

## Investigating Students' Acceptance of e-learning Effectiveness: A Case Study in Higher Education

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Access

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### ABSTRACT

High demands of comfortable and effective education atmosphere have revamped the education national policy to provide e-learning with comprehensive and attractive interactive platforms including the Massive Open Online Courses (MOOCs). One hundred and twenty-three (123) students from two (2) faculties were selected to answer the online questionnaires consisting thirty-four (34) items and the data was analysed using SPSS. The questionnaires are constructed based on the integration of technology acceptance models which are the Technology Acceptance Model (TAM) and; the Unified Theory of Acceptance and Use of Technology (UTAUT). Data analysis involved a frequency analysis and comparison of mean among variables. The interpretation of analysis was made based on the mean score table. The results obtained from the analysis indicated a high acceptance in the use of e-Learning system. Although it has been agreed that e-learning system is a helpful tool in a learning process, the quality of the system should be enhanced to increase the use of e-Learning. Findings showed that the developers should emphasise on creating an e-learning system that are useful and easy to use. Virtual interactivity element between the learners and instructors will become the future focus to produce highly effective e-learning application systems.

### Keywords:

e-learning, LMS, TAM, MOOC

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## 1 Introduction

With the rapid progress in internet technology, the e-learning has become the compulsory supporting tool for teaching delivery in higher educational institutions. The delivery of lecture has changed traditional paradigm methods from the teacher-centred to learner-centred [9]. This paradigm shift requires comprehensive and powerful e-learning systems that are able to improve the students' understanding, feel unwearingly and develop creative activity on the virtual atmosphere [1]. The emergence of e-learning system in higher educational institutions has created significant attention to executive management of educational institutions, software developers, practitioners and business organisations as it is worth their investment and can bring a good impact of cost benefits for long term planning. Among other benefits gained from this investment are reduced education cost, consistency, timely content retrieval, flexible accessibility and convenience to all entities [15]. In addition, educational institutions have spent millions in their ICT expenditure of 5 years or 10 years strategic planning to provide better service of e-learning systems to all students and instructors.

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Many educational institutions expand their teaching territories over their time and space barriers and compliment their traditional off-line class with attractive web-based online system as supporting tools. Many organizations are starting to replace the traditional face to face offline training with the non-face to face online training programs. Online training is able to save up to 40% total expenses of face-to-face training program and enhance the effectiveness of by delivering better quality of training services [16]. The success of the e-learning system depends on the implementation of educational model that addresses from the learners’ voices, the educational objectives and the direction of educational institutions vision [17]. According to the research in Egypt [7], there was 12 to 14 % of increment in the enrolment of e-learning system from 2004 to 2009. The main reason is that e-learning system gives greater access of education at anytime and anywhere in comparison with the traditional teaching methods using the face-to-face approach. E-learning has transformed learning style by giving the opportunity to learners to share knowledge easily in the virtual platforms.

Thus, this paper identifies the variables that influence the acceptance of e-learning system among students at higher educational institutions using the integration of Technology Acceptance Model (TAM) [13] and Unified Theory of Acceptance and Use of Technology (UTAUT) [22] which is appropriate to achieve the objective of the research. The findings of this research will guide system developers in planning effective e-learning models like Massive Open Online Courses (MOOCs) for students and instructors without missing any important variables or factors.

Briefly, this paper starts with the discussion on related works. Then, the following part discusses the methodology followed by findings and further discussion of data analysis. Finally, the conclusion and future works of the research are elaborated at the end of this paper.

## 2. Relate Work

This section focuses on the well-known technology acceptance models which are the Technology Acceptance Model (TAM) and; the Unified Theory of Acceptance and Use of Technology (UTAUT). These models are used to predict technology usage by looking at the variables that will influence technology acceptance. Both have several similarities that aim to understand better why users accept or reject a given technology, and how user acceptance can be improved through technology design (see Table 1).

**Table 1**  
 Similarity of variables in TAM and UTAUT

No.	Similarity Variable		Descriptions
	TAM	UTAUT	
SV1	Perceived Usefulness	Performance Expectancy	The expectation of a user that the system will be useful for the job.
SV2	Perceived Ease of Use	Effort Expectancy	The expectation that the system is user friendly and easy to use.
SV3	Attitude towards using	Social Influence	The degree to which a user perceives that important others believe he or she should use the new system.
SV4	Use	Facilitating Conditions	The degree to which a user believes that an organizational and technical infrastructure exists to support system use.
SV5	Behavioural Intention to Use	Behavioural Intention	The motivation or willingness to exert effort to perform the target behavior.

\* SV – Similarity Variable

The questions that both models focus which are: *Is the technology useful for me?* and *Is the technology easy to use?* UTAUT model adds two further questions to this list which are: *Does my social environment want me to use the technology?* and *Do I have the necessary technical and organizational infrastructure to use the technology?*

In the previous studies suggested the internal variables that influence the students' acceptance of the e-learning based on the use of TAM and UTAUT models. The following explores the previous works that implement the evaluation on e-learning based on these both models. The summary of the previous works based on the analyses of external variables are made and shown in Table 2.

**Table 2**  
 Summary of the Internal Factors on Technology Acceptance

Author(s)	Model Used	Internal Variables
Salloum [20]	Unified Theory of Acceptance and Use of Technology (UTAUT).	Performance expectancy, effort expectancy, social influence and facilitating conditions
Hanif <i>et al.</i> [12]	Technology Acceptance Model (TAM)	Result demonstrability, Subjective Norm, Enjoyment, Self-efficacy, Perception of External Control, System Accessibility.
Indahyanti [14]	Technology Acceptance Model (TAM)	perceived usefulness, perceived ease of use, and attitudes towards to use, affecting the intention to use
Andana and Elvina [4]	Unified Theory of Acceptance and Use of Technology (UTAUT)	e-learning motivation, facilitating conditions, behavioral intention.
Al-Rahmi <i>et al.</i> [2]	Technology Acceptance Model (TAM)	self-efficacy, learner interface, learning community, students' satisfaction, perceived usefulness, intention to use e-learning, e-learning effectiveness

In predicting a student's intention to use E-learning, the Unified Theory of Acceptance and Use of Technology (UTAUT) model have been used by Salloum [20] to obtain the results. The results showed that users can have enormous benefits from E-learning system. The findings revealed that all internal variables of behavioural intention to use E- learning system were reportedly found as the social influence, performance expectancy and facilitating conditions of learning. Hanif *et al.* [12] proposed a study to develop and present a model of e-learning system adoption based on the technology-acceptance model (TAM). The study examined several external variables for the present-world students brought up as digital learners and have higher levels of computer literacy and experience. The work explored and developed relationships between the perceived usefulness (PU) and perceived ease of use (PEOU) of the e-learning system. Results indicated that subjective norm, perception of external control, system accessibility, enjoyment and result demonstrability have a significant positive influence on perceived usefulness and on perceived ease of use of the e-learning system.

Sharma *et al.* [21] attempted to develop a causal and predictive statistical model for predicting instructor e-learning acceptance using The Structural Equation Model (SEM) and Neural Network (NN). The results demonstrated that system quality, personal innovativeness, service quality and technology experience have a statistically significant influence on continuous usage of e-learning by instructors. Indahyanti [14] used the Technology Acceptance Model (TAM) to measure variables influencing students' acceptance of Learning Management System (LMS) using TAM model. The

results showed that the TAM was valid, reliable and substantially acceptable based on the results of data evaluation.

The work by Andana and Elvina [4] to study the implementation of ClassCraft E-Learning tool in the university was based on the model of the Unified Theory of Acceptance and Use of Technology (UTAUT). Findings presented that the significant variables affecting users to receive and use the Classcraft at the university were E-Learning Motivation and Behavioural Intention. This means that user's interest in Classcraft is important as it affects the users in implementing Classcraft; so, these variables should be maintained. Al-Rahmi *et al.* [2] proposed a work on evaluating the e-learning effectiveness in Universiti Teknologi Malaysia (UTM). The results showed that e-learning use was positively and significantly related to students' satisfaction, in which usefulness impacted the intention to use in turn affected e-learning effectiveness. Apart from that, the findings showed that e-learning facilitated academic experience of the participants, making them to have the intention to use e-learning.

Although the terms used in each of these studies vary, all the terms are essentially representative of the variables described in both models. Thus, this study will use the integration of TAM and UTAUT models as a suitable approach in evaluating user acceptance of e-learning.

### 3. Methodology

#### 3.1 Population and Sampling

The population for this study involved students from the Universiti Teknologi MARA at Penang Branch. One hundred and twenty-three students mostly from Faculty of Engineering and Faculty of Pharmacy were selected as a sample for this study. Sample was formed using cluster sampling where a few classes from the corresponding faculties were selected as a sample. All faculties have introduced e-learning as a learning tool to support the traditional face-to-face lectures; therefore, all respondents were assumed to have relevant experience with online educational systems. Data was collected among the students using an online questionnaire, which was made based on instruments used in similar studies.

#### 3.2 Instrumentation

In this section presents methodology in constructing the questionnaires. The internal variables that used in this study were derived from the integration of variables that proposed in both models, the TAM and UTAUT models, which were obtained from the results of investigations of literature review. This study adopted the self-administered questionnaire divided in two parts. The first part consisted of five questions on demographic profile and six general questions pertaining the e-learning system. The questions included students' age, gender, level of education, field and faculty. The second part consists of five variables considered to be the variables of e-learning system acceptance in this study including quality, e-learning self-efficacy, enjoyment, accessibility and computer playfulness.

In Table 3 shows the summary of the variables that used in this study. This table listed the factors dan the descriptions of the factors as well as the similarity variables resulted from the integration of TAM and UTAUT. From this, the factors that used in our study in line with the factor dan proposed in TAM and UTAUT models with intentions to all five variables in TAM and UTAUT models. The questionnaire comprised 34 items rated on a five-point Likert scale, which are strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1).

**Table 3**  
 Summary of the Internal Factors on Technology Acceptance

Factor	Descriptions	*Similarity Variable (SV)
e-Learning System Acceptance	Look on how far the e-learning system provides easiness, usefulness, attractive interaction and comprehensive learning environment for the learners to understand the subject matters. Furthermore, the system acceptance measures additional attributes such as frequency of usage, dependency degree on the system and possibility to recommend or promotes system positive impact to others.	SV1, SV2
Quality	This variable focuses on the valuable, relevancy and arrangement of the contents in the e-learning systems, impact of the features and appearances, respond time, real-time data and information which affects the confidence and trust level of the learners.	SV4
e-Learning Self Efficacy	Beliefs in students' capabilities in accomplishing activities in e-learning and improving satisfaction. Student also confident and have a good skill in using the e-learning system without any helps.	SV5
Enjoyment	A student's subjective feeling of joy, pleasure and positive experience in using e-learning system. Enjoyment act as a catalyst to encourage students learning initiative using e-learning system.	SV3
Accessibility	Accessibility implies that the system can be used conveniently and frequently. Supporting facilities provided by organizational play an important role in an individual's decision to use the system and thus provide a platform in communication among users.	SV4
Computer Playfulness	The expected enjoyment, creativity and exploration gain from the used of the system. The activities of using the system can help users to improve their imagination.	SV3

\*Similarity Variable (SV) based on the integration of TAM and UTAUT (refer Table 1)

### 3.3 Data Analysis

#### 3.3.1 Reliability test

Reliability test is well-defined as the level to which a questionnaire, test, observation or any measurement practice creates the same results on frequent trials [5]. The reliability of this study was tested using Cronbach's Alpha ranging from zero to one with zero showing complete unreliability and a value of one representing perfect reliability. The description of the reliability level shows in Table 4.

**Table 4**  
 Range of Cronbach's Alpha

No	Coefficient of Cronbach's Alpha	Reliability Level
1	More than 0.90	Excellent
2	0.80 – 0.89	Good
3	0.70 – 0.79	Acceptable
4	0.60 – 0.69	Questionable
5	0.50 – 0.59	Poor
6	Less than 0.50	Unacceptable

Source: Adopted from George and Mallery [10]

### 3.3.2 Descriptive Statistics

Responses on demographic information were recorded and analysed using the calculated frequencies. Respondent's preferences were determined by comparing the frequencies among the variables. On the other hand, the mean for each variable was calculated and the result was described according to the mean score interpretation method as shown in Table 5.

**Table 5**  
Mean score interpretation

Mean Score	Interpretation
1.00 – 1.80	Very low
1.81 - 2.60	Low
2.61 – 3.20	Medium
3.21 – 4.20	High
4.21 – 5.00	Very high

Source: Moidunny [18]

## 4. Results and Discussion

### 4.1 Reliability Analysis

The summary of the Cronbach's Alpha for all variables is shown in Table 6. It was clear that all variables reaching the values related to Cronbach's Alpha were greater than 0.78, which suggest a high degree of validity and reliability of all variables. According to George and Mallery [10], an alpha of 0.80 is probably a reasonable goal. Besides, the values of Cronbach's Alpha confirmed that there was a consistency of measurement items for all variables.

**Table 6**  
Summary of Cronbach's Alpha

Variable	No of items	Cronbach's Alpha	Result
e-learning system acceptance (DV)	13	0.956	Excellent
Quality	9	0.925	Excellent
e-learning self-efficacy	3	0.779	Acceptable
Enjoyment	3	0.850	Good
Accessibility	3	0.852	Good
Computer Playfulness	3	0.900	Excellent

### 4.2 Demographic Analysis

This study was conducted among 123 respondents where 81 respondents were males and 42 females. All respondents were young adults below the age of 30 years old. Regarding the academic qualification, 76.4% were diploma students while 23.6% were degree students. Today, handheld smart devices are very common among students to keep in touch with course materials and explore additional resources for learning. In this study, it was seen from Table 7 that most of the respondents are well oriented with the e-learning system where more than half of them (52.8%) have been experiencing e-learning for at least one to three years, thus indicating that computer skill was not an issue in this sample. It was also revealed that 51.2% of respondents were aware of e-Learning from

their lecturers. Lecturers are the important influencers who are able to engage their students with online learning classes or online assessments, leading them to use e-learning system.

Al-rahmi *et al.* [2] stated that most students learned about e-learning system from their lecturers. Besides lecturers, 16.3% of the respondents learnt from friends, 13% from website and media while magazines (0.8%) and books (5.7%) gave the lowest percentage of awareness about e-learning. As for the time spent in e-learning, only 13.8% would spend their time every day but most of them (49.6%) would spend a few times in a week. In addition, in terms of purpose in using e-learning, 69.1% agreed that it is easy to use, 59.3% use it to get materials, 46.3% because of the faculty request and 26.8% use it because they like it. With regards to the medium used, most of them showed preferences on mobile device and desktop PC compared to laptop and other medium. Detailed descriptive demographics of the respondents are shown in Table 7 below.

**Table 7**  
Descriptive analysis

Measure	Item	Frequency	Percentage
Gender	Male	81	65.9
	Female	42	34.1
Experienced in e-learning	<1 (in year)	26	21.1
	1 - 3	65	52.8
	4 - 6	20	16.3
	>6	12	9.8
Where do you usually access the e-Learning system	Classroom	84	68.3
	Lab	29	23.6
	library	48	39.0
	Hostel	97	78.9
	hotspot	49	39.8
Time spent in e-learning	Every day	17	13.8
	A few times a week	61	49.6
	Occasionally	40	32.5
	Rarely/never	5	4.1
Purpose in using e-learning	Easy to use	85	69.1
	Faculty request	57	46.3
	Get material	73	59.3
	I like to use	33	26.8
Medium used to access e-learning	Laptop	62	50.4
	Desktop PC	102	82.9
	Mobile device	109	88.6
	Others	12	9.8
First hear about e-Learning	Lecturer	63	51.2
	Website	16	13
	Friend	20	16.3
	Book	7	5.7
	Magazine	1	0.8
	Media	16	13.0



### 4.3 Descriptive Statistics

The research model included six variables namely system acceptance, quality of the system, self-efficacy, enjoyment, accessibility and playfulness. Each variable was measured with multiple items. Respondents were asked to answer each of the questions using a five-point Likert scale (as in section instrumentation).

Regardless of gender, the analysis of means in Table 8 below shows that the mean of system acceptance has the highest value among all variables. With reference to Table 8, the value 3.6742 for system acceptance in Table 8 indicates that the e-learning system is highly accepted and has a potential in assisting learners with learning tools in their leaning process. However, the mean 3.1174 for the quality of the e-learning shows that the system needs to be improved for user's satisfaction. System quality influences system usage intention and subsequent system usage [6]. MOOC usage intention is influenced by computer self-efficacy, performance expectancy and system quality [8].

According to Lee *et al.* [16] , if the quality of e-learning improves, it suggests that the learners tend to be more positive towards e-learning. Alla *et al.* [3] stated that high level of system quality will attract learners and increase their rate of using e-learning system. From the overall results obtained in Table 8, it can be concluded that respondents are capable and have a good skill in using e-learning as well as belief that e-learning is an important tool for them. Most of the respondents agreed that the accessibility of e-learning system is good. Table 7 presents the result for the location where respondents usually access the internet, whether it is from their hostel or hotspot. It was seen that the institution has provided its students with a good internet access supported by the high mean for enjoyment in using the e-learning. Furthermore, the mean 3.66 for playfulness indicates that the respondents were more likely to use the system if it is playful.

**Table 8**  
Analysis of Mean

	System Acceptance	Quality	Self-Efficacy	Enjoyment	Accessibility	Playfulness
Mean	3.6742	3.1174	3.5339	3.6450	3.5393	3.6558
Standard Deviation	0.75902	0.67050	0.75355	0.82729	0.77591	0.81419

### 5. Conclusion and Further Works

Based on the findings analysis, the variables of system quality, information quality and accessibility have been seen correlated relatively to e-learning systems success. These findings are aligned with those by Hadullo *et al.* [11] whereby the system and information played the important roles in the success of the e-learning quality. The four main components of e-learning system such as instructors, learners, contents and technologies are the determinants for the performance, successfulness and the integrity of e-learning [19].

In addition, e-learning acceptance, self-efficacy, computer playfulness and enjoyment have positively influenced the students' perceived ease of use and usefulness of e-learning systems. Furthermore, perceived usefulness and ease of use have led to an increase in students' intention towards using e-learning; however, perceived ease of use has been found to be the most significant factor affecting the students' intention and their actual use of such systems despite the time and location of accessibility. Conclusively, the findings portrayed that the developer is responsible in creating an e-learning system or Learning Management System (LMS), which is useful and easy to use.



Future works of this research should be expanded on the expects of learners and instructor's interactivity effectiveness using the e-learning systems. To date, many e-learning systems provide the platform for open discussion or forum through e-learning systems and interestingly, part of students actively participate effectively in the discussion, some act as observers, passive users and those who are missing in virtual world. Further study should be done to investigate the contributing factors and how to overcome this issue.

Conclusively, the findings from this study would give the ideas specifically for the system developers and established ICT business organisations for improving their e-learning systems like Massive Open Online Courses (MOOCs). Furthermore, this will encourage the learners and instructors to make use of the e-learning systems as comprehensive assisted supporting tools and ultimately realise the vision of higher education institutions to produce the world class graduates and highly demanded among the top industries or corporate companies.

## References

- [1] Al-Rahmi, Waleed Mugahed, Norma Alias, Mohd Shahizan Othman, Ahmed Ibrahim Alzahrani, Osama Alfarraj, Ali Ali Saged, and Nur Shamsiah Abdul Rahman. "Use of e-learning by university students in Malaysian higher educational institutions: a case in Universiti Teknologi Malaysia." *Ieee Access* 6 (2018): 14268-14276.  
<https://doi.org/10.1109/ACCESS.2018.2802325>
- [2] Al-rahmi, Waleed Mugahed, Mohd Shahizan Othman, and Lizawati Mi Yusuf. "The effectiveness of using e-learning in Malaysian higher education: A case study Universiti Teknologi Malaysia." *Mediterranean Journal of Social Sciences* 6, no. 5 (2015): 625-625.  
<https://doi.org/10.5901/mjss.2015.v6n5s2p625>
- [3] Alla, M. M. S. O., Qais Faryadi, and Norasikin Binti Fabil. "The impact of system quality in e-learning system." *Journal of Computer Science and Information Technology* 1, no. 2 (2013): 14-23.
- [4] Haris, Darius Andana, and Elvina Sugito. "Analysis of factors affecting user acceptance of the implementation of ClassCraft E-Learning: Case studies faculty of information technology of Tarumanagara university." In *2015 International Conference on Advanced Computer Science and Information Systems (ICACSIS)*, pp. 73-78. IEEE, 2015.  
<https://doi.org/10.1109/ICACSIS.2015.7415161>
- [5] Bolarinwa, Oladimeji Akeem. "Principles and methods of validity and reliability testing of questionnaires used in social and health science researches." *Nigerian Postgraduate Medical Journal* 22, no. 4 (2015): 195.  
<https://doi.org/10.4103/1117-1936.173959>
- [6] Delone, William H., and Ephraim R. McLean. "The DeLone and McLean model of information systems success: a ten-year update." *Journal of management information systems* 19, no. 4 (2003): 9-30.  
<https://doi.org/10.1080/07421222.2003.11045748>
- [7] El-Seoud, Samir, Naglaa Seddiek, Islam Taj-Eddin, Pauline Ghenghesh, and Mahmoud El-Khouly. "The effect of e-learning on learner's motivation: A case study on evaluating e-Learning and its effect on Egyptian higher education." In *The International Conference on E-Learning in the Workplace*, pp. 12-14. 2013.  
<https://doi.org/10.1109/ICL.2013.6644685>
- [8] Fianu, Eli, Craig Blewett, George Oppong Appiagyei Ampong, and Kwame Simpe Ofori. "Factors affecting MOOC usage by students in selected Ghanaian universities." *Education Sciences* 8, no. 2 (2018): 70.  
<https://doi.org/10.3390/educsci8020070>
- [9] Gelisli, Yucl. "The effect of student centered instructional approaches on student success." *Procedia-Social and Behavioral Sciences* 1, no. 1 (2009): 469-473.  
<https://doi.org/10.1016/j.sbspro.2009.01.085>
- [10] George, Darren, and M. Mallery. "Using SPSS for Windows step by step: a simple guide and reference." (2003).
- [11] Hadullo, Kennedy, Robert Oboko, and Elijah Omwenga. "A model for evaluating e-learning systems quality in higher education in developing countries." *International Journal of Education and Development using ICT* 13, no. 2 (2017).
- [12] Hanif, Aamer, Faheem Qaisar Jamal, and Muhammad Imran. "Extending the technology acceptance model for use of e-learning systems by digital learners." *Ieee Access* 6 (2018): 73395-73404.  
<https://doi.org/10.1109/ACCESS.2018.2881384>
- [13] Holden, Heather, and Roy Rada. "Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance." *Journal of Research on Technology in Education* 43, no. 4 (2011): 343-367.  
<https://doi.org/10.1080/15391523.2011.10782576>
- [14] I Indahyanti, Uce, and Sukarjadi Sukarjadi. "Applying the technology acceptance model to measure the learning

- management system acceptance by students of Politeknik Sakti Surabaya." *Jurnal Teknologi* 72, no. 4 (2015).  
<https://doi.org/10.11113/jt.v72.3927>
- [15] Kelly, Thomas M., and Diane K. Bauer. "Managing intellectual capital—Via e-learning—At Cisco." In *Handbook on knowledge management*, pp. 511-532. Springer, Berlin, Heidelberg, 2003.  
[https://doi.org/10.1007/978-3-540-24748-7\\_24](https://doi.org/10.1007/978-3-540-24748-7_24)
- [16] Lee, Byoung-Chan, Jeong-Ok Yoon, and In Lee. "Learners' acceptance of e-learning in South Korea: Theories and results." *Computers & Education* 53, no. 4 (2009): 1320-1329.  
<https://doi.org/10.1016/j.compedu.2009.06.014>
- [17] Liaw, Shu-Sheng. "Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system." *Computers & education* 51, no. 2 (2008): 864-873.  
<https://doi.org/10.1016/j.compedu.2007.09.005>
- [18] Moidunny, K. "The effectiveness of the national professional qualifications for educational leaders (NPQEL)." *Unpublished Doctoral Dissertation, Bangi: The National University of Malaysia* (2009).
- [19] Romi, Ismail M. "A model for e-Learning systems success: systems, determinants, and performance." (2017).  
<https://doi.org/10.3991/ijet.v12i10.6680>
- [20] Salloum, Said A., and Khaled Shaalan. "Factors affecting students' acceptance of e-learning system in higher education using UTAUT and structural equation modeling approaches." In *International Conference on Advanced Intelligent Systems and Informatics*, pp. 469-480. Springer, Cham, 2018.  
[https://doi.org/10.1007/978-3-319-99010-1\\_43](https://doi.org/10.1007/978-3-319-99010-1_43)
- [21] Sharma, Sujeet Kumar, Avinash Gaur, Venkataramanaiah Saddikuti, and Ashish Rastogi. "Structural equation model (SEM)-neural network (NN) model for predicting quality determinants of e-learning management systems." *Behaviour & Information Technology* 36, no. 10 (2017): 1053-1066.  
<https://doi.org/10.1080/0144929X.2017.1340973>
- [22] Venkatesh, Viswanath, Michael G. Morris, Gordon B. Davis, and Fred D. Davis. "User acceptance of information technology: Toward a unified view." *MIS quarterly* (2003): 425-478.  
<https://doi.org/10.2307/30036540>