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The Acceptance of E-Learning during Covid-19 Pandemic amongst Dental Students of Islamabad

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Abstract

Background: The worldwide COVID 19 pandemic coerced all organizations including educational facilities to embrace online teaching methodologies. The present study was done to assess the acceptance of e-learning during COVID 19 among dental students in the metropolitan city of Islamabad using the Technology Acceptance Model (TAM)

Methods: This was a cross sectional study involving all dental colleges of Islamabad, was conducted between August 2020 – October 2020. The complete enumeration technique was employed for sampling. A structured self-reported questionnaire of the Technology acceptance model (TAM) was used for data collection. It consisted of four constructs, perceived usefulness (PU), perceived ease of use (PEOU), attitude towards use (ATT) and intention to use (INT). The questionnaire was shared online with 600 dental undergraduate students in Islamabad. To analyze the data SPSS (version 22) was used.

Results: The total number of complete responses received were 274 (RR 45%). The overall mean scores for PEOU, INT, PU and ATT were 3.38, 3.21, 3.1 and 2.92 respectively. Lower mean value showed that the respondents disagreed/strongly disagreed, whereas higher mean value showed that they were inclined to agree/strongly agree with the idea of e-learning. Based on TAM model, six hypotheses were formulated and tested for significance based on the regression statistics. Larger beta and t values and P value of ≤ 0.05 using regression analysis showed existence of significant relationship between all the factors

Conclusion: The present study explored the acceptance of e-learning by dental students and concluded that in order to motivate students to use technology for educational purposes it is necessary for them to perceive technology to be useful and easy to use. This in turn would help them develop a positive attitude towards using it and consequently motivate greater participation.

Keywords: COVID-19, information technology, online learning, pandemic, dental students

Introduction

The internet has transformed communications worldwide. In almost everything we do, including communication, entertainment, education we utilize information technology

system. The worldwide COVID 19 pandemic has coerced all organizations including educational facilities to embrace online teaching methodologies. In the given context e-learning is defined as “the delivery of course content via electronic media, such as

the Internet” (1). A system that uses internet technology to deliver information interactively through computer interfaces (2).

E-learning unfolds innovative prospects in the field of education albeit carrying its own fair share of challenges. The use of information communication technology as learning methodology is cost and time effective for institutes, accessible, along with shifting the learning paradigm from a passive teacher centered to active learner centered model(3). However, high speed connectivity, availability of computers/ laptops plus the user’s perception regarding its feasibility are some factors that affect the utility of E-learning (4).

In recent times e-learning was being used in combination with traditional learning, referred to as “blended learning”. Over the last two decades however the use of technology in education became widespread, with medical and dental colleges adapting to it as well(3,5-8). Concurrently, demographic transition of students further steered universities to adopt added e-learning methodologies so that the learning content would be readily availed by the student in a more flexible way (8).

In a developing country like Pakistan, success of e-learning is eclipsed by a number of issues. Namely the limited availability of high-speed internet in rural areas, the type of teaching methodology being used and lastly the acceptance of this mode of instruction by the user (9, 10).

The Technology Acceptance Model (TAM) developed by Davis in 1989 has been widely used for different technologies ranging from software packages to online services. TAM has four constructs, namely perceived ease of use (PEOU); perceived usefulness (PU); attitude towards use (ATT) and behavioral intention to use (INT). TAM uses the theory of reasoned action for specifying causal links between its two key beliefs (PU and PEOU) and attitude of users, their intentions and actual computer adoption behavior (11,12). TAM is useful because it addresses both the user’s attitude toward using technology and its actual usage. It is an intention-based model developed specifically for explaining and/or predicting user acceptance of computer technology (13).

A number of studies have been conducted to evaluate the effectiveness of e-learning methods alone or in combination with traditional ones as well as in comparison to traditional methodologies both in Pakistan and other countries (5-8). To the best of our knowledge no research has been conducted so far to

assess the impact of the current complete shift to online teaching methodologies during the COVID 19 pandemic. Hence we conducted a survey-based study evaluating the acceptance of online teaching methodologies using the TAM model during COVID 19 among Dental students in the city of Islamabad.

Methodology

Using a cross-sectional study design, online questionnaires were shared with all the 600 undergraduate dental students of the three Dental Colleges in Islamabad, using the complete enumeration technique. Of these, 200 were from Islamabad Medical and Dental College; 100 were from HBS Medical & Dental; and 300 from Islamic International Dental College. The questionnaire devised was based on the four TAM constructs PU, PEOU, ATT and INT. The items measuring PU and PEOU were adapted from the scale developed by Davis et al. in 1989 (11). While the items measuring ATT and INT were modified by Ratna & Mehra in 2015 (12). The instrument is comprised of a total of 24 items. The first section has 8 questions in total regarding demographic details and to seek some general information regarding availability and accessibility to internet.

The second section has 16 items measured on a five-point Likert scale ranging from strongly disagrees to strongly agree. This section is based on the four constructs of TAM model i.e., PU (4 questions), PEOU (4 questions), ATU (4 questions) and INT (4 questions). Six hypotheses are generated based on constructs of TAM model:

H1 PEOU of e-learning has a significant effect on PU of e-learning

H2 PU of e-learning has a significant effect on ATT

H3 PU of e-learning has a significant effect on INT

H4 PEOU of e-learning has a significant effect on ATT

H5 PEOU of e-learning has a significant effect on INT

H6 Perceived ATT has a significant effect on INT

Institutional Review Board’s (IRB) approval was obtained from Islamabad Medical & Dental College (IRB approval letter No: IMDC/DS/IRB/165). Post IRB approval, permission was sought from the administration of the participating colleges. The questionnaire was initially pilot tested for reliability with twenty randomly selected students from the participating colleges. Fourteen of these students

submitted the forms and Cronbach alpha was calculated for each of the four TAM constructs and the entire scale using this data. The Cronbach alpha values

for PU, PEOU, ATT, INT and the overall TAM scale were 0.891, 0.940, 0.863, 0.592 and 0.94 respectively.

Table 1. Summary Statistics of Items

Item Description	Mean	Standard Deviation
Perceived Usefulness (PU)		
PU1I find e learning /online lecturing useful for my studies	3.00	1.169
PU2 Using e learning/ online lectures will improve the quality of my work/ performance in class (process of carrying out or accomplishing task, or function).	2.78	1.153
PU3 Using e learning / online lectures will improve my efficiency (productivity) in class	2.77	1.110
PU4 Using e learning/online lectures helps me save time	3.47	1.199
Perceived Ease of Use (PEOU)		
PEOU1 Using e learning/ online lectures is easy for me	3.41	1.187
PEOU2 During my interaction with e-learning/ online lecturing all the content is clear and understandable	2.89	1.175
PEOU3 It is very convenient to use e-learning/ online lecturing (in terms of time & place)	3.37	1.210
PEOU4 I find it easy to search and find information on the internet	3.84	0.902
Attitude towards e-learning (ATT)		
ATT1I believe it's a good idea to have online lectures / e learning for my course	2.73	1.273
ATT2Online lectures/ e learning as compared to traditional lectures are more helpful	2.43	1.221
ATT3I think it's a trend to use online lectures/ e learning for teaching these days	3.46	1.006
ATT4I have a generally favorable attitude towards e learning /online lectures	3.05	1.149
Intention To Use (INT)		
INT1 I intend to continue with e learning/online lectures only in the future	2.49	1.136
INT2 In future I would like to continue with traditional lectures/ teaching methodologies only	3.74	1.024
INT3 In future I would prefer to continue with a combination traditional and online lectures/ e learning	3.65	1.140
INT4 I intend to use e learning/online lectures frequently in the future	2.95	1.133

The questionnaire was distributed via email and complete confidentiality ensured. Those who gave consent and submitted complete forms were included. The variables of interest were the four TAM constructs PU, PEOU, ATT, and INT. The outcome measures included the regression co-efficient and t-statistics generated for the six hypotheses as well as the coefficient of determination (r^2). Descriptive statistics were calculated for the demographic variables and summary statistics (mean and standard deviation) were calculated for each item associated with each construct. Simple linear regression was used to test the six hypotheses generated based on the TAM model. Statistical package of social sciences (SPSS) version 22 was used for data analysis.

Results

The total number of responses was 274 (N= 274 and RR= 45%). Females contributed 75% (206) of the sample whereas; males contributed 25% (68).Among the participants, 38% (104) belonged to 1st year of BDS, while 26% (71), 23% (63) and 13% (36) belonged to 2nd, 3rd and final years of BDS respectively.

It was observed that 38% (104) Participants had attended e learning lectures before this paradigm shift whereas 62% (170) had not. Similarly, where 41% (112) of the participants enjoyed e learning, 59% (162) did not, and where on one hand, 62% (170) had high speed internet available to them, 38% (104) had no access to high speed internet.

Mean and standard deviation was calculated for all the sixteen items. Means ranged between 2.43 and 3.84 (where the possible range for scores was 1 to 5). Lowest mean score was for the question regarding e-learning as more helpful than traditional learning and the highest mean score was for the question regarding the ease with which they could find information on the internet.

The overall mean scores for PU, PEOU, ATT and INT were 3.01 ± 0.98 , 3.38 ± 0.87 , 2.92 ± 0.98 and 3.21 ± 0.69 respectively. Lowest mean score 2.92 was observed for attitude towards use. The highest mean value 3.38 was observed for PEOU. This shows that even PEOU, which has the highest mean score does not approach the agreement criteria i.e., score of 4 (Table 1).

Based on TAM model, six hypotheses were formulated. These hypotheses were tested for significance based on the regression statistics. Larger beta and t values were observed with smaller p-values for all the hypotheses. (Table 2)

Table 2. Regression statistics for the hypotheses

	Independent Variable	Dependent Variable	Un-standardized Coefficient β S.E	F	p	t	p	R ²	Hypothesis Supported
H1	PEOU	PU	0.817 0.047	303.201	0.000	17.413	0.000	0.527	Yes
H2	PU	ATT	0.821 0.034	574.816	0.000	23.970	0.000	0.679	Yes
H3	PU	INT	0.468 0.032	218.571	0.000	14.780	0.000	0.446	Yes
H4	PEOU	ATT	0.798 0.048	278.445	0.000	16.687	0.000	0.506	Yes
H5	PEOU	INT	0.471 0.038	150.443	0.000	12.260	0.000	0.356	Yes
H6	ATT	INT	0.492 0.030	260.971	0.000	16.155	0.000	0.492	Yes

H1 PEOU of e-learning has a significant effect on PU of e-learning: P value of 0.000 ($t= 17.413$) using regression analysis showed existence of significant relationship between the factors. The value of R^2 0.527 indicated that PU explains 52.7% of PEOU. The un-standardized β coefficient of 0.817 indicates that, for every unit of increase in PU, a 0.817 unit increase in PEOU is predicted. The F statistics is used to test the full model against a model with no variables and by using the mean of the values of the dependent variable as the estimate of the dependent variable. The value of 303.201 for F statistics in regression analysis of this hypothesis indicates the significance of regression model.

H2 PU of e-learning has a significant effect on ATT: Regression analysis showed significant relationship (p value=0.000 and $t= 23.975$). Value of 0.679 for R^2 and 0.821 for un-standardized β coefficient was observed. F value of 574.816 also indicates the significance of regression model.

H3 PU of e-learning has a significant effect on INT: Significant relationship is showed for this hypothesis by regression analysis (p value=0.000 and $t= 14.784$). R^2 for regression equation was 0.446 and un-standardized β coefficient was 0.468.

H4 PEOU of e-learning has a significant effect on ATT: Results revealed a significant relationship between the two ($p=0.000$ and $t=16.687$). The factor PEOU explained 50.6% of the factor ATT. The ability of the factor PEOU to predict the factor ATT was indicated by un-standardized coefficient 0.798. E statistic of 278.445 also indicates that the model is significant.

H5 PEOU of e-learning has a significant effect on INT: PEOU was found to have a significant on INT ($p=0.000$ and $t= 12.266$). R^2 for regression equation was 35.6%, while 0.471 indicates the predictability of INT. The regression model was significant ($F= 150.443$).

H6 Perceived ATT has a significant effect on INT: A significant relationship was observed between ATT and INT, where ($p=0.000$ and $t= 16.155$). R^2 was 49%. The predictability of INT was calculated to be 0.492. F statistics ($F= 260.971$) also showed that the model was significant.

Summary of all these results and linear regression statistics for the hypotheses is shown in figure 1.

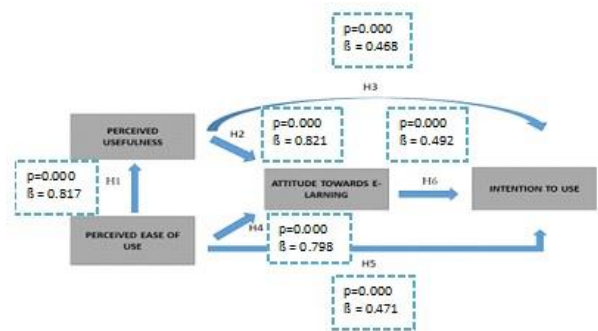


Figure 1. Summary for linear regression statistics

Discussion

The mean scores for each of our 16 questions on the 4 TAM constructs was around 3 which indicates that most of the students are uncertain about the various aspects of e-learning and how acceptable they find it.

This might be due to the fact that only 38% (104) of them had attended any e-learning course or lecture previously and this was their first experience with e-learning modalities. Moreover, the study commenced only a few months after the adaption of this teaching mode in August 2020. The ease of searching and finding information on the internet had the highest mean score of 3.84 probably due to the fact that today's millennial generation is quite technology savvy. But studying online was not one of their favorite activities with 162(59%) stating that they did not enjoy online e learning sessions. Other findings like PEOU's significant impact on PU ($R^2=0.527$ and $p=0.000$) were in line with results from a study on pre-university science students' behavioral intentions towards using online learning technologies (14). The influence of PEOU is based on the assumption that the easier it is for the person to use the technology the more likely they are to use it skillfully and effectively.

The strongest correlation was found between PU and ATT which is in line with an Australian study (15). It is understandable that if students have a high level of perceived usefulness, it will automatically have a positive impact on attitude towards adopting e-learning. Davis (1989)¹¹ found that PU had a significantly greater correlation with usage behavior than PEOU. Our study also had similar findings that PU has a greater correlation ($R^2=0.446$, $p=0.000$) with INT than with PEOU ($R^2=0.356$, $p=0.000$). This is probably due to the fact that perceived usefulness of using e-learning has a greater motivating impact on students and they are willing to make more of an effort to adapt to a new teaching methodology if they perceive it to be useful for them rather than if they find it easy to use. PU means there is potential benefit to be gained from using e-learning, whereas PEOU simply means that it is a convenient and easy to use method. Generally a low perceived level of difficulty or a greater ease of use leads towards a positive attitude and greater likelihood of adopting a certain behavior. To put it in the words of Shroff et al., "user's positive feelings towards the ease of use of technology are associated with sustained use of the technology." This could possibly explain how PEOU explained 50.6% of the factor ATT ($R^2= 0.506$) (16).

This study also concluded that perceived ATT had a significant effect on INT which is in line with the findings of other studies who also found attitude to be a significant predictor of intention to use technology

(14, 15). However, a Spanish study found that attitude towards using technology had no significant impact on intention to use (17). In fact, Davis (1989) is of the view that the role of attitude in accepting technology is modest, as people may adopt technology even in the absence of a positive attitude towards it, provided its benefits were clearly visible in the form of PEOU or PU (11).

The current study's findings support the hypothesis that PEOU influences INT. However, PEOU has been found to be a weaker predictor of INT than PU. This might be explained by the proposition that PEOU is an antecedent of PU and exerts its influence on the acceptance of technology indirectly through affecting PU (18).

This study however, had certain limitations like no external factors such as accessibility, user familiarity with technology, and user anxiety were considered. Also, our study didn't have any comparative aspect to it in which the users' pre and post perceptions of accepting online learning were measured.

Conclusion

With the advent of the COVID-19, pandemic online/hybrid teaching techniques are the new norm. The current system apart from being novel for all users has its own share of challenges, user acceptance being the greatest. The present study explored that acceptance of e-learning by dental students and concluded that in order to motivate students to use technology for educational purposes it's necessary for them to perceive technology to be useful and easy to use. This in turn would help them develop a positive attitude towards using it and consequently motivate greater participation.

References

1. Selim HM. Critical success factors for e-learning acceptance: Confirmatory factor models. *j.compedu*. 2007;49(2):396-413.
2. Al-Adwan A, Al-Adwan A, Smedley J. Exploring students' acceptance of e-learning using Technology Acceptance Model in Jordanian universities. *Int. j. educ*. 2013;9(2):4-18.
3. Asiry MA. Dental students' perceptions of an online learning. *Saudi Dent J*. 2017;29(4):167-70.
4. Yoo SJ, Han SH, Huang W. The roles of intrinsic motivators and extrinsic motivators in promoting e-learning in the workplace: A case from South Korea. *Comput Human Behav*. 2012;28(3):942-50.

5. Baig QA, Zaidi SJ, Alam BF. Perceptions of dental faculty and students of E-learning and its application in a public sector Dental College in Karachi, Pakistan. *J Pak Med Assoc.* 2019;69(9):1320-5.
6. Linjawi AI, Alfadda LS. Students' perception, attitudes, and readiness toward online learning in dental education in Saudi Arabia: a cohort study. *Adv Med Educ Pract.* 2018;9:855-63.
7. Asiry MA. Dental students' perceptions of an online learning. *Saudi Dent J.* 2017;29(4):167-70.
8. Iqbal SA, Shafiq AS, Iqbal N. Perceptions of undergraduate dental students towards e-Learning in Lahore Medical and Dental College. *Pakistan J Med Heal Sci.* 2016;10(4):1191-3.
9. Darakhshan, A. RS.NEWS. High-speed Internet in Pakistan, need of the Hour. <https://www.researchsnipers.com/> [cited 2020 June 24]; Available from: <https://www.researchsnipers.com/high-speed-internet-in-pakistan-need-of-the-hour/>.
10. Gunasekaran A, McNeil RD, Shaul D. E-learning: research and applications. *Ind. Commer. Train.* 2002;34(2):44-53.
11. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* 1989;13(3):319-40.
12. Ratna PA, Mehra S. Exploring the acceptance for e-learning using technology acceptance model among university students in India. *Int. J. Process. Manag. Benchmarking.* 2015;5(2):194-210.
13. Masrom M. Technology acceptance model and e-learning. In: *Proceedings of the 12th International Conference on Education*; 2007 May 21-24; Sultan HassanalBolkiahInstitute of Education University Brunei Darussalam. [Accessed 2020 June 24];81. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.554.6982&rep=rep1&type=pdf>
14. Bazelais P, Doleck T, Lemay DJ. Investigating the predictive power of TAM: A case study of CEGEP students' intentions to use online learning technologies. *EducInf Technol.* 2018;23(1):93-111.
15. Sivo SA, Ku CH, Acharya P. Understanding how university student perceptions of resources affect technology acceptance in online learning courses. *Australas. J. Educ. Technol.* 2018;34(4).
16. Shroff RH, Deneen CC, Ng EM. Analysis of the technology acceptance model in examining students' behavioural intention to use an e-portfolio system. *Australas. J. Educ. Technol.* 2011;27(4):600-618
17. Esteban-Millat I, Martínez-López FJ, Pujol-Jover M, Gázquez-Abad JC, Alegret A. An extension of the technology acceptance model for online learning environments. *Interact.* 2018 Oct 3;26(7):895-910.
18. Ibrahim R, Leng NS, Yusoff RC, Samy GN, Masrom S, Rizman ZI. E-learning acceptance based on technology acceptance model (TAM). *J. Fund. Appl. Sci.* 2017;9(4S):871-89.