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## Constructs describing e-Learning Models: A Literature Review

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### **Abstract:**

*Education sector, which is the basis of human resource development of any country, could not remain immune to the penetration of Information Communication and Technology (ICT). ICT which improves the quality of education is becoming the major determinant of student's success in universities today by supporting the communication among major actors of universities. e-Learning is the result of innovative acclimatization of ICT in delivering education and learning. This study explores the various constructs which can be used in evaluating e-Learning system. For this a review of popular e-learning models (viz. DeLone & McLean, Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT)) had been conducted. It has been found that constructs used in both DeLone & McLean and TAM are crucial for evaluating e-Learning system success and certain constructs are taken from UTAUT and based on this a model is proposed and its various constructs have been tabularized which can be used in future researches for evaluating e-Learning systems.*

**Key words:** e-Learning, DeLone & McLean Model, Technology Acceptance Model

## **INTRODUCTION**

ICT (Information Communication Technology) increasingly contributing to the success of organizations. Role of ICT has shifted from back office to front of a firm's interactions with its customers. ICT has penetrated almost all major sectors be it education, supply chain, healthcare. The convenience and unrestricted reach of internet combined with latest technology in terms of software and hardware equipments forced organizations to deploy ICT for their survival in this globalized competitive age (Al-Sabawy, 2013). Digital India campaign of our honorable Prime Minister Shri Narendra Modi reflects the impact that ICT create on the growth of a country.

Information Communication technology has emerging with a new face in education system to provide e-learning. These types of e-learning systems generally based on LMS (Learning Management System) which is software to support various functionality of e-learning (Olufemi, 2008). Examples of LMS can be Moodle or Blackboard. e-Learning functionalities can be enhanced by applying latest software. The content of e-Learning can also be modified by the instructors who are using new tools to make e-learning more users friendly (Rogers 2000). Education sector, which is the basis of human resource development of any country, could not remained immune to the penetration of ICT. Georgina & Olson (2008) founded that universities are investing significant resources in the efficient improvement of ICT infrastructure development. ICT, which improves the quality of education (Turuff, 1999), becoming the major determinant of student's success in universities today by supporting the communication among major actors of universities (Ahmed et al. 2007; Al-Sabawy, 2013). According to McGill & Klobas (2009), acclimatization of ICT in education sector is a significant improvement of the last decade.

Al-Sabawy (2013), in his thesis mentioned a worth noting fact that "39 percent of all vocational education and

training (VET) activities were based on e-learning systems according to Australian Flexible Learning Framework (2009).

## **E-LEARNING DEFINITION**

e-Learning is the result of innovative acclimatization of ICT in delivering education and learning. e-Learning can be defined as providing learning with the help of computers, laptop, mobile and other electronics channel by using internet (Ozkan & Koseler, 2009). Rosenberg (2001) stressed on three basic elements for e-Learning that is it should be networked, it will reach to the customer through electronic media using internet and it should break the boundary of time and place which is an essential element of classroom learning.

As world is becoming competitive due to globalization and increasing need of knowledge and skills by industries combining with time constraints, e-learning is gaining paramount importance due to its mobility.

e-Learning has increased the importance of Information systems in the last 15 years (Wang, Wang & Shee, 2007). This development has molded the shape of traditional learning by inculcating an element of e-learning (LeePost, 2009)

e-Learning has no generalized definition most of the authors who have worked in the area of e-Learning research have defined e-Learning in their own way. Broadly e-Learning can be defined as electronic medium to learning, in other words, using electronic equipments like computer, mobile to facilitate learning through the medium of internet, which extended the reach of learning beyond time and place.

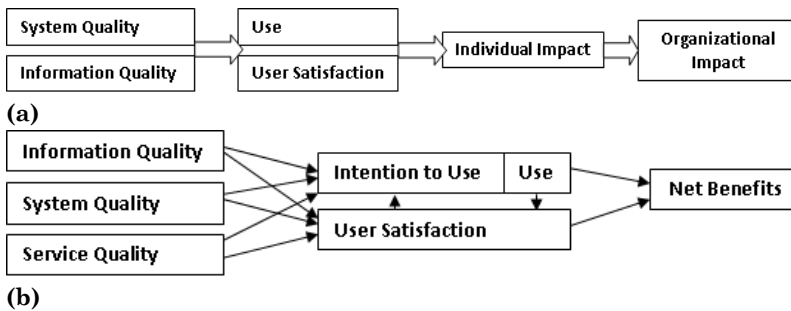
**There are three main approaches have been considered for e-learning system viz. DeLone & McLean Model, Technology Acceptance Model and UTAUT**

### **DeLone and McLean Approach (D&M Model)**

D&M model has contributed a lot in the filed of e-Learning. Various studies which have tested effectiveness of e-Learning has used D&M model and added or modified a few constructs in their research model depends on demographic or organizational differentiation in different parts of the world. Some other studies used only limited constructs of it as per their needs.

DeLone & McLean reviewed 180 research papers/articles and found six major dimensions to define the success of any information system in 1992 and then modified it after a decade in 2003.

**Figure 1**



Source: (a) DeLone & McLean model of Information System Success (1992)  
(b) Updated DeLone & McLean's model of Information System Success (2003)

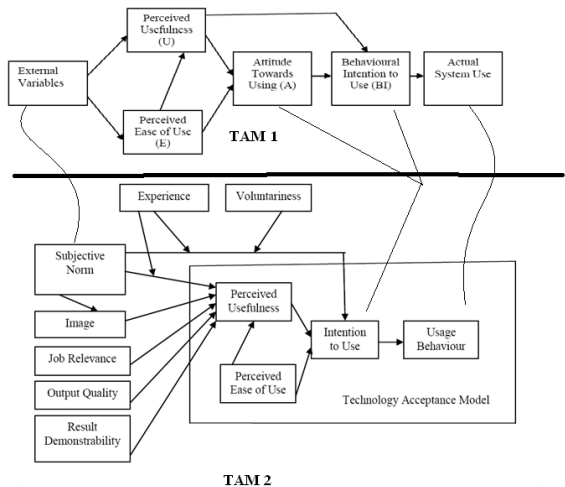
The initial model of 1992 has comprehensively described the information success model as there are six different constructs. This model became a revolution in designing the model of an information system and many authors started checking its reliability and validity in different contexts. After seeing so many reviews and modification of D&M model in a decade

DeLone & McLean updated their initial model of 1992 and include one important construct of service quality and replaced individual impact and organizational component by Net benefits and shows the relationships among various constructs. This new model was statistically found valid in evaluating information system success by Bernoider (2008). This updated model found very much useful in evaluating the success of e-business, e-government, e-banking and now it is becoming more and more attracted model for e-Learning.

### Technology Acceptance Model (TAM)

As e-Learning involves the usage of latest technology to impart learning, we need to consider how much a particular technology is accepted by the end learners. For this purpose it is necessary to understand the technology acceptance model. Lee et al. (2003) mentioned that TAM is gaining huge importance in defining the Information systems. TAM is introduced by Davis in 1986

**Figure 2**



Source: TAM 1- Technology Acceptance Model by Davis (1989)

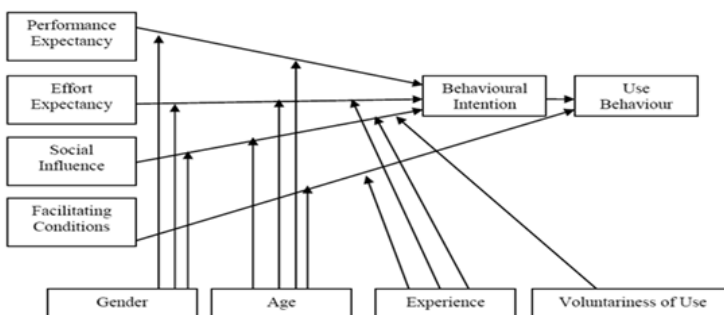
TAM2- Technology Acceptance Model by Venkatesh & Davis (2000)

We can see from the figure that initially TAM used one construct as external factor but it expanded it to five variables in its updated model of TAM 2. It added two more variables in new model viz. Experience and Voluntariness. It also combined two variables of attitude and behavior intention to use into one variable of intention to use and modified actual system use to Usage behavior. In 2008 Venkatesh & Bala further extended the TAM and add two major constructs viz. Anchor (Computer self-efficacy, computer anxiety, computer playfulness and perception of external control) and Adjustment (Perceived enjoyment and Objective usability) which act as antecedent to perceived usefulness.

### **Unified theory of acceptance and use of technology (UTAUT)**

Venkatesh et al. in 2003 reviewed eight models to analyze behavior towards using a particular information system and gave a new model termed as UTAUT. This model added demographic and social variables in addition to intention and use which are part of D&M model and TAM.

**Figure 3**



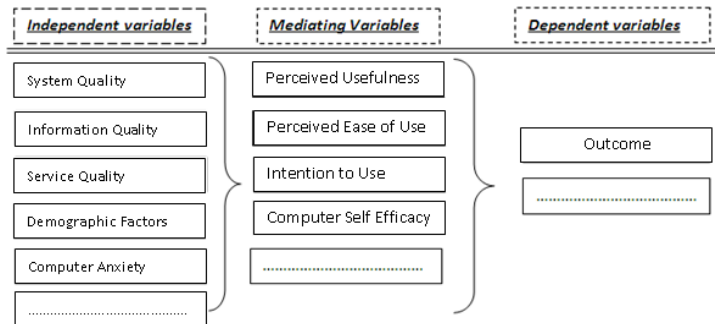
Source: Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et. al. (2003)

### **Proposed Model**

We can see from our literature review that D&M model and TAM, both are necessary for evaluating e-Learning. If we combine the two models it can be a more comprehensive model for e-learning which is applicable in organizational context as well as educational context. In this proposed model constructs can be grouped in to three different variables viz. independent variable, dependent variable and mediating variable. Mediating variable is one which tells if one variable is strongly predicting the final variable then how or why it is causing such prediction. It can also be described as a variable which defines the relation between independent and dependent variable or it is a means which tells how an independent variable influences the dependent variable (Baron & Kenny, 1986).

The independent variable can be taken from the D&M model and one more construct can be added from UTAUT as demographic factors. Two mediating variables perceived usefulness and perceived ease of use can be taken from the TAM, one mediating variable intention to use can be taken from D&M model and a new construct computer anxiety can be added in mediating constructs because if everything is ok with independent variables but a person is anxious to use computers with self direction it will be difficult for him/her to reach final outcome. Empty boxes are left behind each variable because any new independent construct can be added or modified or deleted with respect to a particular scenario, country or time period.

**Figure 4**



The variables which can explain the respective constructs are given in the following table.

**Table 1**

D&M Model	Variables		
<b>Information Quality</b> (The quality of content and information available)	<ul style="list-style-type: none"> <li>well organized</li> <li>effectively presented</li> <li>concise</li> <li>clearly written</li> </ul>	<ul style="list-style-type: none"> <li>useful</li> <li>up-to-date</li> <li>essential</li> <li>sufficient</li> </ul>	<ul style="list-style-type: none"> <li>understandability</li> <li>usability</li> <li>availability</li> </ul>
<b>System Quality</b> (The preferred features of a system)	<ul style="list-style-type: none"> <li>easy-to-use</li> <li>user friendly</li> <li>stable</li> <li>secure</li> <li>fast</li> </ul>	<ul style="list-style-type: none"> <li>good availability</li> <li>easy to learn</li> <li>responsive</li> </ul>	<ul style="list-style-type: none"> <li>user requirements</li> <li>system features</li> <li>system accuracy</li> <li>flexibility</li> </ul>
<b>Service Quality</b> (The quality of support services by the system)	<ul style="list-style-type: none"> <li>prompt</li> <li>responsive</li> <li>fair</li> <li>knowledgeable</li> <li>Contact</li> </ul>	<ul style="list-style-type: none"> <li>available</li> <li>understanding</li> <li>Efficiency</li> <li>System Availability</li> </ul>	<ul style="list-style-type: none"> <li>Fulfillment</li> <li>Privacy</li> <li>Responsiveness</li> </ul>
<b>Intention to use/ Use</b> (How much a user attract towards a particular system)	<ul style="list-style-type: none"> <li>PowerPoint slides</li> <li>audio</li> <li>script</li> <li>degree</li> </ul>	<ul style="list-style-type: none"> <li>discussion board</li> <li>case studies</li> <li>practice problems</li> <li>density</li> <li>timetable</li> <li>study material</li> </ul>	<ul style="list-style-type: none"> <li>Excel tutorials</li> <li>assignments</li> <li>practice exam</li> <li>exercises</li> <li>guidelines</li> <li>accomplishing</li> </ul>
<b>Net benefits/ Outcome</b>	Positive Aspects <ul style="list-style-type: none"> <li>enhanced learning</li> <li>empowered</li> <li>time savings</li> <li>academic success</li> <li>benefits to studies</li> <li>benefits to accomplishing degree</li> </ul>	Negative Aspects <ul style="list-style-type: none"> <li>lack of contact</li> <li>isolation</li> <li>quality concerns</li> <li>technology dependence</li> <li>use of time</li> <li>self guidance</li> </ul>	
<b>User satisfaction</b>	<ul style="list-style-type: none"> <li>overall satisfaction</li> <li>enjoyable experience</li> </ul>	<ul style="list-style-type: none"> <li>overall success</li> <li>recommend to others</li> </ul>	
<b>Usage behavior</b>	<ul style="list-style-type: none"> <li>Increasing abilities</li> <li>Understanding concepts</li> <li>Stimulation</li> <li>Social acceptance</li> </ul>	<ul style="list-style-type: none"> <li>Learning</li> <li>Accomplishment</li> <li>Fulfillment</li> <li>Employability</li> <li>Developing Learning Techniques</li> </ul>	<ul style="list-style-type: none"> <li>Responsiveness</li> <li>Effective Cost</li> <li>Community Relationships</li> <li>Good Reputation</li> <li>Organizational Goals</li> </ul>
<b>TAM</b>			



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<b>Perceived usefulness</b>	<ul style="list-style-type: none"> <li>Accomplish quickly</li> <li>Improve performance</li> </ul>	<ul style="list-style-type: none"> <li>Increasing productivity</li> <li>Easier study/job</li> <li>Overall usefulness</li> </ul>	(How much a user believe that using a particular system enhance his/her skills)
<b>Perceived ease of use</b>	<ul style="list-style-type: none"> <li>e-learning system performance</li> <li>e-learning system experience</li> <li>Students needs</li> </ul>	(How much a user feel comfortable in using the system)	<ul style="list-style-type: none"> <li>Satisfaction with the decision</li> <li>Re-use e learning system</li> </ul>
<b>Other Factors</b>			
<b>Demographic factors</b>	<ul style="list-style-type: none"> <li>Age</li> <li>Gender</li> <li>Experience</li> </ul>	<ul style="list-style-type: none"> <li>Student's status (full-time/part time)</li> </ul>	<ul style="list-style-type: none"> <li>Program of study</li> <li>Level of education</li> <li>Marital status</li> </ul>
<b>Computer self efficacy</b> (How much a user believe in his ability to use computer)	<ul style="list-style-type: none"> <li>Experience in using computers</li> <li>Time Limit</li> <li>Availability of Assistance</li> </ul>	<ul style="list-style-type: none"> <li>Demonstration</li> </ul>	
Source: Davis 1986 & 1989, Lee Post 2009, Al-sabawy 2013, Islam et al. 2011, Saade et al. 2009.			

**CONCLUSION**

This paper tries to describe various e-learning models and theories to design and evaluate e-learning system effectiveness. The main two models which are discussed in this paper are DeLone & McLean Model & Technology Acceptance model and it is found that combination of these two models will give a better analysis tool for e-learning. Any research on e-learning effectiveness can use this model and its elements to design a questionnaire and check its validity in a particular scenario.

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