



Students' Adoption of E-Learning: Exploring the Role of Computer Self-Efficacy as a Mediator

Rizwan Dar¹, Nimitha Kateel² and S. Lakshminarayanan³

¹⁻³School of Management, Manipal Academy of Higher Education, Manipal, 576104, India

Abstract

Background/Objectives: The growth for the need for technology has not hindered with time. The traditional approach of learning is time consuming, the use of technology has helped students in procuring information at a quicker pace. **Methods/Statistical analysis:** The traditional approaches towards learning have not been able to keep the pace. E-learning has increased the accessibility by providing information to anyone anytime anywhere and with that it has been cost effective too. **Methods/Statistical analysis:** Various institutions have implemented similar e-learning platforms so it gives more reason to assess the acceptance of such measures by students. The objective of the study is to explore the attitude of students towards e-learning by using TAM framework and also to assess the influence of computer self-efficacy. **Findings:** The current study was able to establish that computer self-efficacy acts as a mediator between perceived usefulness, perceived ease of use and attitude towards adoption of technology by students. **Improvements/Applications:** The implications of the study will help the management to understand if the students have accepted e-learning as a platform to learn and whether they wish to use this in future.

Index Terms

Computer Self Efficacy, E-learning, Education, TAM, Technology adoption.

Corresponding author : Rizwan Dar

rizwan.ah.dar@gmail.com

- Manuscript received March 17, 2018.
- Revised March 23, 2018 ; Accepted March 27, 2018.
- Date of publication March 31, 2018.

© The Academic Society of Convergence Science Inc.
2546-1583 © 2017 IJEMR. Personal use is permitted, but republication/redistribution requires IJEMR permission.

I. INTRODUCTION

The process of teaching, learning and knowledge acquisition have really undergone a dramatic change over a past few decades. The era of classroom teaching to modern day learning have evolved immensely in the sense the students becoming well equipped with the usage of information and communication technology in their everyday learning process [1,2]. Broadly speaking there are two approaches for delivery of knowledge:

- 1) Modern approach – it focusses on learning gained through lectures and sessions conducted by professors i.e. faculty teaching is the core center of this approach [3].
- 2) Postmodern approach –it focusses on laying emphasis on needs and interests of students, i.e. what medium actually motivates and inspires them to learn more [3]. Digital and virtual learning platforms have made it possible to get access over information and concepts at anytime, anywhere and by anyone, which has really transformed the way, in which knowledge is being imparted to present generation of students. Therefore the shift from modern to postmodern approach is explicitly evident in the present scenario [3].

E-learning adoption (ELA) and information and communication technologies (ICTs) are not the absolute and exact substitutes for traditional style of teaching rather they will aid to improve the quality, efficiency and effectiveness of students learning capacity and thereby strengthening their skills, abilities and competencies in their field of study [2], [4]. Some popular e-learning tools available in the market are – Moodle, Webct, Blackboard, Educomp, Sakai, web 2.0 platforms.

This particular research adopts TAM (technology acceptance model) to explain and provide the insights about how factors like CSE (computer self-efficacy), PU (perceived usefulness), PEOU (perceived ease of use) and ATU (attitude towards use) have their implications on ELA (e-learning adoption). CSE was introduced as a mediating factor to understand its influence on ATU. As this relationship wasn't established in previous studies therefore the study aims to assess how CSE can affect the attitude of students towards adoption of e-learning.

II. LITERATURE REVIEW

Technology Acceptance Model (TAM) has been one of the widely discussed model for defining the acceptance or adoption of a particular technology by

a user [3], [5-7]. Researcher Davis and colleagues [8-11] proposed TAM. The model has its roots in the intention based theories like the Theory of Planned Behavior (TPB) [12] and theory of Reasoned Action (TRA) [13]. TAM introduced the two important elements Perceiver Usefulness (PU) and Perceived Ease Of Use (PEOU) which serve as drivers that predict and explain the acceptance of Information System (IS) of a user [9], [14]. TAM adopted TRA model to explain the user's behavioral intention (BI) particularly with respect to acceptance of information technology [9], [15].

Researchers Elkaseh et al., [16] and AlAmmary and Hamd [17] found PEOU and PU to be important factors in determining the behavioral intention of students and teachers to use e-learning platform in higher education in Lybia. This was also confirmed by various other studies [15], [18]. PEOU however was found to have an indirect relationship with the E-learning adoption (ELA) [17]. The researcher Boateng et al., [2] was able to find that there exists a direct relationship between Perceived Usefulness (PU) and Attitude (ATU) and Perceived Intention of Use (PIU).

Researcher Park [19] found that self-efficacy in e-learning was the most important construct among others when explaining the causal relationships. Also researchers Sam et al., [20] and Zhang and Espinoza [21] argued that computer self-efficacy (CSE) has a direct effect on the attitude (ATU) however researcher Boateng et al., [2] found that there was no significant direct relationship between CSE and ATU.

Research Framework:

Technology Acceptance Model (TAM): Based on TRA, Davis [8] introduced the TAM concept. The model was initially developed with two basic determinants namely Perceived Ease Of Use (PEOU) and Perceived Usefulness (PU). PU is the degree to which an individual feels that using technology would improve their work. PEOU is the degree to which an individual believes that using the technology won't be difficult. The use of technology and electronic devices is vital for E-Learning. By including the external factor, Computer Self Efficacy (CSE) we can determine the effect of CSE on the basic factors, PU and PEOU. CSE is the ability of students to use the computers for their learning [22]. Perceived Ease Of Use (PEOU) was proven to have positive effect on Attitude (ATU) [2], [19], [23,24]. Perceived Usefulness (PU) was seen to have positive effect on Attitude (ATU) [2], [9]. Attitude (ATU) was proven to have positive effect on Perceived

Intention to Use [2], [25]. The TAM model was modified according to Baron and Kenny model [26] so as to measure PIU by keeping CSE as a mediating factor between PEOU, PU and ATU.

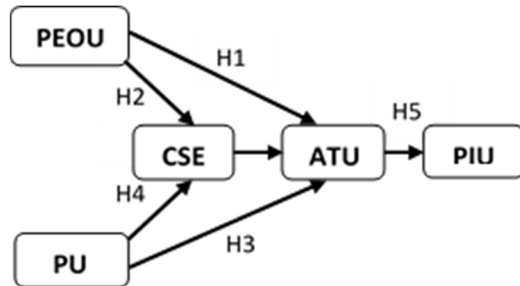


Fig 1. Theoretical framework of the current study.

Hypotheses:

H1: Perceived Ease Of Use (PEOU) has a positive effect on Attitude (ATU).

H2: Computer Self Efficacy (CSE) has a mediating effect between Perceived Ease Of Use (PEOU) and Attitude (ATU).

H3: Perceived Usefulness (PU) has a positive effect on Attitude (ATU).

H4: Computer Self Efficacy (CSE) has a mediating effect between Perceived Usefulness (PU) and Attitude (ATU).

H5: Attitude (ATU) has a positive effect on Perceived Intention to Use.

III. RESEARCH METHODOLOGY

The research papers for review were taken from search engines and databases like Google Search, Google Scholar, Ebsco Host and Emerald Insight. Primary data was collected through structured questionnaires. The data was collected from a private college in Karnataka. The sample consisted of 110 participants. All the participants were from a private post graduate college in Karnataka using convenient sampling method. The respondents belonged the age groups 21-29 years old. The data was collected through structured questionnaire which was developed online. The questionnaires were circulated among the students via emails and messages. All responses were obtained voluntarily. To measure CSE, PEOU, PU, ATU and PIU a 19 item questionnaire was developed based on the questions used in the previous studies [2], [14], [23], [27]. Age and gender were the only demographic

variables considered. Five point Likert Scale was used for measurement of core items ranging from 1= strongly disagree to 5= strongly agree. Regression analysis was done using SPSS 20 for assessing the relationships between the different constructs in the TAM model.

Findings:

TABLE 1. DEMOGRAPHIC ANALYSIS

Variable	Category	Frequency	Percentage
Age	21-23	87	79.1
	24-26	20	18.2
	27-29	3	2.7
	30 and above	0	0
Gender	Male	68	61.8
	Female	43	32.8

The demographic profile of the subjects used in the study consisted of age group and gender. Total of 110 students participated in the study. The age distribution of the participants of the study revealed that the age group 21- 23 years were dominated and accounted for 79.1%. Whereas the age group 24-26 accounted for 18.2 % and the age group 27-29 was 2.7%. According to the gender analysis, male participants were higher when compared to female participants. Males were 61.8 % and 38.2% respectively.

Analysis

TABLE 2. MODEL SUMMARY FOR THE RELATIONSHIP BETWEEN PEOU → ATU; PEOU → CSE → ATU

Model	R	R Square	Adjusted R Square
1	.733a	.537	.533
2	.785b	.617	.609

Note: a. Predictors: (Constant), PEOU

b. Predictors: (Constant), PEOU, CSE

From table 2 it is observed that the relationship between PEOU and ATU explains 54% (r square = 0.537) of variance. Whereas when CSE was introduced as a mediating factor between PEOU and ATU the r square value was increased to 61.7% (r square = 0.617). Which indicates that CSE as a

mediating factor enhances the relation between PEOU and ATU.

TABLE 3. ANNOVA FOR THE RELATIONSHIP BETWEEN PEOU → ATU; PEOU → CSE→ATU

Model		Mean Square	F	Sig.
1	Regression	54.380	125.212	.000b
	Residual	.434		
	Total			
2	Regression	31.229	86.062	.000c
	Residual	.363		
	Total			

Note: a. Dependent Variable: ATU

b. Predictors: (Constant), PEOU

c. Predictors: (Constant), PEOU, CSE

From table 3 the p value for all the variables was found to be $p = 0.000$, which indicates that there is a statistically significant relationship between PEOU and ATU. Hence we reject the null hypotheses and we accept the alternate hypotheses H1 and H2. When the relationship between PEOU and CSE was tested it explained 47.6% variance.

TABLE 4. COEFFICIENT TABLE FOR THE RELATIONSHIP BETWEEN PEOU → ATU; PEOU → CSE→ATU

	B	t	Sig
PEOU	.717	11.190	.000
PEOU	.409	4.656	.000
CSE	.437	4.718	.000

Note: Dependent Variable: ATU

As indicated in the results, the attitude towards using E-learning platform is influenced by individual's perception towards ease of using it. Knowledge on computer efficacy further enhances the attitude towards using such platforms. Individuals with poor computer skills may have difficulty in accessing E-learning platform, thus refraining themselves from adopting E-learning. Therefore having a positive perception and computer skills together can influence the attitude towards using E-learning platforms.

TABLE 5. MODEL SUMMARY FOR THE RELATIONSHIP BETWEEN PU → ATU; PU → CSE→ATU

Model	R	R Square	Adjusted R Square
1	.778a	.605	.602
2	.839b	.704	.699

Note: a. Predictors: (Constant), PU

b. Predictors: (Constant), PU, CSE

From table 5 it is observed that the relationship between PU and ATU explains 60.5% (r square = 0.605) of variance. Whereas when CSE was introduced as a mediating factor between PU and ATU the r square value was increased to 70.4% (r square = 0.704). Which indicates that CSE as a mediating factor enhances the relation between PU and ATU.

TABLE 6. ANNOVA FOR THE RELATIONSHIP BETWEEN PU → ATU; PU → CSE→ATU

Model		Mean Square	F	Sig.
1	Regression	61.296	165.544	.000b
	Residual	.370		
	Total			
2	Regression	35.662	127.362	.000c
	Residual	.280		
	Total			

Note: a. Dependent Variable: ATU

b. Predictors: (Constant), PU

c. Predictors: (Constant), PU, CSE

From table 6 the p value for all the variables was found to be $p = 0.000$, which indicates that there is a statistically significant relationship between PU and ATU. Hence we reject the null hypotheses and we accept the alternate hypotheses H3 and H4. When relationship between PU and CSE was tested it explained 32.9% variance.

TABLE 7. COEFFICIENT TABLE FOR THE RELATIONSHIP BETWEEN PU → ATU; PU → CSE→ATU

	B	t	Sig.
PU	.777	12.866	.000
PU	.522	7.730	.000
CSE	.418	5.985	.000

Note: Dependent Variable: ATU

Perceived usefulness is the extent to which e-learning platform is helpful to an individual. Better the perception, better is the attitude towards adopting such platforms. Further individual with good knowledge in computer skills can perceive the usefulness better.

TABLE 8. MODEL SUMMARY FOR THE RELATIONSHIP BETWEEN ATU → PIU

Model	R	R Square	Adjusted R Square
1	.860a	.740	.738

Note: a. Predictors: (Constant), ATU

From table 8 it is observed that the relationship between ATU and PIU explains 74% (r square = 0.740) of variance.

TABLE 9. ANNOVA FOR THE RELATIONSHIP BETWEEN ATU → PIU

Model		Mean Square	F	Sig.
1	Regression	90.313	307.926	.000b
	Residual	.293		
	Total			

Note: a. Dependent Variable: PIU

b. Predictors: (Constant), ATU

And as observed from table 9 there is a statistically significant relationship between ATU and PIU.

TABLE 10. COEFFICIENT TABLE FOR THE RELATIONSHIP BETWEEN ATU → PIU

	B	t	Sig.
ATU	.944	17.548	.000

Note: a. Dependent Variable: PIU

Perceived ease of use and perceived usefulness helps in building attitude towards using E-learning platforms and attitude towards using influences the adoption of E-learning. Stronger the attitude, stronger is the intention of using E-learning. Therefore a positive attitude makes it necessary for successful adoption of E-learning platforms.

IV. DISCUSSION

The study was done on the basis of TAM model. Additional constructs, CSE and ATU, were introduced to measure the adoption of E-Learning. The study confirms that TAM model used by previous authors was useful in understanding the

acceptance of E-Learning. The study tested five hypotheses and all the hypotheses were found to be statistically significant. In an earlier study the hypotheses of CSE having an effect on ATU and PU was rejected [2] and the current study found that CSE has a significant effect between PIU, PU and ATU when taken as a mediating factor.

TABLE 11. STRUCTURAL MODEL.

H	Hyp. Path	R Square	F	Outcome
H1	PEOU → ATU	0.537	125.212*	Accepted
H2	PEOU → CSE → ATU	0.617	86.062*	Accepted
H3	PU → ATU	0.605	165.544*	Accepted
H4	PU → CSE → ATU	0.704	127.362*	Accepted
H5	ATU → PIU	0.740	307.926*	Accepted

* Significance at 0.1% level.

In this study PEOU and PU were found to show positive strong effect on attitude of students. Further when PU and PEOU were compared, PU was found to have a greater impact on ATU, which is in consistent with previous studies [14]. CSE was introduced as a mediating factor between PEOU, PU and ATU and it was found that CSE has greater impact on PU and ATU. The overall model fit was found to be high, therefore the null hypotheses were rejected and the corresponding alternate hypotheses were accepted.

CSE was also tested as an antecedent to PU and PEOU [2,3]. PEOU as a mediator between CSE and ATU explained 59.8% variance also CSE and ATU explained 47.8% variance and PU as a mediator between CSE and ATU explained 69.7% variance. With this it can be concluded that when CSE is introduced as a mediator between PU, PEOU and ATU the model shows better predictability than the models used in previous studies [2,3].

V. CONCLUSION

Recent advancements in information Technology and communication has totally modified and altered students way of learning and gaining knowledge over a period of time in the sense that earlier students used to understand concepts and theories by learning and memorizing approach which now got transformed to comprehension based approach i.e. explore, learn, understand, interpret and then assimilate the information so observed through the study done.

In order to facilitate such understanding learning based approach e-learning plays a very vital and

crucial role as with the support of such online-learning platforms like Moodle, course era, Harvard business school etc. students can acquire and enhance their knowledge at anytime, anywhere and on any subject through such web based learning portals.

Our research do explains the positive relationship between attitude of students towards e-learning, their mind set on easy accessibility and successful usage of such online-learning platforms which the research explains through the TAM (technology acceptance model).

The current study was able to establish that CSE as a mediator explains better predictability that CSE taken as an antecedent. Which implies that with increased access to technology the self-efficacy improves thereby improving the attitude towards adoption of the technology.

VI. FUTURE IMPLICATIONS

Through online-learning software huge number of students will be able to interact and exchange ideas, information and knowledge on a global platform. With the wide usage and easy accessibility of e-Learning portals students who have urge to learn something new and widen their scope of knowledge will really be benefitted. Soon after the success of e-learning model, even in the rural and sub urban parts of India same model can be replicated in the schools, colleges and universities making students competent enough to keep pace with the changing technology, especially in the field of education. Although prima facie the model of e-learning is more attractive to students but in the near future even teachers and training staff would develop liking towards it because of its ease of use and availability of large pool of information at a common platform. This information technology would make students and teachers to hone their skills and capabilities in multi-disciplinary fields as, apart from curriculum based knowledge, there is lot more what they can learn based upon their interest and passion.

ACKNOWLEDGMENT

It gives us immense pleasure to acknowledge and thank all those who gave us consistent guidance and encouraged us in the endeavor. We would also like to thank all those persons who spent their valuable time to contribute the required information during the study.

We gratefully acknowledge our sincere gratitude to Dr. S. Lakshminarayanan (Associate Professor,

MAHE, Manipal), Dr. Rajasekharan Pillai K. (Associate Professor, MAHE, Manipal) and Prof. Badri Narayan (Research Fellow, MAHE, Manipal) for their kind guidance during the study.

REFERENCES

- [1] Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. *MIS quarterly*, 401-426.
- [2] Boateng, R., Mbrokroh, A. S., Boateng, L., Senyo, P. K., & Ansong, E. (2016). Determinants of e-learning adoption among students of developing countries. *The International Journal of Information and Learning Technology*, 33(4), 248-262.
- [3] Arteaga Sánchez, R., Duarte Hueros, A., & García Ordaz, M. (2013). E-learning and the University of Huelva: a study of WebCT and the technological acceptance model. *Campus-Wide Information Systems*, 30(2), 135-160.
- [4] Islam, A. N., & Azad, N. (2015). Satisfaction and continuance with a learning management system: Comparing perceptions of educators and students. *The International Journal of Information and Learning Technology*, 32(2), 109-123.
- [5] Cheng, Y. M. (2011). Antecedents and consequences of e-learning acceptance. *Information Systems Journal*, 21(3), 269-299.
- [6] Lee, Y. H., Hsieh, Y. C., & Ma, C. Y. (2011). A model of organizational employees' e-learning systems acceptance. *Knowledge-based systems*, 24(3), 355-366.
- [7] Lee, B. C., Yoon, J. O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. *Computers & Education*, 53(4), 1320-1329.
- [8] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
- [9] Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8), 982-1003.
- [10] Davis, F. D., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: three experiments. *International Journal of Human-Computer Studies*, 45(1), 19-45.
- [11] Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of applied social psychology*, 22(14), 1111-1132.
- [12] Ajzen, I., & Madden, T. J. (1986). Prediction of goal-directed behavior from attitudinal and normative variables. *Journal of Experimental Social Psychology*, 22, 453-474.
- [13] Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley, 6.
- [14] Cheng, Y. M. (2010). Antecedents and consequences of e-learning acceptance. *Information Systems Journal*, 21(3), 269-299.
- [15] Kumar Sharma, S., Kumar Chandel, J., & Madhumohan Govindaluri, S. (2014). Students' acceptance and satisfaction of learning through course websites. *Education, Business and Society: Contemporary Middle Eastern Issues*, 7(2/3), 152-166.
- [16] Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2016). Perceived ease of use and perceived usefulness of social media for e-learning in Libyan higher education: A structural equation modeling analysis. *International Journal of Information and Education Technology*, 6(3), 192.
- [17] Al-Ammary, J., & Hamad, S. (2008, December). Factors influencing adoption of E-learning at University of Bahrain. In *proceeding of the International Conference on*

- Information Technology (ACIT 2008), University of Sfax, Tunisia* (pp. 16-18).
- [18] Roca, J. C., Chiu, C. M., & Martínez, F. J. (2006). Understanding e-learning continuance intention: An extension of the Technology Acceptance Model. *International Journal of human-computer studies*, 64(8), 683-696.
 - [19] Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Journal of Educational Technology & Society*, 12(3), 150.
 - [20] Sam, H. K., Othman, A. E. A., & Nordin, Z. S. (2005). Computer self-efficacy, computer anxiety, and attitudes toward the Internet: A study among undergraduates in Unimas. *Educational Technology & Society*, 8(4), 205-219.
 - [21] Zhang, Y., & Espinoza, S. (1998). Relationships among computer self-efficacy, attitudes toward computers, and desirability of learning computing skills. *Journal of Research on Computing in Education*, 30(4), 420-436.
 - [22] Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191.
 - [23] Chang, C. C., Yan, C. F., & Tseng, J. S. (2012). Perceived convenience in an extended technology acceptance model: Mobile technology and English learning for college students. *Australasian Journal of Educational Technology*, 28(5).
 - [24] Okazaki, S., & dos Santos, L. M. R. (2012). Understanding e-learning adoption in Brazil: Major determinants and gender effects. *The International Review of Research in Open and Distributed Learning*, 13(4), 91-106.
 - [25] Al-Adwan, A., Al-Adwan, A., & Smedley, J. (2013). Exploring students acceptance of e-learning using Technology Acceptance Model in Jordanian universities. *International Journal of Education and Development using Information and Communication Technology*, 9(2), 4.
 - [26] Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, 51(6), 1173.
 - [27] Lai, J. Y., & Rushikesh Ulhas, K. (2012). Understanding acceptance of dedicated e-textbook applications for learning: Involving Taiwanese university students. *The Electronic Library*, 30(3), 321-338.