of IT between countries and groups within countries [14], [22], [23], [24], [25]. The reasons for the failures of many technology projects, including IT, in developing countries, was that those designs were not adequately tailored to be matched with the history and industrial traditions of the country and many researchers have addressed the antecedents of technology use in general, and the overwhelming majority on users in developed countries [13], [22], [23].

With the improved availability of internet connections, local area networks, and IT support,

it was further observed that the application of E-learning in developing countries is in a gradually advanced phase in recent years despite other challenges that still prevail [14], [25], [17], [26]. Moreover, the developing countries often do not have to implement advanced educational practices independently [13], [14], [24], [27], [28].

Information workers expect IT literacy to be involved in their lifelong learning process in developing countries [14], [29] and it was also identified that the learners in information management education have not reached the required competence related to information literacy [30]. There is more to be done to improve university teaching through ICT technology as the absence of sufficient E-learning adoption is a result of the absence of improved technology in any university system [6]. The results of the observatory support too suggest that E- learning has not reached its full potential and the E-learning providers are challenged by their ability to predict the degree of acceptability of their E-learning program among potential users [6].

Learning Management System (LMS) is a major component in delivering e-Learning [31], [32]–[34]. LMS is also the tool that will empower teachers to guide and manage student achievement more effectively by contextualizing the learning experience [31], [32]–[34]. A learning management system is an application that provides a comprehensive set of tools for educators to manage learning resources, administrative functions, assessments, and grading. The LMS enables educators to create, access, tag, and manage banks of test items, as well as catalog and use other evaluation methodologies to assess and manage desired student competencies [31].

Students can log on to their courses at any time of the day or night and have access to course materials and class discussions. The students can access not only the course materials but also, they can discuss with lecturers and classmates via the LMS forum. University students in their pursuit of information are willing to learn new things, ideas, technologies, and also new ways of acquiring information. Learning theories, pedagogy, and even E-learning are not yet incorporated into the curriculum in information management education in developing countries [30]. Although there are E- learning systems in developing countries, most of the time students do not effectively and efficiently use E-learning systems.

Many research have been conducted in developed countries conducted to identify the factors that affected LMS usage [35], [36]. Despite the existing vacuum to be filled for the exploitation of the internet and IT in developing countries, relatively little research attention has been drowned on them. The behaviours of students in developing countries are different from those in developed countries [17]. As a result, studies on e-learning uptake in developed countries cannot be utilized as a guide for developing countries [13], [14], [17], [19], [37], [38], [39]. Understanding the determinants of e-learning adoption from the standpoint of a developing country necessitates a study from this perspective [13], [14], [17], [19], [37], [38], [39], [40]. It is difficult to determine the most essential factor determining e-Learning success in developing countries without prioritizing critical success variables in e-Learning [40], [41]. As well as there are three theories related to E-learning usage i.e. The Theory of Reasoned Action (TRA), The Theory of Planned Behaviour (TPB), and The Technology Acceptance Model (TAM). There are criticisms related to those theories. Therefore, it is important to build an best appropriate conceptual model using existing theories. This research aims to develop the appropriate conceptual model to identify the factors that affected to intention to use LMS in developing countries.

2. LITERATURE REVIEW

Web-based and E-learning courses are used by a larger number of institutions that conduct higher education but the ability of undergraduate students to adopt Web-based learning systems is very rarely studied [42] especially in a developing context like Sri Lanka. To implement a system successfully and also for the learners to change accordingly, there has to be strong comprehension of user processes and means of

convincing students to take part with these technologies [10]. There are three widely used and accepted theories related to E-learning usage—TRA, TPB, and TAM.

2.1 Theory of Reasoned Action (TRA)

This theory identified the reasons for the decisions taken by individuals when they perform particular behaviours and the conscious decisions of individuals when undertaking certain specific behaviours. Within the given setting, learning that there is a lack in theory to meet challenges, different ways of behaviour are intended to be responsible according to the new TRA through referring to comparatively a small number of ideologies in a given theoretical framework based on the assumption that generally human being is rational and they make use of the information provided to them systematically [43]. The TRA theory as its intention emphasizes stated the function of a person under two basic factors; personal and the signaling in social influence. To be more precise, some students may differ from each other about the evaluations of adopting E-learning either having a favourable attitude or an unfavourable attitude [1].

In summary, the theory presented that individuals intend to perform a particular behaviour when positively evaluated and when others expect that they should perform it well (see Fig. 1).

There are instances in which the normative considerations are weighted by attitudinal considerations, and normative considerations may be more important for other intentions [1]. Therefore, it is obvious that the attitude towards the behaviour is determined by the evaluation of the outcomes at the individual level related to the behaviour and also by the strength of relationships assistant [44].

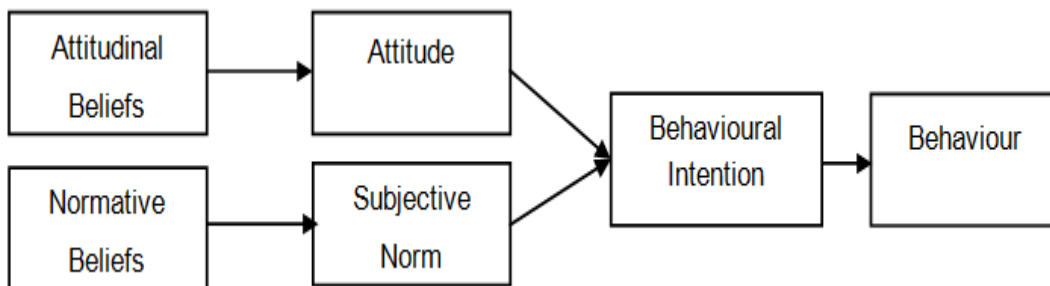


Fig. 1. Summarizes TRA

In the backdrop of online education, [45] adopted TRA to explain the beliefs and attitude of the participants from the faculty towards the participation in the teaching of online courses and to predict their Behavioural Intention and, in this context, the attitude was identified to significantly correlate with intentions and behavioural belief. In addition, Subjective Norm was significantly correlated with the intentions and the normative belief.

Yet, it should not be misunderstood that there were criticisms leveled against this theory in general concerning three issues: the relationship between the concepts of attitude and Subjective Norm; the sufficiency of TRA's predictors of intention and behaviours; and the limited scope of the behaviours explained by theory [46]. TRA was criticized for restricting its scope to volitional behaviours. It was argued that required skills for behavior, resources, opportunities and cooperation essential for the task to be accomplished were excluded from the domain of TRA, or were poorly predicted by TRA [46].

2.2 Theory of Planned Behaviour (TPB)

In comparison to TRA, TPB was founded on the basis that human beings generally behave in a socially accepted way and it looked at the information which was available and studies the results of their behaviors [47]. According to TPB, it was hypothesized, the most important deciding factor of behaviour of a person is the intention of an individual to perform a certain behaviour. Also, theory brought out to light that reason is a function of three basic determinants. They are: personal, consider how it affects society, and the ability to control the order of events [47].

The first determinant that defined the intention is the attitude or how one perceives the behaviour, either as a negative one or a positive one. The second determinant is how society pressurizes an individual's way of thinking to perform or not perform the concerned action or behaviour of interest. Finally, perceived behavioural control or the sense of Self-Efficacy or the strength to perform the behaviour of interest was added by TPB [48].

Similar to TRA, TPB, it was identified that the three determinants and their importance laid halfway on the intention of interest and it differed from one person to another. To explain it further, if one determinant explained its intention on a certain type of behaviour, even the other two behaved equally important (see Fig. 2).

A small amount of external pressure rarely affects the attempts to perform the behavior listed in the study. Subjective Norm is seen by other studies as an important element of intention and behaviour especially when people are struggling with a lack of knowledge to increase attitude [44]. Subjective Norm and the methods of measuring were pointed out by the researchers as needing further scrutinization.

When TPB was applied to analyze the behaviours about ICT, it was looked into the students' acceptance and intentions to utilize a technology-mediated, asynchronous distance environment [49]. Some research predicted the Behavioural Intention of students for E-learning by using TPB [50].

There is criticism on TPB under several aspects particularly on similar issues concerning TRA. The Perceived Behavioural Control component was under criticism for its ambiguity and about the way it was measured [51]. Perceived Behavioural Control, similar to the concept of Self-Efficacy, was suggested to include various constructs [51].

The way how the indirect belief-based constructs of the model were measured was also criticized [44]. Belief structures were organized into uni-dimensional constructs and these belief products are not inconsistently correlated with attitude, Subjective Norm, or Perceived Behavioural Control. Added to this were the belief products, particularly those about attitude, which was idiosyncratic to the empirical context causing difficulty in operationalising the TPB constructs [44]. [47] acknowledged that there is an association between belief components and that of the three determinants of intention (Attitude, Subjective Norm, and Perceived Behavioural Control) though not fully understood.

2.3 The Technology Acceptance Model (TAM)

The objective of the proposal of TAM by [52] was done to figure out the determinants for welcoming computers as a whole and explaining the behaviour of the users among the vast range of end-user computing technologies and the users themselves while it also was resourceful and theoretically justified [53]. One of the main goals of TAM was to become the foundation of figuring out how external factors, as well as internal beliefs, attitudes, and intentions as far as the researcher, could find and trace the reasons

as to why a certain system could be not acceptable and as a result follow proper means of corrections [53].

[52] considering theoretical framework- TRA focused his attention on two fundamental constructs that were suggested by previous research when dealing with the cognitive and affective determinants of computer acceptance: Perceived Usefulness and Perceived Ease of Use. The TAM hypothesis was that the two specific beliefs, Perceived Usefulness and Perceived Ease of Use, were of prime importance for computer acceptance behaviours. The understanding that the usage of a certain system would promote the opportunity to better job performance is the definition of Perceived Usefulness and it was seen as to how far a person believes that the use of a certain system would relieve him from making an effort [52]. In line with TRA, TAM is with the view that computer usage is determined by intention but the difference between TAM and TRA is that intention is determined only by attitude toward the use of the system and Perceived Usefulness as in Fig. 3.

of IT by its model users [54], [55] and the two factors of TAM, Perceived Usefulness and Perceived Ease of Use influence on IT acceptance behavior for primary relevance. As far as [52], is concerned the Perceived Usefulness which comes in between the result of the Perceived Ease of Use on attitudes and the intended use is affected by the possible connection between the Perceived Usefulness and the Perceived Ease of Use. In other terms, Perceived Usefulness creates direct impacts on the attitudes and the prospective just like the Perceived Ease of Use on the attitude and use indirectly via Perceived Usefulness. Hence, the direct and indirect effects are a result of several variables outside of the TAM itself.

The Perceived Ease of Use means the level at which an individual believes that learning how to use technology requires little effort. Perceived Usefulness is the extent to which a learner believes about the use of technology for the improvement of his or her performance [56]. Identification of factors that determine computer usage has been an emerging research area during the past two decades. Many future pieces of research concerning information and adoption of computer technology and its use have their foundation in TAM [52].

This belief-attitude-intention-behaviour relationship was adopted by TAM for acceptance

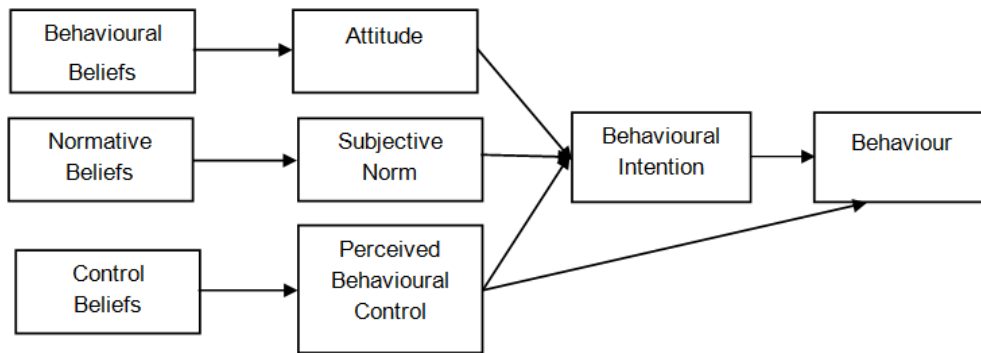


Fig. 2. Summary of the Theory of Planned Behaviour

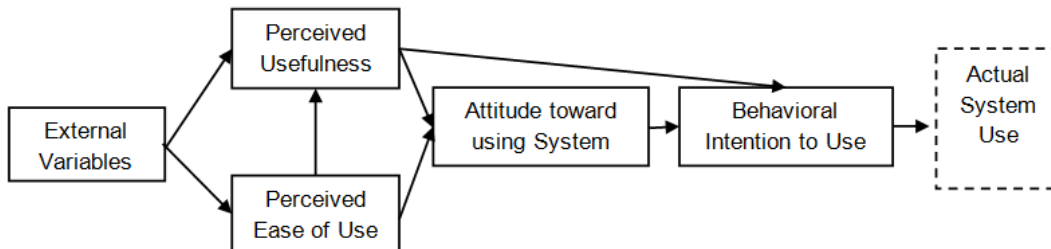


Fig. 3. Original technology acceptance model

[52] suggested two determinants for the usage of computers in the TAM and they are the Perceived Usefulness and the Perceived Ease of Use. This is followed by adopting of furthermore variables through expansion by other researchers to team up for computer technology usage [57], [58]. The TAM was first developed to focus on IT system usage in applications. In recent researches, TAM is applied to the E-learning domain [49]. Hence, this paper is to be developed as an extended version of the TAM related to the factors in focus that are behind decisions made by students to exploit an LMS. Further, there is progressive development of the TAM among research attempts proposing and testing specific antecedents towards its two use-belief constructs. Not concerning factors antecedent, TAM unfolded generally limited information regarding the opinions of the users of a system and was not open for specific information intended for system development [59].

TAM was superior to TPB in an attempt to explain the intention of doctors for the use of telemedicine technology and, in that the most significant factor was Perceived Usefulness for explaining acceptance of doctors of technology while Perceived Ease of Use was not [44]. An alteration of the TRA, The TAM was mainly created to parade the user acceptance of information systems. Hence, the TAM is a model founded on intention. Following the theory of reasoned action, beliefs, influence, attitudes which head towards and intentions and create behaviour as a consequence [59].

The other determinant of intention in TRA, Subjective Norm was not incorporated into TAM due to its theoretical and psychometrical statuses not being clear [53]. However, [57] added with reference that this construct is another version of TAM.

The combination of TRA and TAM as an after-research effort came up with the suggestion to revise the original TAM to a stronger model to forecast and explain user behaviour founded on intention, Perceived Usefulness, and Perceived Ease of Use, the three theoretical constructs [53]. The original TAM, with the attitude exclusion construct, was consistently performed for predicting intentions satisfactorily. So, the practitioners found it useful in situations of primary intentions. Ease of use and usefulness well indicated the type of the software package for a given application after a short introduction to each [60].

The relationship between attitude and intention from TRA suggested the positive attitude of individuals' form intentions for behaviours. The second relationship which was between Perceived Usefulness and intention concludes that going, beyond any favourable or unfavourable attitude he or she held towards the behavior, an individual formed intentions to perform the behaviour [52].

It is the formation of intentions by a person to use a system based on a cognitive evaluation that will improve his or her performance. Still, as the effect is not constantly evoked related to when it is decided to use a system, the influence of performance on intention is not expected to be completely covered by the attitude [53].

TAM in while attempting to comprehend at length and narrate users' intention to accept computer usage accepts many different technological findings amidst various user groups under various back grounds such as word processors [53], spreadsheet applications [38], e-mail [54], web browsers [61], telemedicine [62], websites, World Wide Web [63], [64], on-line shopping [65], the internet [66], 3G mobile the internet [67], weblogs [68], and WebCT (WEB-based Course Tools) [42].

The volume of articles and the introductory papers of TAM by [52] and [53] was an indication of the popularity of TAM. Hence TAM continued to be the most broadly applied theoretical model in the Information Systems field [69]. Researchers examined student acceptance of E-learning technology under TAM [11], [59], [70], [71].

TAM removes the drawbacks which are discussed above in the TRA and TPB. Further, most recently TAM was used to examine the usage of E-learning. Given the prevalence of cultural differences and sociological quirks that exist in diverse contexts, this study gives insight into e-learning adoption from the perspective of students through an extension of the TAM model in a developing country context [19]. Therefore, this study selected TAM among others to examine LMS usage.

2.4 External Variables of TAM

As elaborated above, the extended TAM propositioned that the attitudes of a person about a behavior impacting on the intentions to enact that behavior, and the behavioral intentions have

an impact on the real performance of the behaviour, and under this model, it was hoped to get the Perceived Ease of Use activated as two independent variables; the technological compatibility and how easy it is to adopt [55]. The managers of developing countries had direct and indirect effects on attitudes towards the adoption of technology and on behavioral intentions to adopt similar technology [17], [55]. More behavioural constructs were inbuilt into TAM such as the support of the top management, computer Self-Efficacy, and computer Anxiety [72]. The result showed that there is hardly any effect on Perceived Usefulness by Computer Self-Efficacy but the Perceived Ease of Use [72].

The empirical examinations of the adoption of WebCT using TAM used Technical Support as the external variable [42], [73], [74]. To find out Individual and technical factors affecting the Perceived Ease of Use of web-based learning technologies in a developing country, used Self-Efficacy, Anxiety, Ease of finding, and Ease of understanding as external variables of TAM [75]. Analysis of the TAM for Understanding University Students' Behavioral Intention to Use E-learning takes Subjective Norms and Self-Efficacy as external variables [71]. To find the Effects of Self-Efficacy on Computer Usage, used Experience in the internet and Computer, Self-Efficacy, Anxiety, and Organizational Support as external variables [76].

Theoretical Extension of the Technology Model: Longitudinal Field Studies Acceptance, used Subjective Norms, Experience in the internet and Computer, Voluntariness, Job Relevance, Output Quality, and Result Demonstrability as an external variable of TAM [57]. To Understanding Information Technology Usage: A test of competing models, [44] used Subjective Norms, Self-Efficacy, Resource Facilitating Conditions, Peer Belief, Instructor Belief (superior), and Compatibility.

Subjective Norms, Experience in the internet and Computer, Self-Efficacy, Top mgt. Support, Anxiety, E-learning Accessibility, Compatibility, Voluntariness, Job Relevance, Result Demonstrability, Accessibility, and Complexity as external variables in the study of TAM: Past, Present, and Future [69]. Intended to Investigate the Factors that Influence on the Adoption of E-learning: Saudi Students' Perspective, [1] considered Subjective Norms, Self-Efficacy, Normative Pressure, Management/ University support, E-learning Accessibility, Perceived

Interactivity, Peer Belief, Family Belief and Instructor Belief (superior) as E-learning adoption variables [1]. Experience in the internet and Computer, Anxiety, Normative Pressure, Management/ University support, and Computer knowledge as external variables of TAM in their attempt to measure the Acceptance and Adoption of E-learning by Academic Staff [77].

In a critical review of the TAM to investigate the reason behind the use of information technology, [70] suggested Subjective Norms, Experience in the internet and Computer, Voluntariness, Job Relevance, and output quality to be external variables.

Subjective Norms have been the external variable to find the role of moderating factors in user technology acceptance [78]. Similarly in a study of Attitudes toward the internet: A Study among Undergraduates [79] use Self-Efficacy and Anxiety. [80] also investigated the Information searching strategies in web-based science learning: the role of the internet Self-Efficacy study implemented.

Experience in the internet and Computer and Age as external variables in the study of Attitude of Students Towards E-learning in South-West Nigerian Universities: An Application of TAM [81]. [82] in his evaluation of the TAM as a means of understanding online social networking behavior, uses Subjective Norms and Experience in the internet and Computer as external variables.

Technology acceptance research in education used Subjective Norms, Self-Efficacy, Technical Support, Resource Facilitating Conditions, and Compatibility as external variables [83]. Predicting the effect on E-learning application in agriculture in higher education under the TAM, used Experience in the internet and Computer, Self-Efficacy, Anxiety, and Age as external variables [84]. Researchers extend TAM to include subjective norms as additional components to overcome the potential limits of utilizing TAM in developing countries [37].

As external variables of TAM, [59] in Looking under the Bonnet: Factors Affecting Student Adoption of E-learning Systems in Jordan utilized Subjective Norms, past exposure to the internet and Computer, the ability to interact with the System, Self-Efficacy, and Technical Support.

In accordance with the above, it is evident that there are more researchers who have used

Subjective Norm, for example [59], [78], [82], [83], [1], [26], [85], [86], [87], [88], [89], [90], [91], [92], Experience in the internet & computer [59], [77], [81], [82], [84], [85], [93], [94], [95], [96], [97] Self-Efficacy [59], [83], [84], [85], [1], [71], [72], [73], [86], [95], [98], [99], [74], [97], Technical Support [59], [42], [73], [74], [83], [100], [101], [102] and Anxiety [72], [73], [77], [84], [85], [97], [103], [104], as external variables of TAM. Thus, the present study is essentially an extension of the TAM incorporated with the external factors that affect LMS usage for the testing model. To be more precise, this study was extended based on previous research incorporating the variables: Subjective Norms, Experience in the internet and Computer, Self-Efficacy, Technical Support, and Anxiety.

2.5 Subjective Norms

The researcher defines Subjective Norms as the understanding of a person as to what the people who may influence his or her life would believe whether he or she should engage in a particular type of action in question [105]. The definition of Subjective Norms is such that it considers that according to a person's belief if most of the people who are important to him think whether or whether not, he should perform the behavior in limelight [105]. In the early stages of new creations and their implementation, it was found that Subjective Norms were seen as of importance when the user's direct experience of developing attitudes was limited [44].

Thereby, it is the social pressure either to use or not use technology and it is an outcome of an already agreed thought of what makes up acceptable behavior (normative beliefs), and a person's degree of motivation to follow those beliefs [53]. There is a significant effect and it is when the cooperation of Subjective Norm took place into the revised model to see the possible linkage between behavioral intention and social influence [44], [53]. The Intention to Use a certain type of technology doesn't have anything to do with Subjective Norm [53]. In a developing country environment, the researchers have included subjective norms and conducive factors to the TAM and evaluated personally espoused cultural values modifiers of behavioural intention [106], [107], [108], [39], [109], [110].

Researchers [78], [88] identified that Subjective Norms have no significant impact on Perceived Usefulness while other researchers [26], [59], [82], [86], [87], [89], [90], [91], have identified

that Subjective Norms have a significant positive impact on Perceived Usefulness.

The intention that comes with Perceived Usefulness is influenced through Subjective Norm directly in voluntarily agreeing to implement [82]. In other words, the usage of a certain technology is done through how others see it. When the technology was seen as useful by people who have an impact on the person concerned, there is a higher chance of the user to be judging it to be useful and developed hypothesis the Subjective Norms would have a positive effect on the Perceived Usefulness [82].

Certain studies identified the effects of Subjective Norms decrease with time and remain only important in contexts where it is mandatory [57]. Subjective Norms have a direct effect on Perceived Usefulness and Subjective Norms have a direct effect and indirect effect on Intention to Use [59].

Thus, based on the above justification following proposition is formulated.

Proposition 1: Subjective Norms have an impact on the Perceived Usefulness

Researchers [78], [82], [86], [90], identified that Subjective Norms have no significant impact on Intention to Use computers while another researchers [59], [89], [92], identified that Subjective Norms have a significant positive impact on Intention to Use computers.

The course leader and Subjective Norm were seen to have a notable relationship [98]. Course leader's influence has an influential say and also forecasts 10% of variations in Subjective Norm [98]. Attitude, Subjective Norm, and Perceived Behavioural Control significantly contribute as well as forecast 24% of variations in E-learning adoption intention [98]. Subjective Norms were found to have a significant direct [44] and indirect [57] effect in predicting an individual's Intention to Use computer technology.

Thus, based on the above justification hypothesis proposition is formulated.

Proposition 2: Subjective Norms have an impact on the Intention to Use.

2.6 Experience in the Internet and Computer

The researcher defines Experience in computers and the internet as the time period and how often

one uses the internet and computers disregarding the intention behind using it [1]. When adopting technology, experience is considered a primary variable as the former studies present it [111]. The user's intentions of using computers are governed by certain factors and in research on it have realized that there is a major contrast in the relative influence of the determinants of usage based on experience and the creation of positive attitudes regarding technology is formed by experiences making a comfort zone enabling the people to adopt it [44]. It is identified that there is a better status of an individual to adopt it when they have had former experience in it if found useful. Under the setting of E-learning adoption, the experience one has on computers had some impact on Behavioural Intention to adopt E-learning [112]. The experience concerning the internet supplies the person concerned with some form of knowledge and the benefits of E-learning and how to utilize it with less effort and time.

Behavioural Intention to Use, actual use, perceptions, and satisfaction of various internet applications are seen by numerous studies to be associated with the experience of the internet or related technologies such as computers [44], [113], [114], [115], [116]. Due to the inception of the internet over a few decades back, the overall influence of internet technology on developing countries' economies has yet to be defined, and no more experience has been gained [13]. Level of Experience in the internet and computers in developing countries different from developed countries [13], [14], [117], [118], [109], [119], [120], [121], [110].

Researchers [96], [97], [122] emphasized that Experience in the internet and Computer has no significant impact on Perceived Usefulness while other researchers [59], [76], [82], [94], [95], [123] identified that Experience in the internet and computer has a significantly impact on Perceived Usefulness further confirmed that Experience in the internet and Computer has a significant positive impact on the Perceived Usefulness [76], [82], [94], [95], [123] while researcher [59] found that Experience in the internet and Computer has a significant negative impact on the Perceived Usefulness.

Further, there was some empirical proof that showed the lessening effects of experience on the relations between many constructs related to system or technology adoption and Behavioural Intention to adopt the system [124]. For instance,

the connection between Subjective Norm and Behavioral Intention was moderated by experience and Subjective Norm was considered of lesser importance as against higher levels of experience [124], [125].

Thus, based on the above justification following proposition is formulated.

Proposition 3: Experience in the internet and Computer has an impact on the Perceived Usefulness

Researchers [96], [126] emphasized that Experience in the internet and Computer has no significant impact on Perceived Ease of Use while other researchers [59], [76], [82], [94], [95], [97], [123] identified that Experience in the internet and Computer has a significant positive impact on computers and the Perceived Ease of Use.

Perceptions of ease of use and its usefulness are directly influenced by the experience one has on a certain type of technology is a proposition made by the research done using the TAM [127]. The success of a learner in a distance learning course is based on technical skills of computer operation and internet navigation and the coping mechanism about the subject matter [127].

Thus, based on the above justification following proposition is formulated.

Proposition 4: Experience in the internet and computer has an impact on the Perceived Ease of Use

2.7 Self-Efficacy

The researcher defines Self-Efficacy as a person's personal belief that he or she has the inner strength to carry out a task, to favour a task, the continuity, show keenness and to understand how challenging the particular task is [48]. [48] identified Self-Efficacy in his social cognitive theory. Perceived Self-Efficacy thereby referred back to the beliefs of one regarding his ability to organize and successfully implement the action concerned to achieve certain goals [48] and hence, Self-Efficacy is not a means of measuring the skills one had but a strong understanding of what one could do with the skills he has under various contexts. Individuals lacked the drive to act or to persist in facing challenges unless they had the belief that they could develop the wanted effects through their

actions [128]. [128] further elaborated those other factors serve as guides and motivators; they have rooted in the core belief that one could affect changes by one's actions.

Influencing cognitive, motivational, affective, and decisional processes are the means of operation of the efficacy belief which is seen as personal development. Furthermore, a person's optimism and pessimism in self-improvement and self-debilitation are based on Self-Efficacy [128], [129]. The optimistic or pessimistic believe also define an individual's goals and aspirations and the effort they may put forth in certain targets and how long they will retaliate in front of challenges and failure [129]. Efficacy beliefs decided the individuals' outcome expectations, whether the effort will bring positive or negative outcomes [128], [129]. For example, at challenging tasks individuals withdraw themselves if they question their capacity in a certain area of activity and their weak aspirations and commitments make it difficult to make them motivated in similar conditions [128]. However, an individual who has strong faith in his abilities will reach such tasks as challenges to fight over with then consider them as risks to be avoided as a resilient sense of efficacy enhances the usage of socio-cognitive in a certain domain [129].

Extensive research on various fields was done on the concept of Self-Efficacy and it has gained assistance from an increasing area of study from different disciplines. Self-Efficacy was found to have influenced intention, goal choice and task performance academic performance and persistence, motivation, academic achievement, and computer use [130].

Establishing an internet connection, navigating on the internet, and searching it for relevant information are some activities that are found difficult by a new user as the use of the internet requires them to learn such skills [131]. Internet Self-Efficacy was defined as the understanding that one can successfully execute a specific set of actions required by establishing, maintaining, and utilizing effectively the internet [131]. Task effort, persistence, expressed interest, and the level of goal difficulty selected for performance are influenced by individual's understanding that they could execute a certain task and it is defined as Self-Efficacy [48].

Prior research reveals that Self-Efficacy was an important factor that influenced the adoption of various technologies [44], [113], [132]. Computer

Self-Efficacy created a major influence on individuals' outcomes expected by using computers, their emotional reactions to computers (affect and Anxiety), and their real computer use. This draws the fact that individuals with high Self-Efficacy used the computer more, gained more enjoyment out of it, and faced less Anxiety concerning the use of it. Likewise, computer Self-Efficacy was the only major forecaster of intention to contribute to a web-based distance education course [133]. There is a strong key linkage between computer Self-Efficacy and intentions to use an E-learning system [73], [131].

Given that the scarcity of ICT resources and infrastructure in developing countries [40], [41], [110], [120], [134], [135], teachers expect ICT training programs for teachers to enable trainee teachers with limited ICT knowledge and abilities to seamlessly integrate ICT into their teaching areas. Teachers from non-computer science fields can readily create flipped learning content in the subjects they teach in developed countries, enhancing teachers' self-efficacy in using ICT [40], [41], [110], [120], [134], [135]. Students are educated at universities and then go on to work in society after graduation. Their abilities then serve as the foundation for a country's research capability. As a result, it is critical to comprehend undergraduate students' self-efficacy, especially those in developing countries [41], [136].

Researchers [86], [97], emphasized that Self-Efficacy has no significant impact on Perceived Usefulness while other researchers [59], [72], [74], [76], [95], [99], [137], identified that Self-Efficacy has a significant positive impact on Perceived Usefulness.

Thus, based on the above justification following proposition is formulated.

Preposition 5: Self-Efficacy has an impact on the Perceived Usefulness

Self-Efficacy has a significant positive impact on the Perceived Ease of Use [59], [72], [74], [76], [86], [95], [97], [99], [126].

[48] identifies Self-Efficacy as a major concept under social learning theory and Self-Efficacy can be defined as an individual understands that he can execute specific actions or an individual's personal belief about the ability to execute certain tasks successfully. Many pieces of research declared that understanding of Self-

Efficacy impacted decisions based on actions undertaken, persistence to attempt certain behaviour and the real execution of the task, and the achievement for the individual with the task [138]. Self-Efficacy is the student's level of self-confidence that he is capable of executing a certain task using LMS under E-learning. Hence, a student with a stronger understanding of LMS may have a more positive outlook of its ease of use than a student with less sense of the use of the system.

Thus, based on the above justification following proposition is formulated.

Proposition 6: Self-Efficacy has an impact on the Perceived Ease of Use

2.8 Technical Support

The researcher defines Technical Support as the ability to approach technological resources and infrastructure without difficulty [139]. Perceived benefits of technology adoption are impacted by the enhanced technology compatibility. The utilization of technology and achievement of greater technological benefits can be observed through enhanced technology compatibility and they ultimately produce lower transfer costs, quicker transfer times, and overall improved technology transfer. As in the above case, the organization could gain the economic benefits quicker as a result of technological compatibility similar to increased competitiveness. The technology benefits gained by adopting an organization can also be enhanced through the ease of adoption of the new technology [55], [73], [74].

Developing countries face financial limits, insufficient ICT infrastructure, e-learning illiteracy, political consensus constraints, legal hurdles, and social and cultural constraints [13], [14], [109], [110], [118], [119], [120], [121]. Nations in the developed world have responded with new and revised legislation; infrastructure, such as hardware and high-speed internet access, as well as political rhetoric, appear to embrace the spirit of the era [134], [40].

Technical Support has a significant impact on Perceived Usefulness [55], [59], [74], [98], [100], [101] and, this further confirmed that Technical Support has a significant positive impact on Perceived Usefulness.

Thus, based on the above justification proposition 7 is formulated.

Proposition 7: Technical Support has an impact on the Perceived Usefulness

Researcher [102] emphasized that Technical Support has no significant impact on Perceived Ease of Use while other researchers [55], [59], [74], [98], [100], [101] identified that Technical Support has a significant positive impact on Perceived Ease of Use.

Thus, based on the above justification proposition 8 is formulated.

Proposition 8: Technical Support has an impact on the Perceived Ease of Use

2.9 Anxiety

The researcher defines Anxiety as the level of nervousness or even dread when allowed to use computers [140]. The fear of an individual when he or she is made to use computers can be termed as Computer Anxiety [140]. Computer Anxiety may make users create negative attitudes toward their behavioral intention to adopt technology [73], [140].

There should be courses for lecturers explaining the benefits that could be realized by adopting an E-learning system, and how such a system could effectively assist their educational objectives. As computer Anxiety was found to have a strong and negative effect on the intention to adopt an E-learning system, training should be done to enhance lecturers' computer knowledge. Overall, advantage should be taken by those who have former exposure to the use of technology and utilize them in supporting the others who had no such previous experience by educational institutions [77]. Individuals with a lesser amount of Anxiety seem to be comfortable interacting with computers than those with higher levels of Anxiety.

The main difficulties that students experienced in online learning and distance learning were limited access to libraries and computers, expensive computing costs, internet connectivity, a lack of English competence, and inadequate writing skills [40], [109],[110], [119], [120], [121]. Inadequate access to technology can make children feel excluded, generate anxiety, and create a digital divide between them and students who have it [40], [109],[110], [119], [120], [121]. As online learning expands and extends to multiple learners those with less access and advantages, as well as those with

more awareness of students' viewpoints, concerns, and hurdles is critical in developing countries [40], [109],[110], [119], [120], [121].

Researchers [72], [97], [103] identified that Anxiety has no significant impact on Perceived Usefulness while other researchers [76], [77], [98], [104], identified that Anxiety has a significant negative impact on Perceived Usefulness.

Individuals with lower Anxiety are much more likely to interact with computers than those with higher Anxiety.

Thus, based on the above justification preposition 9 is formulated.

Preposition 9: Anxiety has an impact on the Perceived Usefulness

Researchers [72], [75], [103] stated that Anxiety has no significant impact on Perceived Ease of Use while other researchers [76], [77], [97], [98], [104] identified that Anxiety has a significant negative impact on Perceived Ease of Use.

Thus, based on the above justification preposition 10 is formulated.

Preposition 10: Anxiety has an impact on the Perceived Ease of Use

2.10 Conceptual Model

TAM suggested by [52] for adoption was based on Internal and external variables. The Internal variables of the model displayed that the attitude of the user on the use of new technology was explained by the Perceived Ease of Use and the

Perceived Usefulness of the new technology itself. Theory assisted the impact of the Perceived Usefulness of E-learning technology on the adoption of E-learning systems by students to follow the online module of E-learning. The impact of perception of ease of use of the features of the Moodle E-learning platform on the adoption of the E-learning system is supported by theory.

The external variables linked to the model were composed of other factors influencing student's usage of LMS and they were assumed to influence intentions of use through Perceived Ease of Use and Perceived Usefulness (see Fig.4).

Experience in the internet and Computer was assumed to influence intentions of use through Perceived Ease of Use [59], [76], [82], [94], [95], [123]. Self-Efficacy was assumed to influence intentions of use through Perceived Ease of Use [59], [72], [74], [76], [86], [95], [99], [126]. Technical Support was assumed to influence intentions of use through Perceived Ease of Use [55], [59], [74], [98], [100], [101] and Anxiety was assumed to influence intentions of use through Perceived Ease of Use [76], [77], [98], [104].

Experience in the internet & computer was assumed to influence intentions of use through Perceived Usefulness [59], [76], [82], [94], [123]. Self-Efficacy was assumed to influence intentions of use through Perceived Usefulness [59], [72], [74], [76], [99], [137] Technical Support was assumed to influence intentions of use through Perceived Usefulness [55], [59], [74], [98], [100], [101], and Anxiety was assumed to influence intentions of use through Perceived Usefulness [76], [77], [98], [104].

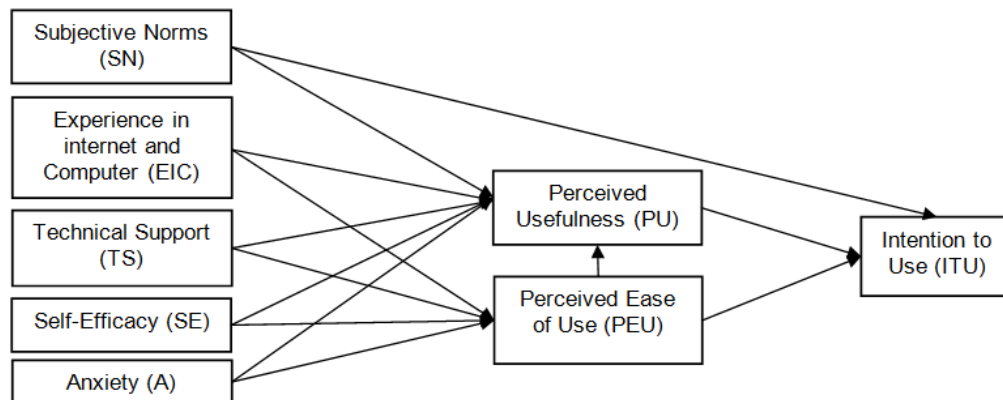


Fig. 4. Conceptual Model

Subjective Norm was assumed to influence intentions of use directly [59], [89], [92] and Subjective Norm influence intentions of use through Perceived Usefulness [26], [59], [78], [82], [86], [87], [89], [90], [91]. The Perceived Ease of Use influences Perceived Usefulness of a system [59], [78], [122], [141]. The Perceived Ease of Use influences Intention to Use [59], [81], [122], [141], [142]. The Perceived Usefulness influenced Intention to Use [59], [78], [81], [122], [123], [141], [142].

3. CONCLUSION

With the concept of student-centered learning in the 21st century, most educational institutions with technology have paved the way for students to improve their abilities. In the broadest sense, E-learning refers to any learning that is electronically enabled and in a slightly narrower sense, learning enabled by the application of digital technologies. Some have argued for a direct transfer of information from developed-country studies to developing-country studies; however, social quirks, computing infrastructure, and culture may obstruct this transfer. As a result, additional research on e-learning uptake is needed, particularly from the perspective of developing countries.

There are many E-learning systems in developing countries, but most of the time students do not effectively and efficiently participate in E-learning. Since the ultimate goal of using LMS is the enhancement of effective learning, the benefits of the system cannot be achieved if the rate of the students who use and are involved in LMS is low. Hence, the identification of the factors that affect LMS usage among undergraduate students in developing countries is of greater importance.

There are three theories related to E-learning usage. They are TRA, TPB, and TAM. There are some limitations associated with TRA and TPB, and therefore, TAM is used for this study.

This study extended the TAM based on previous research incorporating the variables: Subjective Norms, Experience in the internet and Computer, Self-Efficacy, Technical Support, and Anxiety. The external variables linked to the model are composed of other factors influencing a students' usage of LMS and they are assumed to influence intentions of using LMS through Perceived Ease of Use and Perceived Usefulness.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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