Review on Factors Influencing User Acceptance of Cloud-Based Learning System in Higher Education

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Abstract

Cloud based learning system offers the possibility of educational communication and enhance pedagogical frameworks in educational institutions. There are numbers of cloud based learning system implementations in higher education, however, studies which integrates and analyzed factors influencing user acceptance of cloud based learning in higher education are scarce to guide in adoption decision. This paper review factors influencing user acceptance of cloud based learning as well as theories used based on systematic review to determine the current state of art and provide direction for future research.

The findings shows that security, trust, usefulness, ease of use, benefits, performance, expectancy, social influencing, effort expectancy, and facilitating conditions were among the high frequent factors influencing user adoption of cloud based learning. Furthermore, technology acceptance model (TAM), quantitative approach and structural equation modeling (SEM) were found to be widely used in the previous studies.

It was recommended that integration of theories are needed to uncover more factors influencing user acceptance of cloud based learning. In addition, the use of the qualitative studies or mixed approaches using advance statistical analysis was recommended for better results.

This paper offers another valuable literature in the domain of factors influencing user acceptance of technology and provide direction for future works.

Keywords: Cloud based system, critical factors, higher education, influencing, success factors, mobile cloud based system, structural equation modeling, technology acceptance model

1. Introduction

The cloud based system is an emerging technology that allows user to share computing resources at anytime anywhere. This new technology can be beneficial to educational institution in offering flexibility, on-demand services, resources accessibility, and can enhance teaching and learning in higher education [3] [13][37]. The emergence of this new technology has caused a paradigm shift in the educational technology and enables wide application in business organizations, individual usage, and educational usage [29]. Learning through mobile devices are limited in processing power, storage capacity, hardware and software limitations, however, cloud computing optimized these limitations and offer significant benefits to educational communication to enhance pedagogical framework. The cloud based learning system as an emerging technology can be access by mobile device to offer flexible, anywhere at any time learning without the installation of the applications on mobile device.

However, despite the fast growing popularity of cloud-based learning system, many researchers pointed to the limited studies at the user level [22] [8] [20] [19] [3] [4]. A number of studies have argued that the greatest challenges facing cloud-based system adoption is not the technological, but perceptional attitude [13] [9] [8] [4]. There are few studies that discussed how users' experiences are shaped in the cloud based learning context, and what are the critical factors influencing users' intention and satisfaction to use this emerging technology [22][19][4]. In other words, there are limited understanding of critical factors influencing user acceptance of cloud based learning system to guide decision makers in the adoption process in higher education.

The major concerns of this review is that a number of higher education institutions and related organizations are aware about the benefits of this emerging technology, but lacked clear and focused understanding of critical factors influencing users' desire and satisfaction to guide in adoption process[22][19][9].

Although cloud based learning offers benefits to higher education institution, it's worth understanding to note that this alone cannot guaranteed the use and satisfaction by users. Therefore, it is worth noting for researchers and practitioners alike to investigate whether users are willing to use this technology and the level of satisfaction in order to get benefits to institutions. However, the success of implementing a new information system depends on desire of potential user to accept it [24] [3] [19]. In order to avoid possible post-implementation risk, stakeholders need to understand the critical factors influencing users' desire and satisfactions to guide in adoption process [24].

Thus, the objective of this review is to identify critical factors influencing users' acceptance of cloud based learning system as well as theories used to provide directions in future work.

This paper is thus organized as follows. Section two presents the materials and methods used to explore critical factors influencing users' acceptance of the cloud based learning system. Section three discussed the results obtained from the literature. Fourth section discusses the findings. Finally, section five discussed the conclusions and further works.

2. Materials and Methods

The success of implementation and adoption of cloud based learning especially in higher education is depending on many related factors, because cloud based system are delivered in various forms as well as models in a socio-technical environment. These factors are limited and still unclear that need further investigations [19] [22] [3]. To identify these factors, the review process has followed Kitchenham [20] approach which consists of the following activities: Define research question, Define search keywords, Select electronic resources, Search process, Match inclusion and exclusion criteria, and Extract factors.

This approach is discussed as follows:

2.1 Defining Research Question

The review of literature shows that critical factors influencing user acceptance of cloud based learning is still unclear and limited in scoped. Thus, the research question is: What are the critical factors influencing users' acceptances of cloud based learning in higher education? The essences is to identify these factors that are influencing users' desire and satisfaction to use cloud based learning to guide decision makers in the adoption decision and provide directions for future works.

2.2 Define Search Keywords

The following set of keywords and terms have been defined based on research context and research question. These keywords and terms are used as the criterion to select relevant literature. Study abstract, title, keywords that matches study keywords was selected for next process. The following search terms and keywords are used under the following domains:

Cloud Based learning domain: Mobile cloud computing system*, Mobile cloud learning, mobile devices, Cloud-based e-learning, Software as services, Platform as a services, and Infrastructure as a services*

Factor Domain*: Factors, constructs, impacts, attributes, Issues, Characteristics, success, affecting, influencing, User, Acceptance, Adoption,*

Higher Education Domain*: Higher educational institutions, Undergraduates, higher schools and Student*

2.3 Selected Resources

In this review process, in order to ensure that it is contributing to knowledge, the search terms and keywords was assessed with the help of Science Direct, Springer Link, IEEE Xplore, Emerald from the year 2012 to 2016.

2.4 Search Process

The potential papers are selected automatically as the result of the search process. The abstract and key terms of the papers were matched with the search string and terms. If the selected paper matches search terms, then the paper is selected else it is rejected. All the mentioned electronics sources above are iterated to select potential papers, and only papers which match search terms are used in identifying the factors influencing user adoption of cloud based learning as well as the theories used.

2.5 Match inclusion and exclusion criteria

In order to select the most relevant and valuable articles that are amenable to this review paper and question, the inclusion and exclusion criteria have been defined as follow:

- ❖ Inclusion criteria are studies that addressed user factors in:

• Cloud based learning/Cloud based mobile learning/Cloud based e-learning

• Factors influencing user acceptance of Cloud based learning system/Cloud based mobile learning/Cloud based e-learning

• Studies in educational learning & related, and are written in English language

- ❖ Exclusion criteria are studies that do not addressed user Factors:

• Technical aspects of Cloud based learning system/ Cloud based mobile learning/Cloud based e-learning

• Not focusing on factors influencing user acceptance of technology.

2.6 Extract factors

In order to address the research question; twenty six articles have been selected to address the research question and meeting the study objectives, and the results of the search process are discussed in the section 3.

3. Results

In order to identify possible critical factors and to answer the research questions; twenty six selected articles were critically examined. The information of these articles was extracted and then frequencies of factors which occurred more than once were computed to identify most frequent factors, research approach, and theories used. Table I show the related existing works and Table II provide details of the factors with the References and frequencies.

Table I: Related existing studies

Author(s)/Year	Adoption Model(s)	Method(s) Of data collection	Respondents	Focused
[36][27][28][23][7] [21][19][26][35]	No adoption models were used in these studies	Questionnaire /interview	students	Benefits, challenges and factors in cloud computing adoption
[10][1][11][30][5] [2]	TAM	Questionnaire	Students	Ease of use, usefulness and other factors such security, trust, privacy for adoption of cloud based system among students
[12][6][16]	UTAUT	Questionnaire	Students	Effects of the constructs of UTAUT and moderators on cloud adoption on students
[25][14]	UTAUT2	Questionnaire	Students	Effects of new constructs such as habit, price-value, experience on students' intention to accept cloud based learning system
[17]	Channel expansion theory	Questionnaire	Students	Effects Design content, support, attitude on VLE adoption
[18]	Self-determinant theory & Channel expansion theory	Questionnaire	Students	Effects Design content, support, attitude on cloud based adoption

[15]	TAM/ANT	Questionnaire	Students	Effects of human factors on leveraging cloud based system adoption
[31]	SQ/SE/TAM/ DOI/TPB & TRA/MM	Questionnaire	Students	To determine the exploratory of these models through comparison approach
[29]	TAM/TTF	Questionnaire	Students	Effects of ease of use, usefulness, task on cloud adoption decision
[32]	TPB	Questionnaire	students	Effects of attitude on adoption of cloud based system
[33]	DEMETAL/ TAM	Questionnaire	Students	Effects of perceived ease of use, usefulness on cloud based adoption decision

Table II: Factors influencing user acceptance of Cloud based system

Factors	Frequency	References
Service Quality	2	[17][18]
System Quality	2	[18[35]
Self-efficiency	4	[17][18][35][36]
Output Quality	2	[17][36]
Perceived external control	2	[17][31]
competitive pressure	3	[17][18]
Technology readiness	2	[31][35]
Availability	3	[17][18][13]
Gender	2	[14][25]
Age	2	[14][25]
Experiences	2	[14][25]

Accessibility	3	[23][36][40]
Habit	2	[14][25]
Price-value	2	[14][25]
Facilitating condition	6	[12][14][16][6][25][5]
Social Influence	6	[12][14][16][6][25][5]
Performance Expectancy	6	[12][14][16][6][25][5]
Benefits	2	[14[25]
Subjective Norm	4	[1][2][33][31]
Satisfaction	2	[10][31]
Speed	4	[5][11][35]
Collaboration and Sharing	2	[31][31]
Anxiety	4	[2][10][35][5]
Connectedness	2	[3][31]
Ease of use	8	[3][31][5][17][18][7][1][10]
Storage	2	[10][31]
Usefulness	8	[3][31][5][17][18][7][1] [10]
Mobility	8	[3][31][5][17][18][7][1][17]
Portability	2	[25][26]
Trust	15	[3][31][5][17][18][7][1] [10][18][11][19][31][30][26][25]
Support	2	[10][31]
Cloud characteristics	2	[31][40]
Cost	7	[36][5][35][12][31][42]
Privacy/Security	17	[3][31][5][17][18][7][1] [10][18][11][19][31][30][26][25][8][1]
Hedonic Motion	2	[14][25]
Attitude	7	[3][31][5][17][18][7][1][10]

4. Findings and Discussions

4.1 Critical Frequent Factors

The review and analysis of the articles resulted in extracting thirty six critical factors that have been used frequently by previous studies; this was obtained by simply obtaining the frequency of the factor. It shows that security, trust, ease of

use, usefulness, Benefits, performance expectancy, effort expectancy, social influence and facilitating conditions were among the high most frequent factors influencing the adoption of cloud based learning.

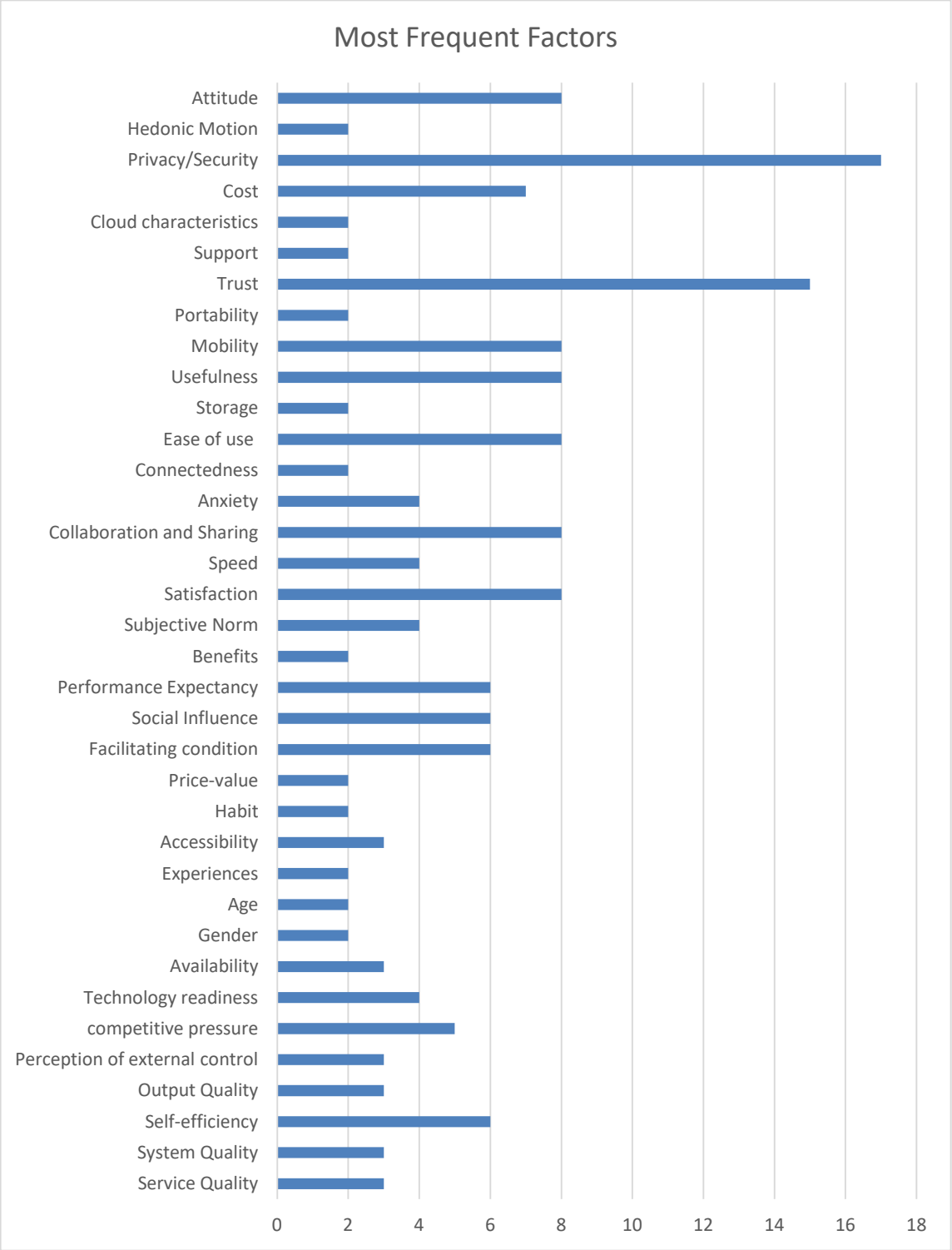

Fig. 1: Most Frequent Factors

4.2 Adoption Theories Used

This section presents theories that have been used by previous studies as presented in Fig. 2. The findings show that technology acceptance model (TAM) is the most used theory, followed by unified theory of acceptance of use of technology (UTAUT) and UTAUT2). There are four studies which integrated models. .

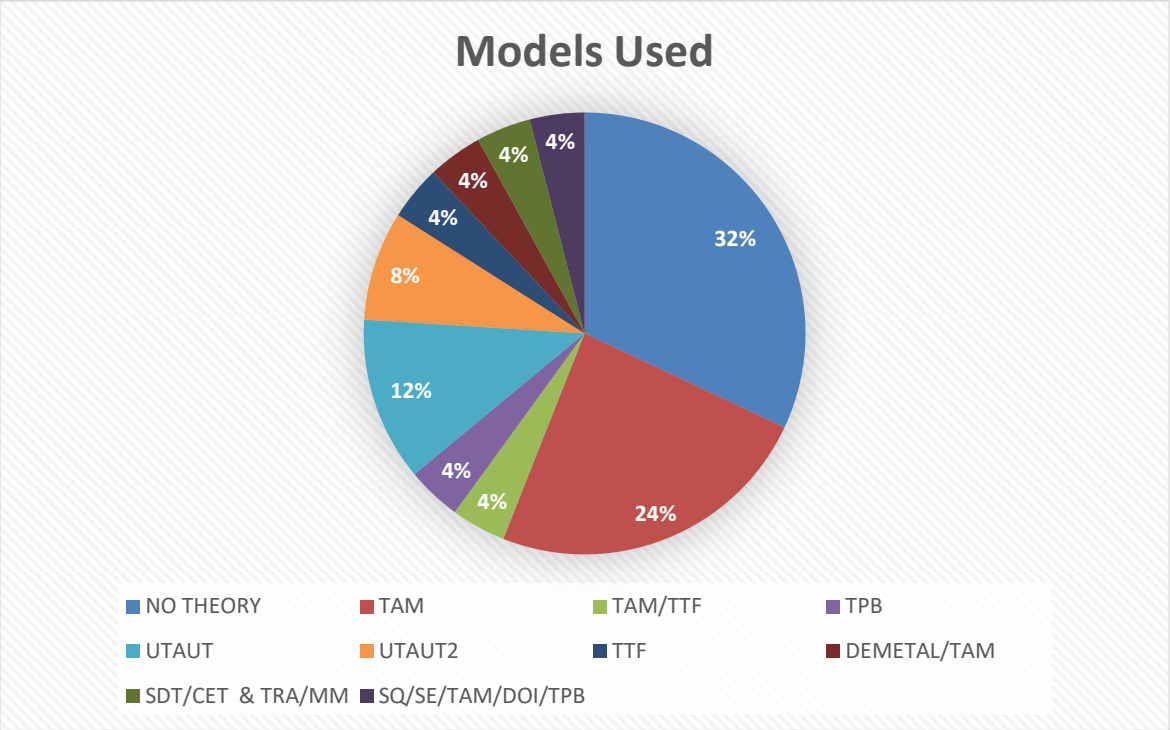

Fig. 2: Adoption Theories Used

4.3 Methodological Approach Used

Majority of the reviewed articles were empirical using existing theories, and have used survey questionnaire (86%) to collect the data from the respondents. This is followed by an interview and mixed methods which are 7% each. The statistical tools used are structural equation modeling (SEM-60%), Analysis of moment structure (AMOS-20%) and Statistical package for social science (SPSS-20%). This indicates that Survey and SEM are widely used in the methodological approaches in the previous studies as shown in fig.3.

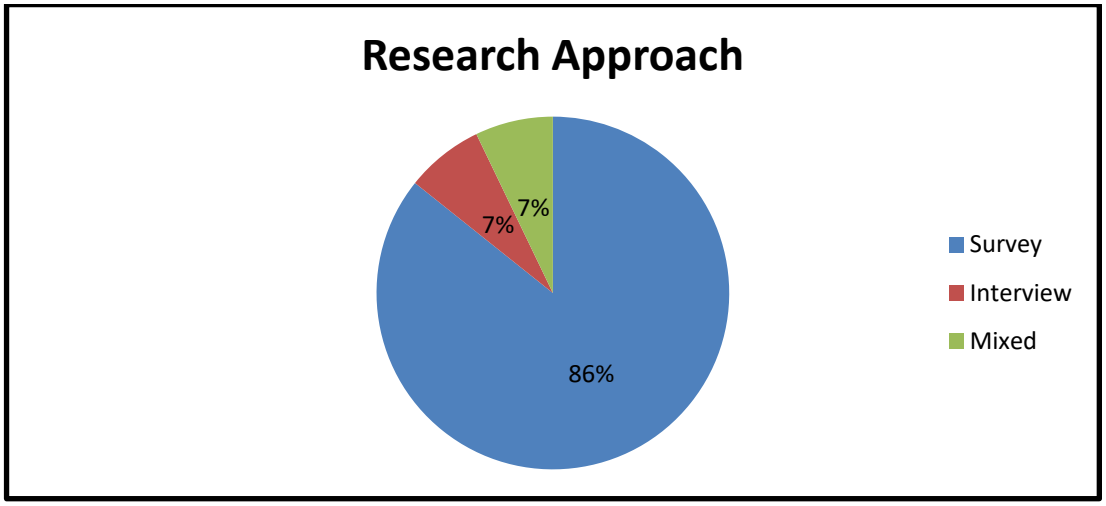

Fig. 3: Research Approaches Used

5. Conclusion and Future directions

The objectives of this review were to identify and integrates factors that influence users' adoptions of cloud based learning system in higher education as well as the theories used. The number of articles included in identifying these factors was twenty six; this is due to lack of literatures that addressed the factors influencing users' adoption of cloud based learning system as the field is still emerging. The articles were extracted mainly from Science Direct, Springer Link, IEEE Xplore and Emerald; therefore, the findings should be caution in generalization. Furthermore, the review only included studies on cloud based learning in higher educational institutions or related organizations; other studies such as mobile learning and e-learning alone are excluded.

The findings show that security, trust, performance expectancy, social influencing, ease of use, usefulness were among the highest most frequent factors influencing users' adoption of cloud based learning system. Further, TAM is still the most widely used theory used in the previous studies which is similar to the findings of Hashim, Hassan &Hashim [19] and Kayali, Safie &Muktar [22]. In addition, most of the previous studies used quantitative strategy using the existing theories, and SEM a second generation statistics was widely used in the analysis. Moreover, from the theoretical point of view, the existing adoption models are fragmented and limited in scope, and tend to only partially explain the phenomenon. The implications of unclear and limited factors could lead to technology adoption failure. Therefore, there is a need for more investigative studies to uncover more factors influencing user adoption of this new technology from multi-perspectives.

Based on this review, future researchers should investigate the cloud based learning to uncover more factors and conceptualization as the field is still

emerging. Further, it is recommended that future works should integrate related theories to develop an evaluation framework to strengthen the inadequacies of the earlier theories/models used. IT related knowledge, technology task, technology characteristics, IS culture are scare in the previous studies. It is recommended that a robust framework involving these variables as a single model should examine on cloud based learning adoption. Moreover, it is recommended that more qualitative or mixed approaches should be carryout to understand the experiences of user in cloud based learning context, this will further uncover dimension of factors influencing user adoption of cloud based learning. In addition, an advance statistical analysis such as AMOS and PLS which are capable of testing complicated models that includes mediators and moderators should use for better results.

This paper contributed to literatures by providing a comprehensive factors influencing users' acceptance of cloud based learning system which might help decision maker in adoption decision, and provide directions for future works.

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