Understanding students acceptance of e-learning systems: Using technology acceptance model

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Abstract

The rapid development of Information and Communication Technology (ICT) has revolutionised the world we live in. The increasing penetration of ICT has led to a new paradigm of education and learning called e-Learning; being ubiquitous it has cut across barriers of time and space to learning. Although e-Learning is in its infancy stages in India but most of the universities in India have started e-learning (MOOCs Massive Open Online Courses) as tool to disseminate knowledge. By virtue of wide recognition of e-learning this study examines factors that affect student's decision towards using e-Learning as a medium of education. Using Technology Acceptance Model (TAM) as theoretical framework, a questionnaire was administered to 315 students. Data about four constructs was collected hypothesized to describe student's acceptance of e-Learning. The constructs namely perceived usefulness, perceived ease of use, attitude toward usage and behavioural intention to use have been adopted from TAM (Davis, F. D. (1985). Data collected was analysed using structural equation modelling (Amos 20). The results showed that Perceived usefulness and Perceived ease of use significantly influenced attitude toward e-Learning and intention to use.

Keywords: Technology acceptance model; E-learning; Higher education.

INTRODUCTION

The rapid development of Information and Communication Technology (ICT) has revolutionised the world we live in and education being no exception. Technology has changed the dynamics of traditional classroom teaching. The increasing penetration of ICT has led to a new paradigm of education and learning called e-Learning which is ubiquitous as it cuts across barriers of time and space to learning. The

infusion of technology has led to e-learning platforms becoming more popular these days. The aim of e-learning is to supplement traditional teaching and not to replace it and provide an alternative channel to learning which is ubiquitous and cost efficient (Pelliccione, 2001; Adomi EE et al., 2010). The traditional methods used in classroom teaching in colleges and universities have been supplemented with technology enabled education.Although e-Learning is in its infancy stages in India but most of the universities in India have started e-learning (MOOCs Massive Open Online Courses) as tool to disseminate knowledge. Under MOOC model courses on various disciplines are offered by the universities, wherein a student can enrol himself and access the video lectures, tutorials and assignments. Once the student has learned a particular course they are assessed thereafter through online tests and certificates are awarded after successful completion of the course. Universities around the globe are using e-learning or distance platforms in addition to regular classroom teaching to support their fulltime on-campus students .Universities have adopted e-learning as an integral part of their teaching pedagogy. There are different e-learning options which institutions are offering, some institutions are using web course tools (WebCT) to enhance their learning systems. WebCT is an e-learning platform developed for higher education. Some of the pedagogical tools available for higher education on this platform are Web Course Tools, Web course Homepage System (WebCH), Blackboard learning system and System for Multimedia Integrated Learning (SMILE). The web based learning system has been widely accepted in higher education around the globe. More than 2000 higher education institutions are using WebCT to provide learning tools such as course content management, chat rooms and discussion boards. E-learning has tremendous potential which is evident from the fact it is getting significant attention from higher education institutions and software developers at large.

THEORETICAL FRAMEWORK

E-learning can be defined in many ways. (Jenkins, 2003) defines e-learning as learning facilitated and supported through utilization of information and communication technology (ICT). The cost benefits associated with e-learning platforms have given them wide acceptance. Other benefits associated are easy and flexible access, timely content availability, consistency and convenience (Cantoni et al., 2004; Kelly, 2004). Many online platforms like Course Era have emerged recently which provide e-learning in collaboration with different universities globally to provide a bouquet of certification courses. These platforms have overcome time and space barriers to provide learner centric education approach and at same time being cost efficient (Pelliccione, 2001; Adomi EE., 2010). While e-learning has offered many advantages it has certain limitations as well. High pedagogical skills, learner's self-discipline and motivation (Cantoni et al., 2004) to name a few. Security issues such as cyber-attacks and hacking in learning platforms is also an area of concern (Ramim et al., 2006). One of the major challenges in administering the online test is to authenticate the test taker as direct monitoring is not possible during online examinations. A combination of online and offline tests are been offered by the institutions to enhance the assessment of learning performance. The ICT led education model came into vogue during mid-1990's. Many researches since then have been undertaken to study learners acceptance to e-learning using technology acceptance model (TAM) however no such study has been reported in India. TAM is an intention-to-use based model developed to specifically predict or explain acceptance of technology by users. Technology acceptance model (Davis et al., 1989; Davis, 1989) is widely researched and recognised model to explain technology adoption in any area. TAM in-turn is grounded on theory of reasoned action (Fishbein et al., 1975) which

states individual's behaviour and intention to behave in a particular way is a function of attitude and subjective norms towards that particular behaviour as in Figure 1.

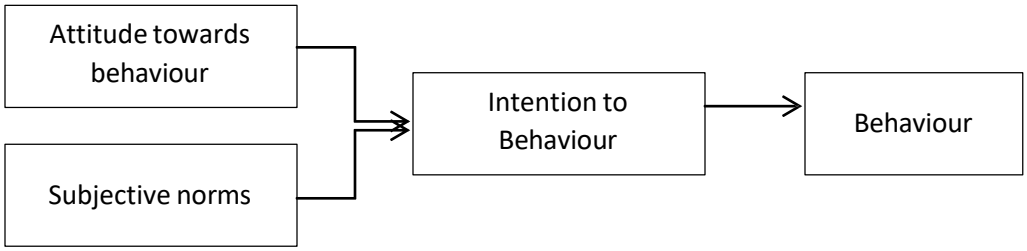

Figure 1: Theory of reasoned action

By virtue of wide recognition of e-learning and the research gap identified above this study examines student's adoption of e-Learning platforms as a learning medium.

RESEARCH MODEL AND HYPOTHESES

From application software adoption like spread-sheet applications (Mathieson, 1991), to e-learning (Roca et al., 2006), TAM has been widely used to study acceptance of users to technology. Various studies have also accentuated the fact that besides various constructs in generic TAM there are few external factors that influence users acceptance of technology indirectly through perceived ease of use and perceived usefulness. Such external factors can be categorised under Individual, Social & Organizational factors. Among these one such factor is technical support which is defined as "assistance one can get to easily use computer hardware and software products" (Ralph, 1991). Including technology support as an external variable the extended TAM used in this study is shown in Figure 2 which includes Technical Support, Perceived ease of use, Perceived usefulness, Attitude toward use, Intention to use and system use.

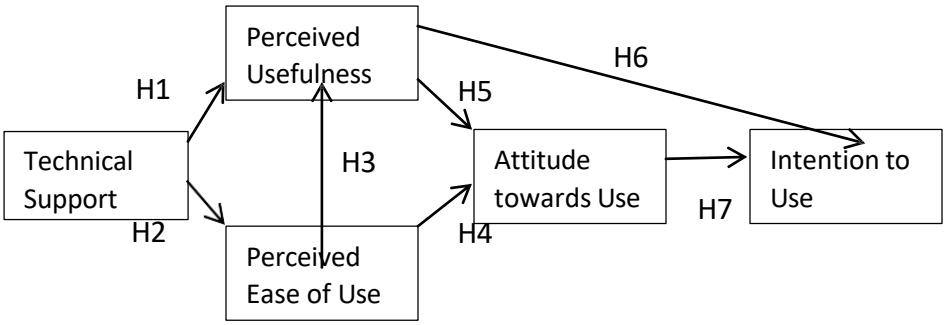

Figure 2: Research Model (Technology acceptance model for e-learning)

Ralph (1991) defined technical support as "assistance one can get to easily use computer hardware and software products". Technical support as external variable is important factor for adoption of technology in e-learning (Williams, 2002; Chung N et al., 2009; Sánchez RA et al., 2010). Thus we hypothesize:

H1: Technical Support positively affects Perceived usefulness.

H2: Technical Support positively affects Perceived ease of use.

In context of this study the perceived ease of use e-learning systems is defined as degree to users consider using e-learning systems free of efforts to use. It has also been empirically verified perceived ease of use has strong influence on perceived usefulness (Saade R et al., 2005; Adams DA et al., 1992; Moon JW et al., 2001). In similar context perceived usefulness of e-learning is defined as degree to users considers using e-learning systems will improve learning performance. Both these factors together have an effect on one's attitude towards technology (e-learning). Attitudes are evaluative statements that one has about everything. In context of this study Attitude towards use is defined as positive evaluation of user to use e-learning which in-turn has direct impact on intention to use e-learning for now and future continuance. The perceived usefulness also influences users intention to use e-learning systems (Davis et al., 1989). The intention to use directly affects System use which refers to actual usage of e-learning systems. With above discussion as premise we hypothesize.

H3: Perceived ease of use positively effects perceived usefulness.
H4: Perceived ease of use positively effects attitude towards use.
H5: Perceived usefulness effects attitude towards use positively.
H6: Perceived usefulness effects Intention to use positively.
H7: Attitude towards use positively influences Intention to use.

RESEARCH METHODS

Instrument development

For measuring various constructs of hypothesized model an instrument was developed using various research's in field of Information system and technology adoption (TAM). A questionnaire consisting of 19 items under 5 constructs along with their references are presented in Table 1. Each measurement item on instrument was measured on seven point Likert scale with (1) representing "very strongly disagree" (3) representing "neutral" (7) "very strongly agree". The questionnaire was presented to two professors with expertise in technology adoption for feedback and expert comments. Any changes desired were done as per feedback of experts. A pilot study was conducted by administering questionnaire to 50 Post Graduate students all of whom had used e-learning systems previously. The final questionnaire with 5 constructs and 19 items is presented in Table 1.

Table 1: Measurement Instrument

Construct	Item	Wording	Reference
Technical Support(TS)	TS1	A helpline is available when there is technical problem	Igbaria (1990)
	TS2	Web based support available for technical problems	
	TS3	E-mail support to resolve technical problems	
	TS4	Trouble shooting wizard is available for technical problems	
Perceived ease of use(PE)	PE1	Learning to operate an e-learning system is easy for me	Davis (1993)
	PE2	It's easy for me to gain skill to operate e-learning system	
	PE3	I found e0learning easy to use	
	PE4	Overall e-learning is easy to use	

Perceived usefulness(PU)	PU1	E-learning could improves my academic performance	Davis (1993)
	PU2	E-learning enhances effectiveness of my learning	
	PU3	E-learning in curriculum makes learning efficient	
	PU4	e-learning enables me to learn at my own pace	
Attitude towards Use(AU)	AU1	Learning using e-learning is good idea	Ajzen&Fishbein (1980)
	AU2	E-learning is easy and fun	
	AU3	I like using e-learning for learning	
	AU4	Overall I have favorable attitude towards e-learning	
Intention to Use(IU)	IU1 IU2	I intend to use e-learning in my course I will often use e-learning	Ajzen&Fishbein (1980)
	IU3	I intend to increase use of e-learning in future	

Data collection

For data collection an online survey was conducted among the students of four Universities in North India. Data was collected online using Google forms by sending out email links to the survey. A total of 300 links were sent out and 225 responses were recorded out of which 20 responses were eliminated due to incomplete data. Complete data set of 205 students (response rate=68.33%) was put to analysis. KMO and Bartletts Test were used to test sample adequacy with both being significant ($p<0.001$) and KMO value more than threshold (0.83). Out of 205 respondents 98 were males and 107 females with average age of 21.5 years with most of them being post-graduate students. The respondents were from Arts, Science and Engineering background mostly. The demographics of respondents are presented in Table 2.

Table 2: Demographics of respondents

Category		**Frequency**	**%age**
Gender	Male	98	47.8
	Female	107	52.2
	Total	205	100
Education	UnderGrad	30	14.6
	PosGrad	150	73.17
	Doctoral	20	9.75
	Others	5	2.43
	Total	205	100
Age	<=20	30	14.63

	21-25	160	78.04
	26-30	10	4.8
	>30	5	2.43
	Total	205	100
Course	Arts	65	31.7
	Science	70	34.14
	Engineering	50	24.39
	Others	20	9.75
	Total	205	100

DATA ANALYSIS AND RESULTS

Factor analysis (EFA and CFA)

For instrument development using theory-driven approach the data collected was analysed using SPSS 20. Scale Validation was done in two steps. In first step exploratory factor analysis was done in which data was put to PCA with Varimax rotation. Factor loadings greater than +- 0.5 and Eigen values 1 were extracted (Hair et al., 1998). Five stable constructs emerged with minimal cross loadings and together explaining 68.7% of variance explained in Table 3. In second step data was subjected to confirmatory factor analysis using Amos 20 and data depicted suitable model fit. The measures of model fit were: normed-fit-index=0.916, goodness-of-fit index (GFI)=0.895, comparative fit index (CFI)=0.946, adjusted goodness-of-fit index (AGFI)=0.883 and root mean square of approximation (RMSEA)=0.059.

Table 3: Factor analysis

	Component				
	1	**2**	**3**	**4**	**5**
TS1					.725
TS2					.712
TS3					.623
TS4					.724
PE1	.710				
PE2	.728				
PE3	.756				
PE4	.828				
PU1		.723			
PU2		.653			
PU3		.723			

PU4		.852			
AU1			.665		
AU2			.722		
AU3			.738		
AU4			.802		
IU1				.762	
IU2				.742	
IU3				.786	
Eigen Value	>1	>1	>1	>1	>1
Cumulative Variance (%)			68.7%		

Reliability and validity

Cronbach's Alpha coefficient was used to test the internal consistency/reliability of data. Cronbach's Alpha coefficient greater than 0.7 indicates high reliability of date however coefficient less than 0.35 indicates a poor reliability (Cuieford, 1965; Nunnally, 1978). In all the cases (constructs) the Cronbach's Alpha coefficient was well above threshold value of 0.7 thereby suggesting high reliability. Construct validity refers to degree to which two constructs are distinct. As in factor analysis using PCA with varimax rotation five stable constructs emerged with all having factor loadings on respective construct more than 0.6 it establishes the constructs convergent validity (Hair et al., 1998). The discriminant validity was verified by checking correlation among various constructs. In none of the cases correlation among constructs was reported above 0.85 thereby suggesting adequate discriminant validity.

Structural model and hypotheses testing

The research model was tested for hypothesized causal relationships between various constructs. No significant correlation or differences was found between respondents groups on basis of level of education, age and gender with dependent variables namely Intention to use and System use. As such demographic variables were dropped for further analysis. With sample size greater than 200 Structural Model Equation (SEM) was preferred over traditional regression model for testing proposed hypotheses (Loehlin, 1992). For model estimation SEM (Amos 20) was used with maximum likelihood method. The Figure 3 represents structural mode results and various model indices were CFI=0.962, NFI=0.954, GFI=0.952, AGFI=0.936, RMSEA=0.059, RMR=0.037. As the good fitness indices are there in modelall above 0.9 (Bentler et al., 1980) thus the path coefficients (standardized) can be used to test hypotheses.

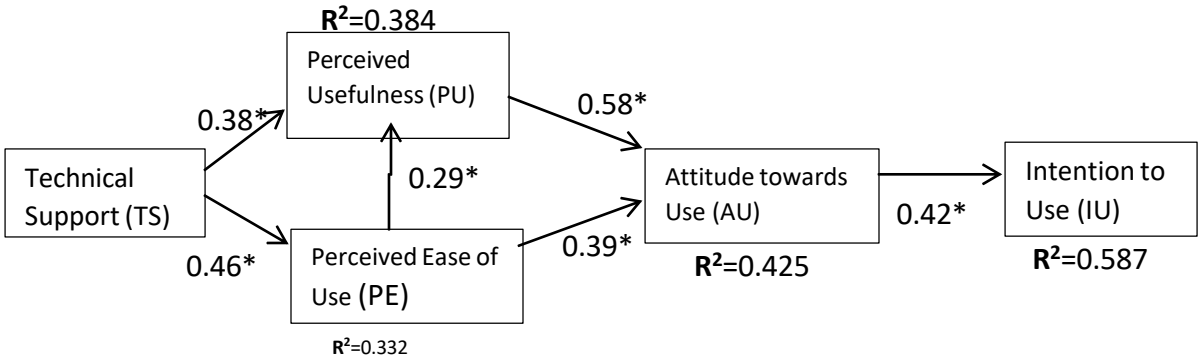

Figure 3: Structural model testing results (* p<0.001)

In hypotheses testing following relationships were found significant among various constructs. Technical support was found significantly effecting Perceived usefulness (H1) and Perceived ease of use (H2). Technical support explained 33.2% variation in Perceived ease of use. Perceived ease of use was found to have significant effect on Perceived usefulness (H3). Technical support and Perceived usefulness together explained 38.4% variation in perceived usefulness. Perceived ease of use and Perceived usefulness had significant effect on Attitudetowards use (H4 & H5) and together they explained 42.5% variation in Attitude towards use. Perceived usefulness did not have any significant effect on intention (H6) to use thus was rejected ($p > 0.05$). Attitude towards use had significant effect on intention to use (H7) and explained 58.7% variation in intention to use. The hypotheses results are enumerated in Table 4.

Table 4: Hypotheses results

Relationship	Hypotheses	Results
TS ----- PU	Technical Support is positively associated with Perceived usefulness	**H1:** Supported
TS ----- PE	Technical Support is positively associated with Perceived ease of use	**H2:** Supported
PE ----- PU	Perceived ease of use is positively associated with Perceived usefulness	**H3:** Supported
PE ----- AU	Perceived ease of use is positively associated with Attitude towards use	**H4:** Supported
PU ---- AU	Perceived usefulness is positively associated with Attitude towards use	**H5:** Supported
PU ----- IU	Perceived usefulness is positively associated with Intention to use	**H6**: Not-Supported
AU ---- IU	Attitude towards use is positively associated with Intention to use	**H7:** Supported

DISCUSSION AND IMPLICATIONS

In contemporary time it has become vital for educationists to impart learning through electronic media (e-learning) as it cuts across the time and space barriers. This study tries to examine factors that students put to evaluation while they decide whether to use e-learning systems for acquiring knowledge or not. All the hypotheses proposed in study are verified to be true with exception of one (PU –IU). Whether student will develop positive attitude towards e-learning and there by actually start using e-learning systems has been observed to be dependent how easy to use and useful student thinks of e-learning system. These factors besides other factors are dependent on how readily technical support for e-learning system is available. The results of this study are coherent with various other studies conducted on adoption of e-learning using TAM.

Implication

Previous studies have shown less consideration to external variables in TAM for e-learning adoption. This study makes Technical Support as one of the external variable to better understand adoption of e-learning. To knowledge disseminating institutes particularly college and universities the e-learning content that is made available online for knowledge dissemination or acquisition, efforts should be made to provide technical support where ever possible which should be in form of Live chats, calling, hotlines,trouble shooting, videos demonstration etc.

Limitations and implications for future research

The limitations of the study include data which was collected from students of four north Indian universities leaving aside huge number of students in other universities. Also majority of respondents were students pursuing degree courses only and in age band of 20-25 years. Thus the generalization of facts ought to be done with care. While this study highlights the intrinsic technical aspects of the e-learning system (an external variable), Studies can also be conducted to understand impact of various other r external variable (institutional, social & individual) that can significantly affect adoption of e-learning systems.

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