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Impact of Technology Availability and Self-Efficacy on E-learning Usage

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Abstract: India is on the road of incorporating electronic learning and related technologies in the education system. The goal is to develop standard learning environment for the large population with resources on hand. Despite of several advantages of e-learning, it would not be meaningful if learners don't adapt to it. The factors that influence students' intentions towards using e-learning systems are worth to study.

This empirical study is based on revised Technology Acceptance Model (TAM) and it analyses the effect of two external factors, technology availability and self-efficacy on the behavioural intention of students to use e-learning. The responses were collected from 54 diploma engineering students and the collected data was assessed for their inclination towards using e-learning. The results of the study may be significant to educationists and decision makers to implement e-learning strategies.

Keywords: e-learning, online learning, self-efficacy, behavioural intention, technology acceptance model

I. INTRODUCTION

There are many definitions of e-learning across available literature. Wentling et. al.[1] and Rosenberg [2] defined e-learning as the utilization of internet and related technologies to provide a wide array of solutions that improves knowledge and performance. E-learning is the term broadly used to describe instructional material or learning experience disseminated or enabled by electronic technologies [3].

In general, E-learning can be thought of as the learning process created by interaction with digitally delivered content, services, and support. It involves intensive use of information and communication technology to serve, facilitate, and revolutionize the learning process. E-learning can theoretically incorporate all the other types of learning.

The government is very keen on incorporating information and communication technologies in academics. Universities along with government bodies have put steps in the direction of making Wi-Fi-enabled campuses and hence building necessary technological infrastructure for the coming era of e-learning. Availability of technology to access online learning resources plays a vital role in the process of digital learning. In addition, the young generation is regarded as digital natives. Therefore, it is crucial to reveal the effect of their computer self-efficacy (SE) on their behavioural intention (BI) towards use of e-learning systems.

Technology acceptance model (TAM) is widely used for predicting user's behavioural intention to use the system [4, 5 and 6]. This paper uses revised technology acceptance model [7] and tries to examine the effect of two crucial factors technology availability (TA) and self-efficacy (SE) on behavioural intention (BI) to use e-learning. The relationship of these factors with TAM elements perceived usefulness (PU) and perceived ease of use (PEOU) is examined which influences behavioural intention (BI) that in turn leads to actual system usage.

II. REVIEW OF RELATED LITERATURE

Davis conducted the first study via TAM to analyse 40 master of business administration (MBA) students' acceptance toward two business graphic systems. The results found perceived usefulness had strong effects on both the attitude toward using and the actual system. In addition, perceived ease of use had minor effects on the attitude toward using and a moderate effect on the perceived usefulness. Attitudes toward the systems had only moderate effects on system use [8].

Several studies have examined TAM as a model to explain user behavioural intention. Yu-Li Chen studied students' perception on a virtual reality learning environment using TAM. He found self-efficacy is one of the important factors in determining technology acceptance [9].

H. Holden and R. Rada used TAM to assess influence of self-efficacy on technology acceptance of about hundred K-12 teachers. The results indicated that the incorporation of perceived usability into the TAM explained more variance and was more influential to TAM elements than its absence, thereby supporting the importance, positive influence, and necessity of evaluating usability when

investigating educational technology acceptance and usage behaviour. Furthermore, the study found teachers' technology self-efficacy was more beneficial to the TAM than their computer self-efficacy [10].

Many researchers extended TAM by accumulating additional elements. Jun Lu et al. revised TAM to suite wireless environment. They used constructs such as individual differences, technology complexity, facilitating conditions, social influences and wireless trust environment to determine user-perceived short and long-term usefulness and ease of using the revised system [11].

Another extension of this model, known as General Extended Technology Acceptance Model (GETAM) is developed by Abdullah and Ward [12]. This model was tested by Ching-Ter et al. to examine more than 700 undergraduate and post graduate students' behavioural intention to use e-learning. It was seen that the Subjective norm (SN), Experience (EXP) and Enjoyment (ENJOY) positively and significantly influence students' perceived usefulness (PU) of e-learning, while Computer anxiety (CA) has a negatively effect. EXP, ENJOY and Self-efficacy (SE) positively and significantly affect their perceived ease of use (PEOU) of e-learning. It was also seen that SN has a positive and significant impact on BI to use e-learning, while Technological innovation (TI) significantly moderates the relationship between SN and PU, PU and BI to use e-learning [13].

Zahir Osman et al. carried out a study to develop an understanding on the mediating effect of attitude on perceived ease of use and students' intention to use online learning platform in Malaysia. The model was developed and later tested by adopting the Partial Least Square (PLS) procedure. The results revealed that the relationship between attitude and the willingness of the students to use online learning platform may dwell in attitude's influence on students' intention, and that attitude plays crucial function within the online distance learning institutions [14].

III. RESEARCH MODEL AND HYPOTHESES

A number of studies have been carried out to examine influence of various external factors on TAM variables. An extensive meta-review performed by Y. Lee et al. on TAM studies mentioned that most of the studies on analysing user behavioural intention are carried out for communication systems, general purpose systems, office systems and specialized business systems [15]. Very few studies have focused on measuring students' behavioural intention to use e-learning. The current study focuses on examining students' attitude towards e-learning using TAM constructs.

This study uses two external factors, technology availability and self-efficacy. Since the Government is putting a lot of efforts to make education related technology available to students, it would be interesting to study how these factor impacts students' intentions to use it for acquiring knowledge.

Since this study is carried out on diploma engineering students, who had very limited exposure to computers and related technologies in their earlier curriculum, self-efficacy of using such systems is taken as a critical factor.

The main objective of the study is to study the impact of technology availability and self-efficacy on usage of e-learning using technology acceptance model. From the literature reviewed, the following hypotheses are formed:

H1: PEOU has positive influence on PU

H2: PEOU has positive influence on BI

H3: PU has positive influence on BI

H4: SE has positive influence on PEOU

H5: SE has positive influence on PU

H6: TA has positive influence on PEOU

H7: TA has positive influence on PU

Thus, the researched model as shown in Figure 1 is formed.

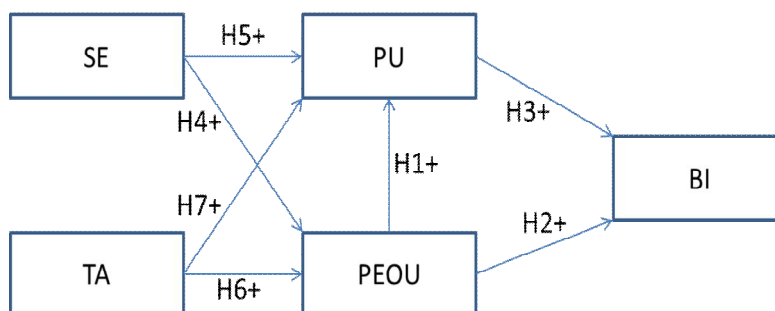


Fig. 1 Research Model Using TAM

IV. METHODOLOGY

Survey instrument with two sections was used to conduct the research. The first section collects demographic information about students and the second section consisted of 16 items related to five constructs of the study PEOU, PU, BI, TA and SE. The survey items are derived from previous studies [12, 16, 17, 18 and 19]. The five variables were measured using five-point Likert scale items with 1 being “Strongly disagree” and 5 being “Strongly agree”.

The survey was distributed to 70 students of diploma engineering students from information technology branch. 54 responses were successfully received. These students were already enrolled in an online learning course on “Core Java” as part of their curriculum. Survey items are validated using factor analysis. Reliability of the items is tested using Cronbach’s alpha. Cronbach’s alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. The proposed model is then tested for goodness of fit and standardized coefficient values are calculated to understand the relationship between constructs in the model.

V. DATA ANALYSIS AND RESULTS

A. Validity and Reliability

Factor analysis is done for measuring validity of survey items. Cronbach’s alpha method is more appropriate to measure reliability because the instrument includes likert scaled items.

Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited your data is for factor analysis. The test measures sampling adequacy for each variable in the model and for the complete model. Its index value ranges between 0 and 1, where higher value indicates well suited data for factor analysis. Bartlett’s test of sphericity tests the hypothesis that your correlation matrix is an identity matrix, which would indicate that your variables are unrelated and therefore unsuitable for structure detection. Small values (less than 0.05) of the significance level indicate that a factor analysis may be useful with your data.

The KMO index was 0.90, supported by Bartlett’s test of Sphericity of 0.00, allowing the research to proceed with factor analysis. The results of Total Variance Explained of Confirmatory factor analysis indicated that there were two extracted factors having eigenvalue greater than 1.0 explaining 66.298% of variance. Factor loading values of component matrix were used to determine the items to be removed from survey instrument. Value ≥ 0.5 indicates acceptable. All items in the proposed PEOU, PU, BI, TA and SE were retained based on the results of component matrix as all factor loading values were greater than 0.5.

Cronbach’s alpha method was used to measure reliability. The results in Table 1 confirm the reliability of instrument items.

TABLE I
CRONBACH’S ALPHA COEFFICIENT FOR RELIABILITY TEST

Construct	Cronbach’s α
Technology Availability (TA)	0.859
Self-efficacy (SE)	0.792
Perceived Ease of Use (PEOU)	0.848
Perceived Usefulness (PU)	0.904
Behavioural Intention (BI)	0.866

B. Adequacy of the proposed model

Structural Equation Modelling (SEM) analysis was used to understand the relationships between different constructs of the proposed model shown in Fig.1. Testing the structural model showed that it has a good fit ($\chi^2 / df = 1.521$, CFI = 0.921 and TLI = 0.901) [20]. Once the goodness of fit is established, we can proceed with incorporating the values of the standardized coefficients between constructs and the R² or coefficients of determination for each endogenous variable.

The final model with these values is shown in Fig.2. It shows that the R² values for PU, PEOU and BI are 89%, 91% and 80% respectively. It indicates that 80% of students intend to use e-learning.

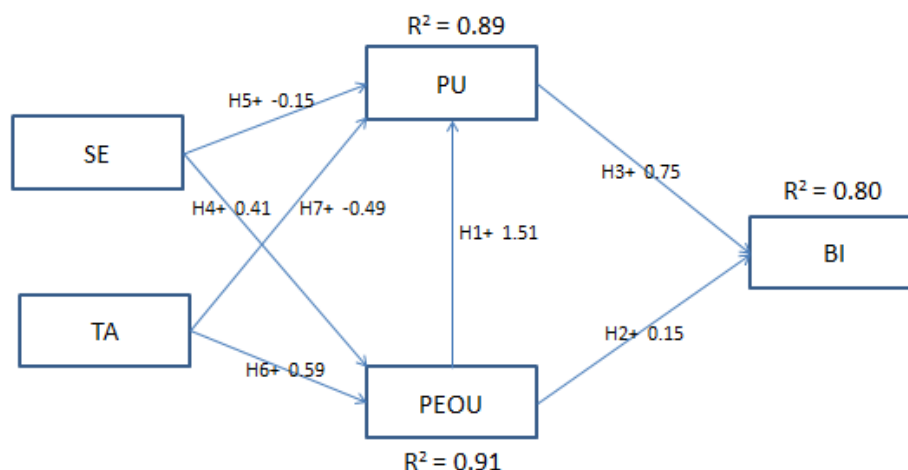


Fig. 2 Final Model

From the above model it can be seen that H1 is confirmed, that is PEOU positively influences PU ($\beta=1.51$). The model also confirms H2 and H3 with coefficient values 0.15 and 0.75 respectively. SE has clear positive influence on PEOU ($\beta=0.41$), confirming H4. However, negative coefficient value of -0.15 indicates negative influence of SE on PU, thus rejecting H5. H6 is supported with strong positive coefficient value of 0.59. TA has strong negative influence on PU ($\beta=-0.49$) and thus H7 is rejected.

VI. CONCLUSION

This study examines the moderating effect of self-efficacy (SE) and technology availability (TA) on student's intentions to use e-learning using Technology Acceptance Model (TAM). The resulting model indicates that self-efficacy has positive impact on perceived ease of use and has no impact on perceived usefulness. Thus, concluding that one's self-efficacy does not affect system's usefulness. Also availability of technology makes it easy to use e-learning, which is confirmed by the results of the model. But, the availability of technology has no impact on usefulness of the e-learning systems, which means the advantages and usefulness of e-learning does not diminish even if the adequate technology is not available at a place. The positive effect of self-efficacy and technology availability on perceived ease of use contributes to students' behavioural intentions to use e-learning. The final model also shows strong influence of perceived usefulness on behavioural intention of students for e-learning usage.

Therefore, SE and TA are significant factors that affect the perceived ease of use and behavioural intention. The education institutes must consider these factors in design and development of e-learning systems. The students should be motivated to increase their efficiency in technology. Also adequate learning technology should be made available to allow them to access e-learning resources which may result in high usage of e-learning systems.

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