International Journal of Engineering & Technology, 7 (4.41) (2018) 179-184

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper



Technology Adoption Models - An Empirical Comparative Analysis for LMS Technology in Higher Education

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Abstract

The rapid technological advancement is changing the landscape of higher education. The efficacy of technology has spurred higher educational institutions to transform their educational structures and modes of knowledge dissemination from process-focused to student-focused. Higher educational institutions are adopting new information and communication technological (ICT) tools to enhance teaching-learning process and student engagement. One such ICT tool which blends technology in the classrooms into educational experiences is the learning management system (LMS). The LMS usage by the higher education institutions facilitates the students for "anytime and anywhere access" to the contents. In this context this paper examines the acceptance of learning management system as a technological tool among students. And, examines the critical factors that effects the behavioral intentions of students towards LMS usage and factors influencing the actual usage of the LMS. The study also focuses on comparing the threemodelsof technology adoption, TAM, revised version of TAM and C-TAM-TPB. The comparative analysis of three models discloses that perceived ease of use and perceived behavioral control being an important exogenous variable in understanding the behavioral intention and actual usage. The study was conducted among the first year business management students of private deemed university.

Keywords: *Learning Management System, Technology Adoption, Behavioral Intention, TAM, C-TAM-TPB*

1. Introduction

As the Internet continues to grow at an exponential rate, Learning Management System (LMS) like any other information communications technology (ICT) innovations has been irrevocably transformed. Educationists are combining new technologies with traditional practices of talk and chalk, where necessary, to modify previously established techniques to create and deliver value to the teaching and learning process. LMS is a digital software which helps to develop and assign course content, track student progress and evaluate outcomes. LMS are also termed as course management system, content management system and e-learning. Szabo & Flesher (2002)define LMS as "infrastructure that delivers and manages instructional content, identifies and assesses individual and organizational learning and training goal, tracks and progress towards meeting those goals, collects and presents data for supervising the learning process of an organization as a whole". Weller (2007) explains LMS as "a software system that combines a number of different tools that are used to systematically deliver content online and to facilitate the learning experience around that content". LMS are widely used by educational institutions and consulting companies for training purpose. With the increase of mobile user population, innovative web-based applications with user centric designs and other features of web 2.0 technologies like social media and wearable technology integration has been the priority of many LMS platforms. There are four types of LMS: proprietary or commercial LMS, open-source LMS, cloud based LMS and hybrid LMS (Iuliana D, 2014)

Proprietary LMS such as Blackboard, Google Classroom, Adobe Captivate Prime, Canvas, Desire2Learn, eCollege, Angel etc. are licensed by their developers under exclusivity of copyrights. Usually proprietary LMS needs installation of software in servers and computers. Since the LMS has to be interfaced using internal infrastructure, accessibility outside the infrastructure could be a disadvantage. The cost for such LMS would be based on number of users or licenses, number of upgrades, level of maintenance etc. Open source LMS such as Moodle, WebCT, Sakai, Dokeos, eFrontetc are platforms which have source code under a public free license. The user is given rights to use the software as per their own requirements. In past years proprietary platforms were mostly used but currently many educational institutions worldwide used open sources platform. According to Moodle statistics 2018*, it has 131,451,271 users in 232 countries. The cloud-based LMS does not require installation and could be accessed directly through an Internet connection. It is a low cost solution as it does not require infrastructure and maintenance cost. DigitalTalk, TalentLMS, DobecoSaaS LMS etc. are some of the cloud-based LMS.

The LMS market is growing at an unprecedented pace. According to Learning Management System (LMS) market to 2025 Global Analysis and Forecasts report**, the global LMS market is expected to grow from USD 5.5 billion to USD 18.44 billion by 2025, at a CAGR of 15.52%. There has been a gigantic shift in K-12 and higher education structures with the introduction LMS. To keep up with thispace, adopting LMS has been inevitable for higher educational institutions. From the students' perspective LMS provides them the access to course materials delivered by the instructors, enables peer interaction through discussion forums and interactive features has significantly enhanced their academic performance. Number of studies (Garrison D.R, 2011; André P,

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2010; Park, S. Y, 2009; Ahmad A, 2013; Dillion and Morris, 1998; Hiltz S. R, 1994)have indicated that the successful pedagogical use of technology depends on students' attitude and acceptance of technology.

Several studies (Hanson and Robson, 2004; Dutton et al., 2004; Weaver et al., 2008; Lonn and Teasley, 2009; Coastes et al., 2005; Harington et al., 2004;Morgon, 2003; Allan et al., 2009; Sevgi et al., 2009) have highlighted the significant role of LMS in enhancing the teaching-learning process be it classroom based teaching, instructor led training, e-learning or blended learning. LMS providers are using several tools and techniques to improve student engagement levels. Gamification is one such tool which allows better learning experiences coupled with higher levels of engagement. It uses game mechanics among a peer group, where learners strive to earn points and get badges, and race ahead on leader board.This will lead to better knowledge recall and retention levels in the minds of the students. Responsive designs have enabled easy access from any device. Intuitive personalized dashboards to customize experiences, multi-lingual support, voice-based searches, unified content playback, virtual classroom sessions, offline learning and auto sync with online learning are some of the latest features offered by LMS.

Despite the advantages of the LMS, the outcome of many studies indicate that the LMS use is limited to downloading course materials and submitting assignments. Therefore, this research on students' acceptance of LMS will benefit universities to re-examine and evaluate the utility of learning management system software and its impact on the teaching-learning process of the institution.

2. Literature Review

The successful adoption of technology is in the ability of management to create trust, cllaboration and fostering an organization culture and climate to adopt technology and innovation (Marshall, 2004; Surry et al., 2005; Benson and Palaskas, 2006). The adoption of such innovation requires mutual understanding between the policy makers and instructors without which there is less likelihood of instructors' ever adopting technology, or even considering it in their teaching (Eynon, 2005). The facilitating conditions such as administrative support and technical infrastructure plays a vital role and is of paramount importance in technology adoption. The technology malfunctions such as slow access time, bandwidth issues and incompatibility between hardware and software can impede the adoption of technology (Surry et al., 2005; Benson and Palaskas, 2006). They also propose that the lack of proper training in use of technology and how to integrate the technology with the curriculum and delivery can also be a barrier for adoption of technology.

The use of learning management system represents significant technological development in higher education. Institutions world over are using an enterprise-level or in-house developed LMS (Harington et al., 2004, Morgon, 2003).

Dillion and Morris (1998) defined technology acceptance as "the demonstrable willingness within a user group to employ information technology for the tasks it was designed to support." The adoption of technology and understanding the factors affecting the acceptance is explained by several theories and models. Basic theoretical models and their extensions as classified by Hanafizadeh et al. (2014), have evolved over the years: Innovation Diffusion Theory (Rogers, 1962); Theory of Reasoned Action (Fishben&Ajzen, 1975); Theory of Planned Behavior (Ajzen 1991); Social Cognitive Theory (Compeau& Higgins, 1995); Technology Acceptance Model (Davis, 1985); Model of PC Utilization (Thompson & Higgins, 1991); Motivational Model (Davis, Bagazzi, &Warshaw, 1992); Task Technology Fit (Goodhue& Thompson, 1995); Combined TAM and TPB (Taylor & Todd, 1995); TAM2 (Venkatesh & Davis, 2000); Unified Theory of Acceptance &Use of Technology (Venkatesh, Morris, & Davis, 2003); UTAUT2 (Venkatesh, V., Thong, J.I.L. and Xu, X., 2012).

The TRA, TPB and SCT are grouped as traditional behavioral theories. The theories such as TAM, MPC, UTAUT are classified as technology adoption theories.

TRA is one of the widely studied model for behavior in social psychology literature (Farley et al., 1981; Ryan, 1982; Sheppard et al., 1988). In TRA, behavioral intention (BI) is modelled as weighted sum of the attitude (ATT) and subjective norm (Fishbein&Ajzen, 1975). TPB is an extension of TRA by incorporating additional construct, perceived behavioral control (PBC), to the subject norm (SN) and attitudinal components of TRA. TPB is designed to predict behavior and is based on expectancy-value model of attitude-behavior relationship (Ajzen, 1985; Ajzen&Maden, 1985) and has measured variety of behaviors with significant degree of success. TPB addresses conditions where users do not have behavioral control. TRA and TPB are considered as most referred integrated models that affirm behavior is a direct function of BI. The ATT, SN, and PBC is in turn determined by belief structures namely attitudinal belief, normative belief, and control belief. In both TRA and TPB, the belief structures are typically combined into unidimensional constructs. The models are extensively used by researchers to predict variety of intentions and behavior (Teo, 2012).

TAM model is widely accepted and empirically proven model by researchers to determine the users' acceptance of a new technology (Venkatesh and Davis, 2000). Therefore, the present study attempted to test the TAM for measuring the students' BI towards LMS. The theoretical roots of TAM can be found in the expectancy-value model and TRA. TRA found in social psychology literature, improves the predictive and explanatory nature of expectancy-value theory. TAM uses TRA as a theoretical basis for specifying casual linkages between two key beliefs: perceived usefulness and perceived ease of use, and users' attitudes, intentions and actual technology adoption behavior. Behavioral intention is a measure of the strength of one's intention to perform a specified behavior (Fishbenand Ajzen, 1975). TAM does not include TRA's subjective norm as a determinant of BI.

One of the important components of TAM is perceived usefulness (PU) which has been used by many researchers. PU can be defined "as the measure to which the subject believes that the use of a technology will enhance performance" (Davis, 1989). PU has been found to be one of the most significant factor in influencing the acceptance (Venkatesh and Bala, 2008). PU reflects the users' subjective assessment of whether using a particular system would enhance performance (Davis, Bagozzi&Warshaw, 1989). Perceived ease of use (PEU) has been stated as "an extent to which the user uses the technology without any effort" (Davis et al, 1989). Studies have shown that PEU has a positive effect on users' ATT and PU of using systems (Hong, Suh, & Kim, 2009)

Fishbein and Ajzen (1975) defines the attitude towards behavior as "an individual's positive or negative feelings (evaluating affect) about performing the target behavior". Ajzen (1991) defines it as "the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior". Fishebein and Ajzen (1975), Ajzen and Fishbein (1980), Ajzen (1985) have explained the importance of individual's attitude in measuring the BI. Past research has found that the ATT is the most powerful predictor of intention to use technology.

The ATT construct was removed in the revised version of TAM. Davis et al., (1989) explained that this was due to partial mediating effect of attitude on beliefs and BI. The researchers found significant results after exclusion of the attitude construct and observed indirect effect of perceived ease of use on BI through

perceived usefulness (Davis and Venkatesh, 1996). These relationships has been tested in the study as revised version of TAM.

The augmented TAM or combined TAM & TPB (C-TAM and TPB) was developed as a hybrid model that combines the predictors of TPB with PU and PEU from TAM by Taylor and Todd (1995). The influence of social factors and personal control factors was excluded from TAM (Davis et al., 1989). Lewis et al. (2013) has argued that the social factor like SN has no significant effect on intentions over and above PU and PEU.

Based on the literature of previous research it is found that TAM alone cannot provide behavioral predictions (Chen et al., 2007), therefore considering these two additional variables, namely, social influence and facilitating conditions, the study attempts to test C-TAM and TPB in understanding the acceptance of learning management system by students.

Social influence refers to how opinions of teachers, peers, seniors or others can influence how a person feels about a given technology. Fishbein and Ajzen (1975) in TRA, defines the subjective norm as "the person's perceptions that most people who are important to him think he should or should not perform the behavior in question". Social influence has also appeared in many models of user acceptance of technology (Hsu & Lu, 2004), and empirically, it has received strong support as the driver of user behavior.

Perceived behavioural control measures ones' self-efficacy to use the system, and facilitating conditions available to an individual to use the system. Facilitating conditions are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system". Venkatesh et al. (2003) recognized that behaviour intention and facilitating condition were two direct determinants of adoption behaviour. Facilitating conditions such as training and support impacted the actual use (AU) directly. PBC is defined as "perceived ease or difficulty of performing the behavior, and it is assumed to reflect experience as well as anticipated impediments and obstacles" by Ajzen (1991). Moreover, the C-TAM and TPB highlights the effects of SN and PBC on BI and AU. This research attempts to understand the effects of PU, ATT, SN, and PBC, on BI by testing C-Tam and TPB for LMS.

Thus with the appropriate above given supportive literature, the research would be comparing these three models, TAM, revised version of TAM, and C-TAM and TPB, for explaining the better variance in BI, and AU for the LMS adoption by the business management students.

3. Research design and methodology

This study has used quantitative technique for the data collection. Closed-ended questionnaires were used to measure the latent variables, testing the hypotheses and deducing the relationships among the exogenous and endogenous constructs. The first year business management students of a private University in Karnataka State were selected as sample for this study. Among the total strength of 180first year students, 100 students have participated in the survey and survey was conducted after one month of LMS usage by the students.

3.1 Instruments

Perceived Usefulness - PU was measured by using five items developed by Davis (1989) and a sample item is "Using LMS improves my performance in my degree program" and the items were anchored as "1 = strongly disagree" to "5 = strongly agree".

Perceived Ease of Use - PEU was measured by using six items by Davis (1989). An example item is "I find LMS easy to use", and the items were anchored as "1 = strongly disagree" to "5 = strongly agree".

Subjective Norm - SN was measured totally by six items. Among six items, four items by Venkatesh and Davis (2000) and two items by Venkatesh et al.(2011). An example item is "People who influence my behavior think that 1 should use the LMS" and the items were anchored as "1 = strongly disagree" to "5 = strongly agree".

Perceived Behavioral Control - PBC was measured by using four items by Venkatesh et al.(2011). An example of this item is "I have control over using the LMS" " and the items were anchored as "1 = strongly disagree" to "5 = strongly agree". Among these four items, three items were retained and one was removed from the study as it resulted with poor outer loading. The item "The LMS is not compatible with other systems I use"

Attitude - ATT was measured by using four items by Taylor and Todd (1995). An example item is "Using the LMS is a bad/good idea" and the items were anchored as "1 = strongly disagree" to "5 = strongly agree".

Behavioral Intention - BI was measured by using three items by Venkatesh et al. (2011). An example item is "I intend to use LMS in the future", and the items were anchored as "1 = strongly disagree" to "5 = strongly agree".

Actual Use - The items of AU items were anchored as "1 = never" to "5 = many times per day". An example item is "Please choose your usage frequency for E-content".

4. Findings and discussion of the study

This study has used partial least square structural equation (PLS-SEM) to compare the variance explained by technology adoption models. As per Anderson and Gerbing (1988), these theories were tested based on measurement and structural model. The validity and reliability was examined as per Straub et al. (2004). The discriminant validity has been established by using the Fornell and Larcker (1981). According to Fornell and Larcker (1981) the square root of the AVE need be larger than the correlation values (displayed in Table 3) either across the rows or columns. The values in Table 1 reflects that the constructs used for the study have reasonable discriminant validity.

Table 1: Reliability

	Cronbach's Alpha	Composite Reliability	AVE
ATT	0.903	0.932	0.774
AU	0.781	0.858	0.601
BI	0.815	0.890	0.729
FC	0.793	0.879	0.707
PEU	0.879	0.917	0.734
PU	0.897	0.928	0.764
SI	0.803	0.864	0.559

Table 2: Discriminant Validity

	ATT	AU	BI	FC	PEU	PU	SI
ATT	**0.880**						
AU	0.343	**0.775**					
BI	0.818	0.286	**0.854**				
FC	0.709	0.403	0.701	**0.841**			
PEU	0.692	0.468	0.655	0.709	**0.857**		
PU	0.514	0.412	0.576	0.567	0.713	**0.874**	
SI	0.677	0.361	0.674	0.659	0.695	0.621	**0.748**

Internal consistent reliability is measured in Table 2 and it is found that the Cronbach Alpha and Composite reliability values are above the threshold values. Moreover, the Average Variance Explained (AVE) values are also above 0.5. The composite reliability and Cronbach alpha values should be above 0.6, and AVE

above 0.5 (Hair et al., 2012). As the study has met the validity and reliability criteria, these constructs were used for model testing. However, measures were taken to retain the items with outer loadings greater than 0.7. The items with lesser outer loadings, i.e., lesser than 0.7, were eliminated from the study (Hair et al., 2012). Hence three items with lesser loadings below the threshold values were removed from the further analysis**.**

4.1. Technology Acceptance Model(TAM)

This study first attempts to test the TAM in understanding the BI of students towards LMS. The results of technology acceptance model for LMS usage by students of MBA is shown in Figure 1. The results of TAM inferences the significant relationships among the exogenous and endogenous variables, except the relationship between PU and ATT. The R^2 value, the coefficient of determination for, ATT is 0.479, PU is 0.5098, and BI is 0.701. These R^2 values indicates that variance explained by these constructs are moderate (Henseler et al., 2009). However, the variance explained by AU is low as the R^2 value being 0.083.

An insignificant relationship between PU and ATT was captured in this study for LMS usage by students, however the relationship between PU and BI is significant. This significant relationship between PU and BI explains that the students' behavioral intention to use LMS depends directly on PU, instead the indirect effect of PU through ATT. Further, the path coefficient value between ATT and BI is greater than the path coefficient value between PU and BI. The path coefficient value between ATT and BI being 0.70, it confirms a strong relationship existing between ATT and BI.

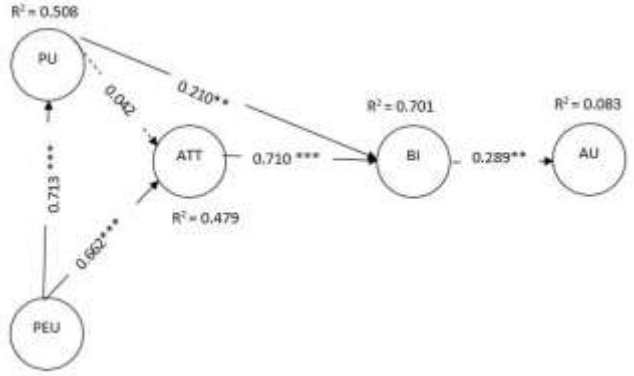

Figure 1: Technology Acceptance Model

The relationships between PEU and ATT, and PEU and PU are significant at 5 per cent level of significance. As the relationship between PEU and PU being stronger, it could be interpreted that the students' perceived benefits of LMS is highly induced by the ease of usage level of the LMS. The bootstrapping values and p-values of TAM results are available in Table 3.

Table 3: Results of TAM

Relations	**Path Coefficients**	**t-Values**	**Significance Levels**	**p-Values**	**Results of Hypotheses**
ATT→ BI	0.710	14.104	***	0.000	Accepted
PU→ BI	0.210	3.304	**	0.001	Accepted
PU→ATT	0.042	0.384	NS	0.701	Rejected
PEU→ATT	0.662	6.445	***	0.000	Accepted
PEU→ PU	0.713	12.961	***	0.000	Accepted
BI → AU	0.289	3.661	**	0.000	Accepted

Note: *p < 0.05; **p < 0.01; ***p<0.001; NS – Non significant

The results of TAM highlights a strong relationship between ATT and BI as the t-value being 14.104 and which is greater than t-value of PU and BI. Moreover, the ATT is induced only by the PEU and not by PU as the relationship between ATT and PU is insignificant. This result throws an insight about students attitude towards LMS is influenced only by the perceived ease of use of the LMS than the perceived benefits attained by LMS. Davis et al. (1989) had proved the partial mediation effect of ATT on BI through PU and PEU. Therefore, Davis and Venkatesh (1996) have measured the direct effect on PU and PEU on BI in absence of ATT. These relationships are also tested in this study as revised version of TAM which is discussed in the next section.

4.2. Revised TAM

The revised version of TAM (R-TAM) by Davis and Venkatesh (1996) measures the direct relationships between, PU and BI, PEU and BI, PU and PEU, and BI and AU. Further, the model also examines the indirect effect of PEU on BI through PU, which resulted in partial mediation. The results are depicted in Fig.2. The R^2 value, the coefficient of determination for, BI is 0.455, PU is 0.512, and AU is 0.085. It has been observed that the R^2 value for BI has decreased by 25 percent in absence of ATT.

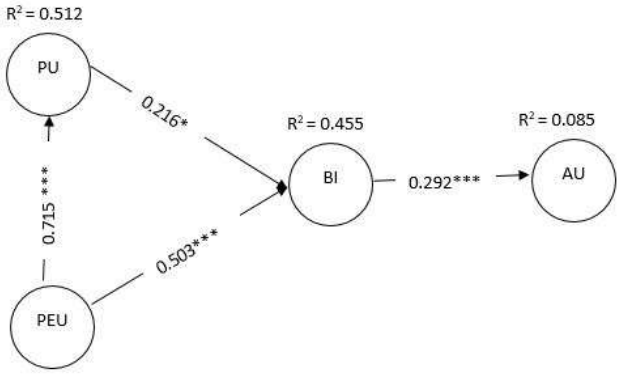

Figure 2: Revised TAM

The path coefficient value between PEU and BI is greater than path coefficient value between PU and BI. The path coefficient value between PEU and BI being 0.503 indicates a strong relationship existing between PEU and BI, irrespective of the mediation effect created by PU between PEU and BI. Moreover, this model reveals the importance of perceived ease of use for LMS among the students for their intention to use LMS. However, as TAM model even R-TAM confirms a strong relationship between PEU and PU, as path coefficient value being 0.715. The bootstrapping values and p-values of R-TAM results are available in Table 4.

Table 4: Results of R-TAM

Relations	Path Coefficients	*t*-Values	Significance Levels	p-Values	Results of Hypotheses
PU→ BI	0.216	2.016	*	0.044	Accepted
PEU→ PU	0.715	12.634	***	0.000	Accepted
PU → BI	0.216	4.876	***	0.000	Accepted
BI → AU	0.292	3.560	***	0.000	Accepted
PEU-PU-BI	Partial Mediation				Accepted

Note: *p < 0.05; **p < 0.01; ***p<0.001; NS – Non significant

The indirect path PEU-PU-BI being significant as the empirical t-values are above 1.96 at 5% level of confidence, the effect of mediation is termed as partial mediation (Mathieu and Taylor, 2006). Though, the hypotheses of R-TAM are accepted but the variance explained for BI by R-TAM is only 45.5 percent. Therefore, this study attempts to test the C-TAM-TPB for better understanding of the effects of ATT, SN, and PBC on BI. The next section highlights the results of C-TAM-TPB.

4.3. Combined TAM-TPB

The C-TAM-TPB by Taylor and Todd (1995) has combined the TAM and TPB for better understanding of the effect of SN and PBC on BI and AU. Fig. 3 depicts the results of C-TAM-TPB.

The R^2 value of BI is 0.720, AU is 0.163, PU is 0.508, and ATT is 0.479. The relationships between BI and AU, PU and ATT, SN and BI are non-significant. However the relationships between other exogenous and endogenous constructs are significant.

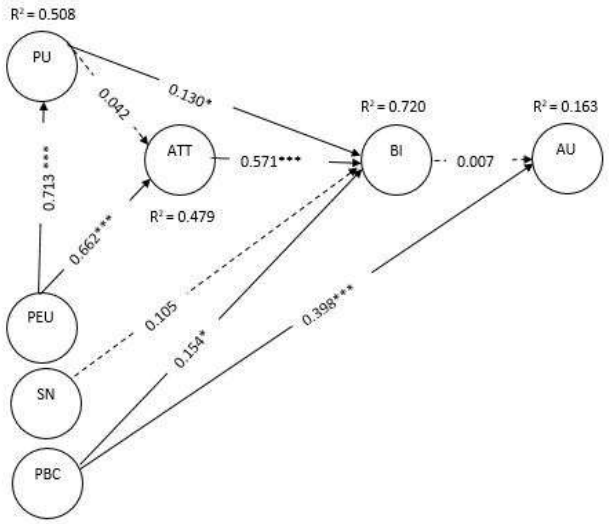

Figure 3: C-TAM-TPB

As per C-TAM-TPB, the actual usage of LMS depends based on the perceived behavioural control of students than their behavioural intention to use LMS. Though the relationship between BI and AU is non-significant, the R^2 value of AU has improved by 50 per cent comparatively with TAM and R-TAM. The R^2 value of AU in TAM and R-TAM-TPB is 0.08, whereas the R^2 value of AU in C-TAM-TPB is 0.16, i.e., the variance explained in AU is 16% by C-TAM-TPB. Therefore, it could be noted that the availability of facilitating condition for LMS usage determines the actual usage of LMS than individual students' intention to use LMS. Moreover, among the factors of BI, only ATT and PBC determines the behavioural intention to use LMS. Further, the social influence doesn't play any role among students in determining the behavioural intention to use LMS. The bootstrapping values and p-values of R-TAM results are available in Table 5.

Table 5: Results of C-TAM-TPB

Relations	Path Coefficients	*t*-Values	Significance Levels	p-Values	Results of Hypotheses
ATT→ BI	0.571	7.640	***	0.000	Accepted
BI→ AU	0.007	0.057	NS	0.954	Rejected
PBC → AU	0.398	3.574	***	0.000	Accepted
PBC→ BI	0.154	2.052	*	0.040	Accepted
PEU → ATT	0.662	6.316	***	0.000	Accepted
PEU → PU	0.713	12.809	***	0.000	Accepted
PU → ATT	0.042	0.387	NS	0.699	Rejected
PU → BI	0.130	2.064	*	0.039	Accepted
SI → BI	0.105	1.472	NS	0.141	Rejected

Note: *p < 0.05; **p < 0.01; ***p<0.001; NS – Non significant

5. Conclusions and Suggestions

The comparative analysis of TAM, R-TAM, and C-TAM-TPB have resulted in to the differences among the variance explained in BI and AU. At first, by inferring the variance explained in AU by three models, it has been found out that C-TAM-TPB has the higher value of R^2. The R^2 value of AU being 0.163 in C-TAM-TPB, and which is greater than the R^2 values of TAM and R-TAM (0.083, 0.085). It is observed from the study that C-TAM-TPB resulted in 50 per cent higher R^2 value than the other two models. This higher percentage of increase in AU's R^2 value is due to the effect of PBC on AU. Moreover an interesting result from this study has been interpreted by the researchers, that is, the effect of BI on AU has become non-significant in presence of PBC (Fig. 3). However, in TAM and R-TAM, the effect of BI on AU is significant in absence of PBC (Fig.1 and Fig. 2). As the R^2 value of AU has improved in presence of PBC, the institutions that emphasis the LMS for students' learning process should take measure in improving the PBC effect on AU, than depending of students' intention to use LMS. Therefore, the higher education institutions should take adequate efforts to improve the self-efficacy of the students towards LMS, provided the facilitating conditions are quite supportive for the LMS usage.

In C-TAM-TPB the non-significant relationship between SI and BI, highlights the least importance given by the students towards SI in determining their BI to use LMS. Furthermore, the BI is influenced by ATT at a larger extent, as the ATT and BI path coefficient value being 0.571, and which is greater than other path coefficient values in determining the BI. This is quite similar in case of TAM, where the path coefficient value between ATT and BI (i.e., 0.710) is greater than the path coefficient value between PU and BI (i.e., .210). Hence, this study supports the discussions made by Fishbein and Ajzen (1975), and Ajzen (1991). The researchers (Fishbein and Ajzen, 1975, and Ajzen, 1991) have explained that among ATT, SN, and PBC, the ATT of an individual would be the major determinant in determining the BI. Moreover, it is evident from this study that, in absence of ATT, the R-TAM has resulted in decrease of R^2 value for BI by 26 per cent.

Further, PEU effects the ATT and PU at higher level of significance. And among the PEU and PU, the path coefficient value of PEU towards BI is greater than PU and BI. Therefore, the higher education institutions should ensure that the design of LMS should be simple and easy. And, the students should be able to use the LMS with less efforts. As PEU plays a major role in determining the BI (Fig.2), ATT (Fig.1 and Fig. 3), and PU (Fig.1 and Fig. 3), the ease of LMS usage would actually help in improving the perceived benefits of LMS indirectly through PEU. This in turn, would facilitate the students' intention to use LMS in future to a greater extent.

The comparative analysis of three models discloses that PEU and PBC being an important exogenous variable in understanding the BI and AU.And, the study also identifies that C-TAM-TPB as a better model than TAM and R-TAM, as the variance explained in AU being the higher R^2 value than TAM and R-TAM. Thus, the study recommends C-TAM-TPB as the most suitable technology adoption model for assessing the technologies used in the higher education sector. And, also this study insists the higher education institutes that are interested to incorporate the LMS in academic curriculum,to emphasis on ease of use of the LMS, and to focus on providing better facilitating conditions to students to increasethe LMSusage.

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