

September 2019

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Mallya, Jyothi; S, Lakshminarayanan; and Payini, Valsaraj, "Self-efficacy as an antecedent to students' behavioral intention to use the Internet for academic purposes: A structural equation modeling approach" (2019). *Library Philosophy and Practice (e-journal)*. 3055. <https://digitalcommons.unl.edu/libphilprac/3055>

Self-efficacy as an antecedent to students' behavioral intention to use the Internet for academic purposes: A structural equation modeling approach

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Abstract:

This study is based on the technology acceptance model by integrating the internet self-efficacy (ISE) as an antecedent to determine students' behavioral intention (BI) in adopting internet for their scholarly activities. To achieve this objective a structured questionnaire composed of 26 items that represented five constructs, namely, perceived usefulness (PU) perceived ease of using (PEOU), Attitude towards using internet (ATI) behavioral intention towards internet (BI), and Internet self-efficacy (ISE) were distributed among four-hundred and forty-eight students from technical; management and health science stream. The data is further analyzed using structural equation modeling. The findings of the study suggest that ISE has a significant influence on PEOU. Students with high self-efficacy find it easy to use the internet and thus develop a positive attitude towards the internet. Findings of this study stress on both online and offline internet literacy training program for the students to enhance their ISE for effective and efficient use of internet in an e-Learning environment.

Keywords: internet self-efficacy, internet usage, behavioral intention, technology acceptance model, structural equation modeling

1.Introduction

The Internet is a worldwide system of computer networks providing a variety of information and communication facilities. The origin of the internet is way back to 1960's conceived by the Advanced Research Projects Agency (ARPA) of the U.S. government (UNESCO 2003) and was first known as the Arpanet. Internet continued to grow and evolve since then, and now it has become a primary source of information and means of communication for humankind. The number of internet users is increasing around the world and has become a favorite source of information among student community because of its easiness and smooth access to information. Furthermore, It serves as a vast source of reading materials (UNESCO 2003); allows users to retrieve information from remote location of data (Owston 1997); contributes to both quantitative and qualitative growth, if used comply with teaching goals and objectives (Somekh and Davies 1997); serves as valuable resource for research and academic learning (Tella 2007). Furthermore, it reduces the possible gap in the quality and quantity of information available for education between developed and developing countries (Sadowsky 1996). Other advantages of the internet are low cost, quickness of information delivery, and storage of information in volumes. Besides, it is now possible to process and distribute information like text, image, audio, and video because of better computer software and equipment. Thus, it is obvious from the literature that the internet is a powerful tool which enhances the academic performance of students if it is used effectively in the learning and teaching process. Yet mere access to the internet is not enough. In other words, it is essential for the educators to understand the factors that are influencing the adoption of the internet by the students for academic activities. Meanwhile, researchers in the past successfully adopted technology acceptance model (TAM) to understand the consumer behavior in adopting the new technology. TAM is an information system model which argues that the individual's decision to adopt new technology is influenced by various factors. It also suggests that Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) are the two fundamental constructs that have relevance to technology acceptance (Davis 1989). Additionally, studies also suggest that internet self-efficacy (ISE) is one such factor which has an influence on students' academic performance (Goulão and Koseoglu 2014; Koseoglu

2015); students' motivation and learning satisfaction (Hii et al. 2013); academic achievement (Carroll et al. 2009; Motlagh et al. 2011). Though there are numerous studies on self-efficacy and its impact on academic performance, there are no studies which demonstrate the role of ISE as an antecedent and its relationships to behavioral intention (BI) of students in adopting the internet as an educational tool for learning activities. Thereupon, this study adopts ISE as an antecedent to TAM to determine the students' behavioral intention in using internet for their academic purposes. The outcome of this study is useful for the educators to formulate policies to enhance the internet self-efficacious skill of students for effective use of the internet.

2. Literature Review and Theoretical framework

2.1.1 Adoption of ICT in education

Computers were used as a learning tool for the first time by Stanford University in the early 1960's (Hunter 1992). Later, in 1980's computer networks appeared as part of the new academic learning environment (Harasim et al. 1995) and the first World Wide Web (WWW) based learning environment appeared in mid-1990's (McPherson 2009). Since then the internet saw fascinated growth and emerged as a favorite source of information because of its easy accessibility and quick retrieval of information. The use of internet in academic set up has many folds. It helps the student community to create a social, highly collaborative and personalized environment to learn and communicate both on and off campus. Also, the innovative and efficient use of internet strengthen the students learning the outcome. Consequently, adoption of the internet in higher education facilitates a higher quality of education, improved access to information, flexibility in content delivery, new ways of interaction, learner-centered approach, improved quality of teaching, collaborative learning, and improve placements (Calsoft Labs 2012). It is evident from the past studies that the internet plays a significant role in students' learning activities (Jones et al. 2007; Williams Nwagwu et al.2009). Moreover, usage of the internet showed more advantages over disadvantages (Rayan et al. 2016; Suhail and Bargees 2009); it also establishes the positive impact on students' academic performance (Muniandy 2010); contributes significantly to student's academic achievements (Chen and Peng 2008; Dogruer et al. 2011. In like manner, the research conducted by (Jackson et al. 2006) suggests that children who used more internet had higher academic scores than the children who didn't. Likewise, the study which demonstrates the heavy use of internet both by teachers and students finds that respondents use the internet to support their study resulting in more research publications, better learning experience, and quality research work (Kumar and Manjunath 2013).

2.1.2 Indian Scenario

Adoption of ICT for promoting education was always an integral part of the educational policy of the Indian government at Central and State level. There are numerous initiatives at school and higher education levels to promote learning through information and communication technology. IIT- Madras creates e-content for NMEICT (National Mission on Education through Information and Communication). National Programme on Technology Enhanced Learning (NPTEL), a joint venture by IIT and Indian Institute of Science (IISc) provides e-learning through video courses, access to e-books and e-journals through N-list program. In 2007, the Distance Education Council (DEC) allowed premier institutes to offer online courses. Since then Indian Institute of Management (IIM)-Calcutta, IIM-B, IIM-K, Xavier Labor Relations Institute (XLRI) and other management institutes have offered courses in association with private players like Hughes, Reliance, National Institute of Information Technology (NIIT), etc. Internet access was considered as a luxury in India until a few years ago, but today, the country is home to the second-largest online population in the world and internet penetration is poised to continue growing at a rapid pace, particularly due to the rapid uptake of mobile internet (Mckinsey and Company, 2014).

2.1.2 Barriers to internet adoption:

Though the internet is has grown from nascent technology to educational tool, there exist few barriers to adopt internet for educational purposes. The studies conducted by Budhedeo (2016) and Calsoft Labs (2012) reveal that lack of knowledge, technology readiness, and poor penetration of internet especially in rural areas were barriers to adopting internet. Another study conducted in Dubai also suggests that lack of training prevents the adoption of ICT in school education system (Khan et al. 2015). Furthermore, lack of confidence and disbelief in ICT have emerged as barriers in adopting ICT by faculty members in Oman (Al-Senaidi et al. 2009); learning new technology has appeared as one

of the major barriers in adopting ICT by teachers (Butler and Sellbom 2002). Similarly, a recent study (NMC 2016) detects poor digital literacy skills among students and faculty as one of the six barriers to adopting technology in education. Digital literacy is considered as an essential competency of one's ability to find, understand, evaluate, and communicate the information in a digital environment. In fact, a recent study (Yang et al. 2014) establishes a significant positive correlation between digital literacy and self-regulated learning. Therefore, it is necessary for the educators to measure the internet self-efficacy of learners in an e-learning environment. Compared to face-to-face learning, e-learning much depends on the individual's ability to read, use, and utilize digital information. In other words, students with high self-efficacy score are more likely to be independent learners. Contrary to the general belief, a recent survey conducted (NMC 2016) suggests that one in four millennials is most afraid of the internet and around 37% of 18–34-year-old respondents find the internet scary, and 35% admitted they don't feel safe online (Rasmussen College 2015). Therefore, to address this gap in the literature, this study identifies ISE as an antecedent to TAM to determine the adoption on the internet by students for their academic purposes.

2.2 Internet self-efficacy

Self-efficacy (SE) is "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura 1994). SE has appeared as an important construct in predicting the students' motivation and learning (Hii et al. 2013). Various studies conducted in the past establish the relationship between self-efficacy and academic performance of students (Goulão 2014; Husain 2014; Meral et al. 2012; Motlagh et al. 2011). Bandura (1994) argues that self-efficacy and outcome beliefs have different antecedents and that in any given instance, both self-efficacy and outcome belief predicts behavior. Thus, in this study, Internet self-efficacy (ISE) has been conceptualized as one's ability to organize and execute the courses of action required to manage the internet. It is evident from the past studies that ISE has a predictive role in determining the behavioral intention of users (Al-Haderi 2013; Fathema et al. 2015; Park 2009; Tsai, et al. 2011); sensitive to subtle changes in students' performance (Zimmerman 2000). To provide a better understanding of the adoption of the internet as an educational tool, this study adopts ISE along with TAM as a research framework.

2.3 Technology Acceptance Model (TAM)

TAM which is derived from the Theory of Reasoned Action (Ajzen and Fishbein, 1980) is popular and widely used model in e-learning environment (Ernst et al. 2014; Farahat 2012; Hsia, 2007; Masrom 2007; Moghadam and Bairamzadeh, 2009; Park, 2009; Punnoose, 2012; Roca et al. 2006; Tarhini et al. 2013); internet utilization (Shih 2009); computer-based learning environment (Doleck et al. 2017). According to this theory, PEOU and PU are the two primary constructs that have relevance in adopting the new technology. PU is defined as "the degree to which a person believes that using a particular system would enhance his/her job performance" (Davis 1989, p 320) and PEOU has been defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989, p320). Further, TAM suggests that PEOU has a direct influence on both PU and Attitude Towards Technology (ATT). Attitude is defined as "an individual's positive or negative feeling about the performing the target behavior" (Fishbein and Ajzen 1975). In addition, it is evident from the past studies that PU and PEOU have a positive influence on attitude (Adams et al. 1992; Chen and Wu 2013; Joo et al. 2016; Saadé and Bahli 2005; Shah and Attiq 2016). Students who find using internet easy will perceive it as a useful resource for their learning activities, and because of this, they develop a positive attitude towards the internet. Research from the past suggests that perceived useful has a positive influence on attitude towards the technology (Renny et al., 2013). TAM also establishes the relationships of PU with another construct "Behavioral Intension (BI)." BI is defined as "a degree to which a person has formulated conscious plans to perform or not perform some specified future behavior" (Davis 1989). Attitude is assumed to be the first antecedent of behavioral intention. It is one's positive or negative belief towards specific behavior. An individual will intend to perform a certain behavior when he or she evaluates it positively. (Ajzen and Fishbein 1980).

3. Methodology

3.1 Research Model and hypothesis formulation

Based on the above-mentioned literature, the following research model and hypotheses were proposed. The proposed research model adopts the basic version of the TAM along with ISE as an antecedent for this study (Figure 1).

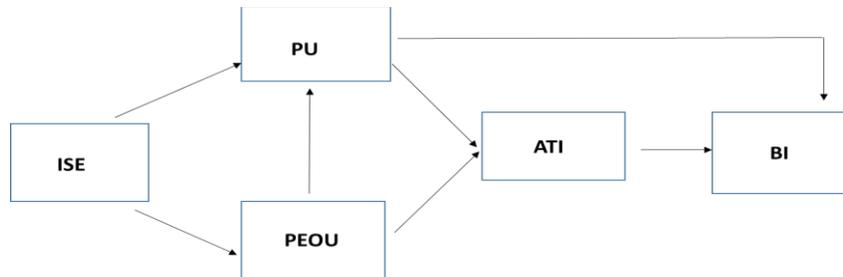


Fig 1: Proposed research model based on original TAM (David, Bagozzi, & Warshaw, 1989)

Note: ISE=Internet self-efficacy, PU=Perceived usefulness, PEOU=Perceived ease of use, ATI=Attitude towards Internet, BI=Behavioral Intention

H1: Internet self-efficacy (ISE) has a positive influence on PEOU

H1a: ISE has a positive influence on PU

H2: PEOU internet has a positive influence on the PU of internet

H3: PEOU internet has a positive influence on Attitude towards internet (ATI)

H4: PU has a positive influence on ATI and BI to use the internet

H5: Students' ATI has a positive influence on BI in using internet for academic purpose.

3.2 Survey Instrument Design

The survey instrument consists of two distinct parts. The first part includes subject information and consent letter and the second part provides demographic information and questions related to usage of the internet by the respondent for academic purposes. Three subject experts duly ascertained face validity and content validity of the survey instrument. The final questionnaire composed of 26 items that represented five constructs perceived usefulness (PU) perceived ease of using (PEOU), Attitude towards using internet (ATI) behavioral intention towards internet (BI), and Internet self-efficacy (ISE), adapted from earlier studies (Fathema et al. 2015; Hsia 2007; Kolog 2015; Park 2009; Siang and Santoso,2007). The items were rephrased to make relevant to the context of this study. All five constructs were measured using a 5-point Likert scale, PU was measured from 1 being least useful to 5 being highly useful, PEOU was measured from 1 being very easy and 5 being very difficult, ATI and BI were measured from 1 being strongly agree and 5 strongly disagree with the statements and ISE was measured 1 being very poor and 5 being very high.

3.2 Data Source

The purpose of this study is to investigate the role of self-efficacy as an antecedent to TAM in using internet for academic purposes by both graduate and postgraduate students pursuing studies in a private university in India. A survey methodology was used in this study to gather data. The target population in this study were graduate and postgraduate students enrolled in the discipline of technical, management and health sciences stream of the university. Students who visit the health science, technical and management library very frequently were identified from the library log records and a simple random sampling of participants within each library was adopted to draw the sample. The total number of questionnaires distributed were 515, out of which 448 received back resulting in an 87% response rate. Sixty-seven questionnaires were omitted from analysis because of incomplete data.

4. Data Analysis and hypotheses testing

4.1 Sample profile

The total number of respondents in this survey were 448, out of which 68 % were male, and 32 % were female students. The participating colleges and the number of students from each discipline are as follows: Health and Allied Health Sciences (127), Technical (187) and Management (134). Sixty-four percent of the respondent were undergraduates, and 36 % were postgraduates. The mean and standard deviation were calculated and presented in Appendix A.

4.2 Analysis of Measurement Model

First, a confirmatory factor analysis (CFA) was conducted to examine the factor structure of the measures and to determine whether the measurement model has acceptable fit to the data. All 26 items significantly loaded onto the respective constructs. The loading fell within the range of 0.68 to .085 except for PU3(0.34), and BI5(0.35) see Appendix A. These two items were removed for further analysis in the measurement model. Subsequently, the model fit was also evaluated based on multiple indices. The ratio of chi-square to degrees of freedom (χ^2/df) was 2.664, which was well within the recommended threshold value of 5 (Wheaton et al. 1977). The comparative fit Index (CFI), Incremental fit index (IFI), Tucker-Lewis index (TLI) were greater than 0.9 (CFI=0.920, IFI=0.920, TLI=0.909) as recommended (Bentler and Bonett, 1980). The root mean square error of approximation (RMSEA) was 0.061, which was less than the suggested threshold level of 0.08 (Browne and Cudeck., 1993). The results indicate a favorable model fit.

Table 1: Bivariate correlation among constructs

	ATI	BI	ISE	PEOU	PU
ATI	1				
BI	0.60	1.00			
ISE	0.48	0.41	1.00		
PEOU	0.53	0.40	0.60	1.00	
PU	0.58	0.45	0.46	0.56	1.00

Note: ISE=Internet self-efficacy, PU=Perceived usefulness, PEOU=Perceived ease of use, ATI=Attitude towards Internet, BI=Behavioral Intention

The bivariate relationships showed that all the constructs were significantly correlated with each other at the level of 0.01. The correlation among the latent constructs ranged from 0.40 to 0.60 at the 0.01 level indicating moderate to strong correlation among constructs (Cohen 1988).

Table 2: Convergent and Discriminant Validity

	Mean	SD	CR	Cronbach's Alpha	Average Variance Extract Matrix				
					ATI	BI	ISE	PEOU	PU
ATI	4.2	0.7	0.838	0.831	0.634				
BI	3.9	0.9	0.862	0.862	0.358	0.611			
ISE	3.9	0.8	0.876	0.871	0.230	0.168	0.588		
PEOU	4.2	0.7	0.866	0.865	0.278	0.163	0.365	0.520	
PU	4.1	0.7	0.858	0.857	0.340	0.204	0.209	0.308	0.501

Note: ISE=Internet self-efficacy, PU=Perceived usefulness, PEOU=Perceived ease of use, ATI=Attitude towards Internet, BI=Behavioral Intention, SD= Standard deviation, CR=Composite reliability

Cronbach's alpha was calculated to assess the reliability of each construct. Cronbach's alpha score of at least 0.70 is considered acceptable for internal consistency (Hair 2009). The above table shows the reliability value of each factor. The results confirmed reliable scales. Convergent and discriminant validity was established by testing of the measurement model. Convergent validity was estimated by the score of Composite Reliability (CR) and Average Variance Extracted (AVE) (Fornell and Larker 1981). The value of CR should be at least 0.7 (Nunnally and Bernstein 1994). The AVE estimates should be 0.5 or higher to suggest adequate convergent validity (Hair 2009). Table 2 shows that the AVE is all above the benchmark of 0.5, which demonstrates that there exists convergent validity among the constructs measured. The discriminant validity, of the construct, is established when the AVE per construct is higher than the correlations between any two different constructs (Fornell and Larker 1981). AVE matrices are presented in Table 2 with the AVE on the diagonal and squared correlations among constructs on the off-diagonal. The results specify that the elements in the principal diagonal were higher than the off-diagonal elements confirming the presence of discriminant validity.

4.3 Structural Equation Modeling

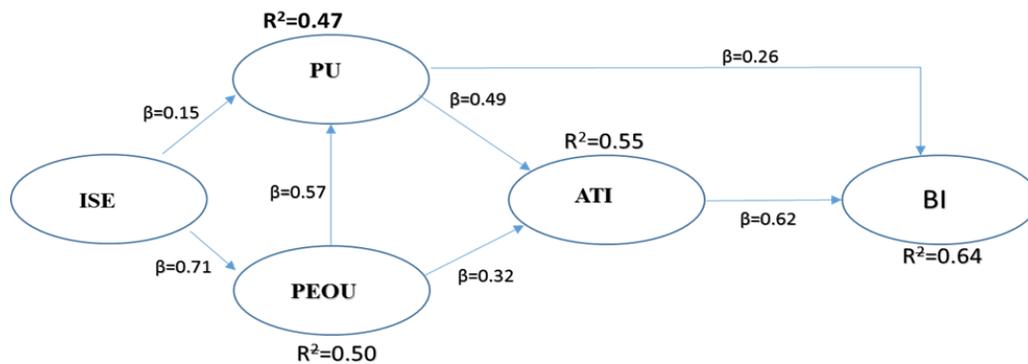


Figure 2: Structural Equation Modeling of the proposed Model

Further, the structural equation modeling was performed using AMOS 24 to examine the predictive relationships between the constructs as proposed in the model. A CMIN/DF =2.854, RMSEA=0.064, CFI=0.922, IFI=0.923, TLI=0.912, was obtained for the hypothesized measurement model. Analysis continued to improve the model fit. The modification index (MI= 60.34, and 52.98) for the item 3 (It is easy to get what I look for) and item 4 (I find the internet to be flexible); item 1 (It is easy to remember the procedure in internet) and item 2 (the language of the internet is easily understandable and clear) related to PEOU indicated that model fit can be improved by correlating these error terms. The fit statistics of the revised model showed that model fit had improved when errors were correlating. A CMIN/DF =2.379, RMSEA=0.056, CFI=0.943, IFI=0.943, TLI=0.935. was obtained for the hypothesized measurement model. The test also produced the squared multiple correlations (R^2), which indicates the variance of the dependent constructs (Fig 2). ISE has a positive influence on both PEOU ($\beta = 0.71$, $p < 0.001$), and PU ($\beta = 0.15$, $p < 0.001$), resulting in R^2 value of 0.50 and 0.47 respectively which means ISE accounted 50% variances in PEOU and 47% variance in PU. Hence, the hypotheses H1 get supported. The ISE ($\beta = 0.15$, $p < 0.001$), and PEOU ($\beta = 0.57$, $p < 0.001$), predicted the PU by accounting for the R^2 value of 0.47, which means both PEOU and ISE accounted for 47% variance in PU. Therefore, H2 get accepted. Further, PU ($\beta = 0.49$, $p < 0.001$), and PEOU ($\beta = 0.32$, $p < 0.001$), has a positive influence on ATI resulting in the R^2 value of 0.55, which means both PU and PEOU together accounted for 55% variance in ATI. Therefore, H3 and H4 are also supported. ATI ($\beta = 0.62$, $p < 0.001$), and PU use ($\beta = 0.26$, $p < 0.001$), have a positive influence on BI, resulting in R^2 value of 0.64, which implies ATI and PU together contributed 64% variance in BI. Hence H5 is also supported.

5. Discussion and Implications

The purpose of this study is to examine the role of ISE as an antecedent construct to TAM. Self-efficacy plays an essential role in a student's approaches towards any task, goal, challenges, and actions. The results of this study provide support for ISE's role in modified TAM and suggest that ISE has a significant positive influence on both PEOU and PU. People with strong internet self-efficacy will develop a more profound interest in the activities they participate and develop a stronger sense of commitment towards their attention and actions. In other words, students who have high ISE perceive using the internet as easy and useful for their learning activities. The students who believe in their ability to perform any task using the internet view it as an accessible and useful tool. The study conducted by (Schunk 1990) which concludes that people with high self-efficacy are more likely to put efforts to complete a job and to continue longer in those efforts, than those with low self-efficacy. The prior studies also exhibit positive influence of ISE on PEOU (Agarwal et al. 2000; Amornkitpinyo and PiriyaSurawong 2015; Ariff et al. 2012; Igbaria and Ivari 1995; Kulviwat et al. 2014; Venkatesh and Davis 1996) and PU (Amornkitpinyo and PiriyaSurawong, 2015; Ariff et al. 2012; Sentosa 2012). The results of this study exhibit that both PU and PEOU have a significant influence on ATI. This suggests that students who perceive using internet easy and useful have a healthy positive attitude towards the internet. These findings are in line with the previous studies (Elkaseh et al. 2015; Renny et al. 2013). Results of this study also propose that ATI and PU together have a significant influence on BI, which means, students who perceive internet as a useful tool for their learning activity develop a positive attitude towards the internet and they intend to use it for their academic activities. This study investigated the role of self-efficacy in influencing the behavioural intention of the students to adopt internet for their learning purposes. The main findings indicated that self-efficacy could affect behavioural intention through perceived use, perceived ease of use and attitude. The results of the study suggest that self-efficacy is an expressive antecedent of perceived use, perceived ease of use and attitude. The university should try to enhance the behaviour intention of the students through self-efficacy which can lead to enhanced intent to use internet for academic purposes. Internet self-efficacy play a crucial role in affecting the behaviour intention of the user. Self-efficacy may be considered an inherent motivational factor that could help university students to self-regulate their motivation towards internet usage for learning activities. According to Bandura (1994), a high level of self-efficacy results in an increasingly active learning process. The educators and the university authorities should make every attempt to enhance the self-efficacy of the students, by giving them creative assignments, internet-based exercises which can kindle the student's interests to use the internet for their learning purposes. Instructors can improve the self-efficacy of the student to participate in online learning by praising and confirming their achievements when they use web-based LMS functions such as online discussions etc. The IT department of the University along with the educators can provide both online and offline support to increase the internet self-efficacy by creating web-based learning modules and train them to use these modules. This, in turn, will boost the self-confidence of the students and prompt them to use the internet for enhancing their learning capabilities.

6. Conclusions and limitations

The results of this research reveal that ISE as an antecedent has a significant positive effect on student's behavioral intention to use the internet for their academic activities. This shows that higher the self-efficacy, the higher will be their intention to use the internet for learning purposes. The inclusion of ISE as an antecedent in TAM contributed to the better understanding of the students' behavioral intention regarding their intention to use the internet. The findings of this study have validated that the external variable ISE (Campeau and Higgins, 1995; Wang, and Wu, 2008), is crucial in determining predictors of technology use intention. In this study, ISE serves as indirect motivation, through TAM, to enhance student's PU, PEOU, and ATI in shaping the behavioral intention towards the internet as information resources for their academic resources. Thus, ISE is an influential factor in accepting the internet. The findings suggest that educators need to concentrate on boosting the student's internet self-efficacy. The educators need to provide both on and off-line digital literacy program to students to enhance their self-efficacy. The focus of the study is on how the students use the internet for their learning purposes. The data was collected only from one university; therefore, results of the study may be restricted to a single setting. Replication of this study in other settings with different sample groups would help in understanding the implications of this extended TAM. Future work should examine possible moderation effects of age, gender, and qualification on predicting behavior intention.

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