Behavioral Intention for Adopting Technology Enhanced Learning Initiatives in Universities

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Advent of information and mobile communication technologies has given new dimensions to educational research. Investment in technology based infrastructure for education will be effective if students are ready to adapt their behavior to accept technological changes. The research objective is to identify state of student's behavioral intentions and readiness for online learning to increase their participation towards e-learning initiatives taken by institutions. This study implements a survey of undergraduate, masters and PhD students (*N*=211) of 3 departments (Engineering, Computer Science and Management Sciences) from four universities. Results suggested that behavioral intention for online learning was a predictor of students' participation in e-learning initiatives. The proposed mediation model revealed that perceived institutional support for information technology infrastructure affect the students' participation. Findings indicated that females had better preparedness for e-learning initiatives and undergraduate students found e-learning methods effective as compared to classroom teaching. Directions for future research have been provided.

Keywords. e-learning, behavioral intention, technology enhanced learning, student participation

An important role of e-education is the preparation of trained manpower that will help to build, utilize and maintain e-government processes since these are highly dependent on effective use of information and communication technologies (ICT). In Pakistan the digital literacy (ability to recognize and employ the potential of ICT) is already low and e-education aims to bridge that gap by providing a collaborative learning environment which focuses on building knowledge. In this environment, there will be a visible shift from teacher-

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centered education to a cohesive platform where learners work in collaboration, develop shared knowledge, and engage in activities involving creative thinking and problem-solving skills. Advances in ICT have also changed perceptions about and approaches to e-learning; from behaviorism through cognitive to social constructivism or explicitly, from communicated knowledge to negotiated and then collected knowledge (Kundi & Nawaz, 2010).

Considering the benefits of e-learning specifically in the context of being asynchronous and location independent learning, it accounts for different learning styles. Bennet and Bennet (2008) links the biology of human learning to better understanding of the personal needs of individual learners which when brought together with e-learning system capabilities will offer a significant jump in the learning rate and efficiency. Online learning has great potential in providing a clear and coherent structure of the learning material, in supporting self-regulated learning, and in distributing information. As researched by Paechter & Maier (2010) students preferred face-to-face learning for communication purposes in which a shared understanding was to be derived or in which interpersonal relations were to be established. An interesting finding was that when skills in self-regulated learning were to be acquired, students advocated online learning. Lim et al. (2007) demonstrated through empirical data that a positive relationship existed between individual, organizational and online training design constructs and training effectiveness constructs (learning and transfer performance). Multimedia-based e-learning systems have become popular. Provision of flexible process control in an e-learning environment is essential to enable personalized knowledge construction and improve learning effectiveness. An e-learning system with interactive multimedia can help learners better understand learning content and achieve learning performance comparable to that of classroom learning (Dongsong & Zhou, 2003).

With rapid changes in the educational world, it is observed that use of the Internet ICT based learning systems have become an important part of the learning and teaching strategies of many universities (Meerza & Beauchamp, 2017; Vega-Hernández et al., 2018; Lawrence & Tar, 2018). While some are becoming global, virtual institutions, many others are using the Internet to combine traditional methods of delivery with online teaching (Erich & Vargolici, 2008). Kirkwood (2009) argues that the use of ICT alone does not result in improved educational outcomes and ways of working for e-learning used in higher education. Students' expectations and conceptions of learning and to assessment demands are

equally important and so are beliefs and practices of the instructors concerning teaching and assessment and their impact on the experience of learners. Bowers and Kumar (2017) studied teacher and social presence in online learning environment and found that it was stronger in such an environment as compared to traditional classroom.

Some other benefits of technology based learning have strong implications for both the faculty and university management. Craw & Wade (2006) developed an e-learning system to be used with the existing VLE (virtual learning environment) in the University of West England UK to facilitate faculty and students using current educational modules by providing them additional links to the resources already being used by them to enhance learning. Folorunso et al. (2006) examine the factors that affect the acceptability of electronic-learning (e-learning) in public and private universities in Nigeria. They state that employing e-learning will solve problems in universities such as overcrowding in lecture rooms, insufficient laboratory equipment, and low lecturer to student ratios. They also identified mass awareness, low computer literacy level and cost as the main factors hindering acceptance of the technology in the universities. Some other key factors related to e-learning within the higher education were identified as organizational strategies and policies, the technological infrastructure, curriculum development, and educational systems design and delivery (Hackett, 2004).

The important consideration of technology based learning to be accepted as a norm or standard practice in universities then becomes a question of technology acceptance as to how users come to accept and use new technology. The technology acceptance model (TAM) suggests a number of factors influencing the decision about how and when users will use the new proposed technology (Davis et al, 1989). The technology here being technology based learning systems, a number of additional variables need consideration. Learning variables such as cognitive, social and affective learners' characteristics play a critical role in the design and implementation of web-based learning systems (Siadaty & Taghiyareh, 2008).

The present study uses the technology acceptance model (TAM) as a basis of the theoretical framework and explores the approach of technology acceptance as behavioral aspect of technology adoption. The same has been studied in different researches in the past in different contexts. Factors affecting attitude toward using social media and intention to use social media simultaneously through perceived ease of use and perceived usefulness were identified (Lee et al., 2013). In an

Australian study, the findings indicated that perceived usefulness and managerial support were dominant in explaining technology adoption (Talukder, 2012). As far as personal factors were concerned, student self-efficacy was found to be an important variable to understand user's acceptance of e-learning and the attitude towards its adoption (Park, 2009). Social factors have been reported to influence technology acceptance (Niehaves et al., 2012). Rupak et al. (2014) studied technology adoption behavior of social network sites and support the technology acceptance model for their evaluation process. Provision of resources and institutional support has been identified as important factors for optimal uptake of learning technologies (Buchanan et al., 2013). The same aspect of institutional support is being explored in the current study as well in relation to student participation in e-learning. The ability to share information in the collaborative learning environment is found to influence intention and behavior toward technology acceptance and adoption (Cheung & Veugel, 2013). Another study related to use of mobile learning confirms the validity of the technology acceptance model and highlights student attitude as the most important construct to use technology (Park et al., 2012).

Having established the benefits of e-learning and the central theses of this research in the theoretical framework of technology acceptance model as various studies link technology acceptance with user behavioral intention, this study aims to determine the state of student's readiness (behavioral intention) for online learning so that their participation to undertake e-learning initiatives can be enhanced.

Hypotheses

This research aims to explore the following hypotheses:

- There are gender differences on students' preferences related to e-learning.
- There are differences in students' participation in e-learning according to their academic background.
- There are differences in students' participation in e-learning among Undergraduate, Masters, and PhD students.

Method

Research Design

In order to achieve the research objectives, quantitative research method was applied to collect data for further processing and analysis. This study utilizes cross sectional survey research design involving data collection from university students through a questionnaire. The unit of

analysis is therefore higher educational institutes and research data for analysis was collected from students involved in e-learning in addition to routine classroom education.

Sample

Considering the requirements of sample size for factor analysis, the minimum is to have at least five times the cases as the number of variables to be analyzed whereas the acceptable sample size limit would require a 10:1 ratio between responses and variables to be analyzed (Hair et al., 2010). However, 300 questionnaires were distributed to students from which 211 usable responses were received. The sample comprised of 211 students. The data were collected from four universities (public=2, private=2) in the Islamabad/Rawalpindi region by using convenience sampling approach. Other demographic information of these students is given in Table 1.

Table 1
Demographic Characteristics of Participants (N=211)

Variables		*f*	*%*
University	Public	123	58.30
	Private	88	41.70
Department	Engineering	56	26.5
	Computer Science	68	32.3
	Management Sciences	87	41.2
Program	Undergraduate	109	51.7
	Masters	76	36
	PhD	26	12.3
Gender	Male	137	65
	Female	74	35

Measures

The questionnaire was chosen according to the objectives of the present research study and previous research. Part-I was designed to gather demographic attributes of the respondents. Part-II had questions related to the constructs used in the research. The constructs related to technical support were adapted from Volery and Lord (2000) and questions related to readiness for online learning were adapted from

Musa and Othman (2012). The questions related to student factors were adapted from Papp (2000). The questionnaire consisted of 21 statements with five point Likert scale. The scale required to mark 1 if they strongly disagreed to a particular statement and mark 5 if they strongly agreed to a given statement. The Cronbach alpha reliability was reported as .89 indicating high internal consistency.

Procedure

Prior to data collection, permissions were taken from the concerned authorities of universities. The data collection was conducted through self-administered questionnaire which was printed and distributed to the students. Majority of the sample came from undergraduate students as their population in universities is larger as compared to graduate and PhD students. The authors tried to get a balanced representation of students in the sample from the three departments (Engineering, Computer Sciences and Management Sciences). 300 questionnaires were distributed to students from which 211 usable responses were received; therefore the response rate was 70%. Data analyses were done by using the SPSS statistical software.

Ethical Considerations

The autonomy of individual respondents for this research was given due consideration by the researchers and all participation in the survey was voluntary. Confidentiality of participants and informed consent were specifically ensured. All participants were informed that their identity and individual responses were to be treated as anonymous and utilized only for the purpose of this research.

Results

The suitability of running a factor analysis was ascertained first before executing and interpreting the results. The KMO measure of sampling adequacy was .87 (commonly recommended that the value to be greater than .60) and Bartlett's test statistic was also significant indicating that the set of variables were adequately related for factor analysis (Hutcheson & Sofroniou, 1999). The questionnaire listed 21 statements relating to e-learning, which were analyzed using principal component analysis with Varimax (orthogonal) rotation.

Table 2 shows the item–total correlation values and factor loadings after rotation. The details of these factors and the underlying interpretations of their constructs are explained in subsequent paragraphs.

Table 2
Factor Loadings and Item Analysis of the Scale (N=211)

No.	Statements	Components					r_{it}
		1	2	3	4	5	
1	e-learning support at my university is very good	.80					.68
2	Can access library website, material, papers etc.	.77					.62
3	University IT infrastructure is efficient and well	.75					.70
4	There are enough computers to use and practice	.61					.62
5	Can print my assignments and materials easily	.60					.56
6	Can easily contact the instructor through the web	.55					.55
7	I interact with my classmates through the web	.44					.49
8	I learn best by absorption (sit still and learn)		.73				.40
9	I am inclined to use technology for learning.		.64				.65
10	Can easily express verbally and in writing.		.61				.57
11	I have strong time management skills.		.56				.48
12	I prefer online availability of course material		.52				.46
13	There is easy on-campus internet access		.50				.56
14	I have access to computer for eLearning purpose		.45				.53
15	I read/ respond to discussions on groups on web			.71			.59
16	Teachers place course information on the web			.68			.53

Table Continued

Table 2
Factor Loadings and Item Analysis of the Scale (N=211)

		Components					r_{it}
No.	Statements	1	2	3	4	5	
17	I learn best by construction (by participation)			.62			.49
18	I prefer online communication with other students				.70		.43
19	I find e-learning methods more effective.				.68		.41
20	I am able to learn without face to face interaction.				.65		.49
21	I attend e-learning seminars at the university					.76	.21

Note. $r_{it=}$ Item total correlation

The analysis yielded five factors explaining a total of 58.7% of the variance for the entire set of variables. The fifth factor was dropped as it had only one variable loaded on it and thus a four factor solution was considered appropriate. The factor 1 was labeled "Perceived Institutional IT support" due to high loadings by statements clustered in this area. Factor 2 was labeled "Behavioral Intention or Readiness for Online Learning", factor 3 was labeled "Student participation" and factor 4 was labeled "e-Learning adoptability". The mediation model (Fig 1) includes 3 factors so correlations between these 3 factors only were considered (Table 3). The 4th factor was handled independently, so its correlation was not considered. Table 6 presents the results of analysis using this 4th factor.

Table 3 summarizes the correlation results and it can be seen that moderately strong correlation exists between "Perceived Institutional IT support", "Readiness for Online Learning" and "Student participation". The correlations are significant and the relationship is positive linear in all three cases.

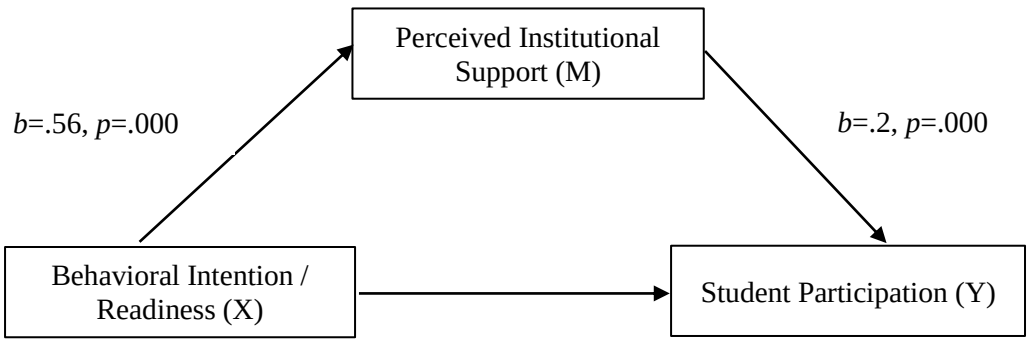
Table 3
Relationship between Perceived Institutional IT support, Readiness for Online Learning and Student Participation (N=211)

Variables	2	3	*M*	*SD*
1. Perceived Institutional IT support	.49**	.61**	3.28	.83
2. Readiness for Online Learning		.54**	3.56	.73
3. Student participation			3.40	.46

***p*<.01.

Regression analysis was used to test the hypothesis that the relationship between Readiness for online learning or behavioral intention (X) and Student participation (Y) was mediated by Perceived institutional support (M). As Figure 1 shows, the standardized regression coefficient between Readiness for online learning and Perceived institutional support was statistically significant, as was the standardized regression coefficient between Perceived institutional support and Student participation. Approximately 45% of the variance in Student participation was accounted for by the predictors (R^2 = .445). The standardized indirect effect was (.56) (.20) = .11. The significance of this indirect effect was tested using bootstrapping procedures. Unstandardized indirect effects were calculated for 10,000 bootstrapped samples, *SE*=.03 and the 95% *CI* = [.07, .17]. Thus, the indirect effect was statistically significant. These results support the mediation hypothesis.

Figure 1. Mediation Model with Standardized Regression Coefficients



Answers to other hypotheses are discussed in subsequent paragraphs.

There are gender differences in students' preferences related to e-learning. The extracted factor related to readiness for online learning was analyzed for differences in means across gender groups. An independent samples *t*-test was conducted and the results which are statistically significant are given in Table 4.

Table 4
Gender Differences on Readiness for Online Learning (N=211)

				95% *CI*		Cohen's
Variables	Gender	*M (SD)*	*t*(209)	*LL*	*UL*	*d*
1. Preference of online availability of course material	Male	3.64 (1.30)	-2.79***	-.84	-.15	.38
	Female	4.14 (1.05)				
2. Inclination to use technology for learning	Male	3.53 (1.12)	-2.39*	-.63	-.06	.33
	Female	3.88 (.74)				
3. Time management skills	Male	3.32 (1.18)	-2.89***	-.76	-.14	.40
	Female	3.77 (.87)				

*p<.05. ***p<.001.

Females have a higher preference for online availability of course material and are more inclined to use technology applications for learning. Similarly, females tend to have a higher tendency to manage time and meet deadlines.

Further, one way ANOVA was conducted to ascertain the differences in means regarding student participation in e-learning initiatives on the web considering the three groups of undergraduate, masters and PhD students. The results shown in Table 5 show that reading and responding to course discussions on the web was significantly different and was explored further.

Table 5
One Way ANOVA Comparing Students' Participation in e-Learning according to their Academic Background (N=211)

Variables	Undergrad (*n*=109)	Masters (*n*=76)	PhD (*n*=26)		
	M (SD)	*M (SD)*	*M (SD)*	*F*(2, 208)	*p*
1. Teachers place timely course information for use on the web	3.57 (.93)	3.24 (1.09)	3.5 (.99)	2.53	.08
2. I read and respond to course group discussions on the web	3.45 (.99)	3.13 (1.12)	2.85 (1.08)	4.33	.01
3. I learn best by construction (by participation and contribution)	3.57 (1.15)	3.49 (1.13)	3.19 (1.13)	1.15	.32

The results showed significant difference between groups, $F(2, 208) = 4.33$, $p = .01$). A Tukey post-hoc test revealed that reading and responding to discussions on the web course groups was statistically significantly different between undergraduate and PhD students ($p = .03$) as compared to the other groups. There were no statistically significant differences between the masters and PhD groups ($p = .46$). Similar analysis was done for department as the grouping variable. In this case, no significant differences were observed and it was concluded that e-learning participation was not different in the three departments namely Engineering, Computer Science and Management Sciences.

The factor related to student participation and adoptability of e-learning between the three groups (undergraduate, masters and PhD) was analyzed through conducting one way ANOVA. The results are placed in Table 6, and show statistically significant difference in one variable only, which is related to the students finding e-learning methods more effective as compared to conventional classroom teaching.

Table 6
One Way ANOVA for Student Adoptability for e-learning by Academic Background (N=211)

Variables	Undergrad (*n*=109)	Masters (*n*=76)	PhD (*n*=26)	*F*(2, 208)	*p*
	M (SD)	*M (SD)*	*M (SD)*		
1. I find e-learning methods more effective.	3.51 (1.17)	3.14 (1.03)	2.81 (1.20)	5.19	.01
2. I am able to learn without face to face interaction with others	3.24 (1.17)	3.28 (1.12)	2.77 (1.28)	2.00	.14
3. I prefer online communication with other students	3.65 (1.17)	3.61 (.98)	3.15 (1.12)	2.21	.11

*$p < .05$.

The results showed significant difference between groups, F (2, 208)= 5.19, p= .01. A Tukey post-hoc test revealed that finding e-learning methods more effective as compared to classroom teaching was statistically significantly different between undergraduate and PhD students as compared to the Masters group. There were no statistically significant differences between the masters and PhD groups (p = .386). Moreover, there were no significant differences among students of different academic backgrounds as far as preferring online communication and learning without face to face interaction was concerned.

Discussion

This research aimed to identify the state of student's readiness for online learning so that their participation to undertake e-learning initiatives could be enhanced. Readiness for online learning was a predictor for student participation in e-learning initiatives, however, perceived institutional support for IT related dimensions was also affecting student participation. This is backed by the finding that ICT support factor has a positive impact on the undergraduates ' attitudes towards using ICT in learning as highlighted by Meerza and Beauchamp

(2017). This finding is also consistent with previous research on the subject. ICT infrastructure has also been found to have an impact on learning climate at the institution (Vermeulen et al., 2017). The positive impact of ICT support has been found to influence student's attitude to use ICT for learning as observed by Fu (2013). Moreover, another dimension of support is in terms of teacher and peer support for the student. ICT provides the platform for communication between teachers and the students thereby contributing to positive attitudes towards use of technology for learning among students. These findings have strong implications for institutes of higher education where technology assisted instruction is likely to be employed more to augment traditional classroom learning. It was also observed that females have better preparedness for accepting e-learning initiatives and are more likely to benefit from the self-regulation required to successfully undertake online learning courses. Academic self-regulation is thus a pre-requisite for learning at own pace using technology (Akhtar & Mehmood, 2013). Females also inclined to use technology for e-learning. These results support the research of Yau & Leung (2016) who found that male students did not have more self-efficacy and positive attitude that females towards the use of technology. From this research, it is also evident that females are stronger candidates for benefitting from e-learning applications because they are able to better manage their time and also prefer utilization of technology applications for e-learning. This finding is also in accordance with Ramirez-Correa et al. (2015) who reported higher scores obtained in the use and behavioral intention of e-learning platforms in the case of females thereby showing the fading of perceived gap between males and females with regard to the adoption of new technologies. Undergraduate students were more likely to respond to discussions posted on online forums and course groups and also found e-learning methods mode effective as compared to PhD students. That is more likely since they are more inclined to explore new supportive material for their academic courses, assignments and exam preparation as compared to other students. Moreover, student participation in e-learning programs was not different in the three departments namely Engineering, Computer Science and Management Sciences as no significant differences were observed. Another important finding is the requirement of resources and institutional support for student participation in optimal uptake of learning technologies in agreement with Buchanan et al. (2013). This has strong implications for university management since provision of required resources is their responsibility.

Conclusions. The proposed mediation model presented in this paper fulfills the aim of this research to ascertain and understand student participation in e-learning initiatives based upon their readiness for online learning. The mediating variable was perceived institutional support for technical aspects of the process, and it is as per expectations because online learning initiatives cannot be implemented successfully without necessary infrastructure based upon information and communication technologies. Therefore, even if students are trained and mentally ready to adopt e-learning initiatives to augment classroom learning, their participation will be affected unless the institution has provided necessary technical support and infrastructure like an effective learning management system (LMS).

Limitations and Suggestions. A limitation of the study is the sample of students from four universities only and may limit the boundaries of generalizing the drawn conclusions from the analyzed data. The present study is also limited in the sense that it could generate extensive results based upon additional dimensions being added to explain student participation. For example, attitude towards learning technologies is a dimension that could be explored further to explain student participation in future studies. Future research can be undertaken to link the studied variables with the behavioral intention of technology adoption to make users acceptance of e-learning programs a success.

Implications. Some implications for subsequent research could include how student perceptions of learning technologies, computer self-efficacy and their prior experience of using information and communication technologies will affect their participation and adoption of e-learning systems. Moreover, identification of moderating variables and their influence on behavioral intention of adopting e-learning systems could be another area for extending the research. Implications for policy or practice could be initiatives taken by higher education institutions to promote e-learning by investing in relevant technological infrastructure and supporting its utilization.

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