Factors That Influence An Academic Institution's Intention To Accept CloudIOT: A Proposed Framework

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Abstract— The combination of Cloud Computing (CC) and Internet of things (IOT) which is known as CloudIOT are two different kinds of technologies that are already part of our lives. The growing usage of CloudIOT in the education sector is changing the Teaching and Learning processes. There is very limited study related to the factors which effect students' acceptance of CloudIOT innovations in an academic institution. The aim of this paper is to illustrate different aspects of CloudIOT and to understand the beneficial impacts of using these technologies in the education sector. Besides, it also examines the factors which influence students' acceptance of CloudIOT in the academic institutions in Libya. This study will develop a conceptual framework (CloudIOT adoption model) based on extending UTAUT2 model.

Keywords— internet of things; Cloud Computing; CloudIOT; UTAUT2; Education; acceptance

1. INTRODUCTION

This paper aims to examine the factors which influence students’ acceptance of CloudIOT in the academic institutions in Libya and propose a framework to study the acceptance of CloudIOT by the academic institutions. It has been established from the analysis of the survey which is conducted by [1] that technological advancements have played an indispensable role in transforming the facade and overall functionality of the education sector. CloudIOT will find a place in various educational environments as many other emerging technologies integrate into the world of the education from the industrial sector. Based on literature review of past studies and empirical studies there is insufficient knowledge about the acceptance of CloudIOT in the local academic institutions.

Most of the previous studies have focused on frameworks and implementations of cloud services and adoption of IOT technology and how to create competitive advantages and help educational institutions make more informed and faster decisions. Other studies implement and produce specific systems for Cloud Computing in education. Many universities are interested in using new technology in several areas, however there a lack of empirical studies focusing on the acceptance of CloudIOT service in educational organizations. Some studies have been conducted on Cloud Computing adoption and IOT e.g. [2] but none of these studies examined the acceptance of both of these technologies in the education field especially in the Libyan context. Thus, this study intends to contribute to an increasing association of research on CloudIOT by determining the factors that influence and inhibit CloudIOT acceptance by academic institutions of Libya. More specifically, one of the aim of this study is to investigate the relationship between related factors based on UTAUT2 model and then accelerate and speed up the Cloud Computing and IOT solution in Libyan academic institutions.

Section II will give brief information about Libyan academic institution, and Literature Review. Section III will explain adoption of UTAUT2 theory and proposed research framework. UTAUT2 Model. Part IV will be the research methodology. Conclusion and contribution of this paper will be in section V.

II. LITREATURE REVIEW

Libya is a developing nation that is facing many difficult challenges in improving educational quality and standards due to technical, cultural or institutional problems [3]. Therefore, most of the Libyan Higher Education Institutes (LHEIs) and the Libyan universities are striving to update their processes and utilize information technology as a key element in their education system[4].

The concerned authorities have started to focus on improving its education sector. Integrating both Cloud Computing and Internet of things IOT is expected to provide promising solutions for all areas [5]. According to [6] when a new system is presented a better understanding of the elements influencing its acceptance will result in an improvement of the users’ system adoption and implementation. Few studies have been conducted to examine how the consumers accept CloudIOT e.g. [7], and the reasons behind this low percentage of acceptance of cloud and IOT technologies among Libyan academic institutions have not been ascertained yet.

Internet of Things or IOT is a network of physical things which is surrounded by different technological tools that foster active communication. It has been established from the research of [8] that IOT plays an inevitable and indispensable role in enabling all components of the particular environment.
to participate in the collaborative practices actively. IOT can provide many opportunities for education, students and teachers alike. Although IOT in education is still in the early stage some institutions are already leading the way in using IOT efficiently to educate young people and the public. IOT technology based education allows students to have the access to personalise, rich and interactive learning anywhere at any time they need. It has been noted from the study of [3] that collaborative learning beyond the classroom has made the learning process more active. Furthermore, the integration of IOT and the Cloud Computing allows students to become digital savvy and have a better understanding and knowledge of annotating real-world information through the smart sensors. The adoption of IOT technology creates competitive advantages and helps academic institutions to be more informed and make faster decisions. Moreover, IOT assists the students to improve upon their learning experience by enabling real-time interactive performance.

Students can bring wireless devices into classrooms or utilise them at home. The materials used in learning on mobile devices for instance e-books are more interactive and appealing. There is an endless need for new technologies in the field of education for instance high-speed wireless networks with sufficient bandwidth for streaming audio and conducting video lessons. The advanced IOT application enables students to go through a course at their own pace. Hence, it increases both the satisfaction and course completion rate. Teachers can offer one-to-one instructions and continues student assessments. Instructors can collect data on students’ performance using cloud technology.

The advanced technology enables teachers to collaborate and share with one another. Many papers and researchers have been done in the field of IOT in many different areas such as the smart campus, healthcare, smart city, smartphone and in general but in the field of education such studies is still lacking. No empirical instrument has been developed and tested for the acceptance of CloudIOT in the field of education.

Cloud Computing can provide technical support and reliable services thus combining it with IOT will bring practical significance as IOT can take advantage from the unlimited capabilities and resources of Cloud Computing. At the same time, Cloud Computing can benefit from IOT by extending its scope to deal with real-world issues in a more dynamic manner. Cloud infrastructure can provide a good architectural fit for IOT. Besides, the cloud infrastructure requires lower capital expenditure and operational cost. It is easily accessible anytime and anywhere.

According to [9] “The future world must be an intelligent virtual world, which is also the world of Cloud Computing and the Internet of Things.” Out of the 119 identified papers, 39 papers had explored the integration of Cloud Computing and IOT but they only provide an overview of the concept.

However, in this study IOT-cloud integration will be discussed with detailed working architecture, working scenarios and potentials.

[10] has discussed the importance of CloudIOT, its architecture, how it works and issues such as energy efficiency, resource management and heterogeneous protocols support. [11] examines future internet concepts and how IOT has its influence on future internet. However, previous studies on the integration of Cloud Computing, and IOT in the field of education is lacking in general and especially in Libya. [9] analyses the impact of Cloud Computing and the Internet of things in the field of military studies to prove that CloudIOT can contribute more strength to the education resources integration with its low-cost, high benefit and unlimited development prospect superiority. [12] Introduces the application of CloudIOT in education by discussing the current status of smart campus and indicates the difference between digital campus and intelligent campus. Although the Integration of Cloud Computing and IOT in the field of education and teaching is still facing various problems and challenges, it is undeniable that CloudIOT will contribute a greater strength to the integration of education resources. This new integrated environment will lead to significant changes in the construction of educational resources, teaching methods and trigger updates which can improve the quality of teaching in educational institutions.

Based on literature review that has been discussed it is obvious that there is less empirical evidence about the acceptance of Cloud Computing and Internet of things technology (CloudIOT) in the field of education especially in Libya. Most articles have focused on frameworks and implementations of cloud services and adoption of IOT technology and how to create competitive advantage and help academic institutions to be more informed and able to make faster decisions. Several studies have reported factors which influence usage of both technologies in education while others design and implement specific systems for Cloud Computing in education. Hence, there is a gap in the empirical studies focusing on adopting CloudIOT service in the field of education.

III. THE PROPOSAL: THE RESEARCH FRAMEWORK BASED ON THE UTAUT2 MODEL

Recently researchers have tried to identify the factors which effect the diffusion process of different techniques. However, the need to understand the factors affecting the acceptance of CloudIOT is important for the users, students, staffs, managers, providers and researchers. Various theories and models have been proposed to address the process of accepting new technologies in the academic institutions.

After reviewing UTAUT2 and its validation in [13] it is noted that there is seventy percent (70%) variation in usage intention or acceptance of UTAUT2 technology which is higher than the eight previous models and their extensions. Nonetheless, according to [7] the Unified Theory of Acceptance and Use of Technology (UTAUT2) can explain the variation in the acceptance of technology better than TAM or any other theoretical model.

The aim of this study is to identify the factors and determine the extent to which they influence the adoption of CloudIOT in a Libyan academic institution. Studies which consider technological factors, institutions and individuals in a broader perspective is still lacking. Even though, TAM and UTAUT have been used independently in several studies to
examine the acceptance of various IT applications, few studies have used UTAUT2 theories to identify the behavioural intentions of individuals in an academic institution. In the field of accounting there are some studies on the determinants of the adoption of IoT and CC applications. Nevertheless, all the available studies have not integrated all these theories into one research. No research has been done to examine the impact of CloudIOT adoption in an education institution. Hence, this study is conducted to fill in the gap by adding to the existing knowledge the factors that might influence the adoption of CloudIOT in an education institution of a developing nation such as Libya.

This study will describe a research model that is built on the UTAUT2 theoretic framework. Based on literature review research model is develop to test sixteen variables namely institutional factors (feasibility, institutional technical support and requisite knowledge), individual factors (performance expectancy, effort expectancy, social influence, hedonic motivation, habit of use CloudIOT and facilitating conditions), technological factors (attitude, security concerns, privacy and trust) and demographic factors (age, gender and experience).

The framework of this study aims to identify the factors affecting students' acceptance of CloudIOT in an academic institution, Libya. The Unified Theory of Acceptance and Use of Technology2 (UTAUT2) will be utilised as the foundation of the model for this research. This study intends to extend the UTAUT2 derived from [14] suggestion to incorporate additional external factors to understand and obtain a better on the subject of technology acceptance. Based on the UTAUT2 model and literature review, this study proposes a framework which examines factors that determine academic institution intention to accept CloudIOT technologies in Libya. This study also seeks to confirm the mediation effects of behaviour on the relationship between the main predictors of UTAUT2 and CloudIOT acceptance. The proposed external factors to be included in the UTAUT2 are institutional factors and technological factors. These factors and their related variables are derived from models and traditional theories found in literature review. The proposed framework contains two sections. The first section represents the main construct of the UTAUT2. The dependent variable (DV) is represented by the behavioural intention to use CloudIOT which is the students’ acceptance of CloudIOT”. The second section contains the external factors which could influence the students’ acceptance of CloudIOT in an academic institution in Libya. This section contains three factors namely institutional factor (IF) which consists of three variables, namely feasibility (FE), institutional technical support (ITS) and requisite knowledge. The second factor is an individual factor (IF) which consists of six variables namely performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM) and habit of use of CloudIOT Besides demographic factors such as gender, age and experience, the third factor is a technological factor (TF) that has four variables namely attitude (AT), security concerns (SC), privacy (PR) and trust (TR). The proposed factors are independent variables (IV). Hence, the framework presented in this study will provide vital information and useful guidelines to help accelerate CloudIOT’ adoption by Libyan academic institutions and academic institutions in other developing nations. The proposed framework is as in Figure 1.

![The proposed framework](image)

**Fig. 1.** The proposed framework

**IV. RESEARCH METHODOLOGY**

According to [15], research methodology is a systematic method of solving any problem or issues. The main objective of this study is to find factors which influence the acceptance of CloudIOT by a Libyan academic institution. A structured framework has been chosen and research hypothesis for this research has been developed. Data collected from respondents will be analysed. Primary quantitative research methodology will be used in this study to obtain information on the given topic of research. According to [15], quantitative method of research is more data-led and logical approach which allows the researcher to examine what people think from a numerical and statistical viewpoint. [16] has affirmed that the quantitative method of research is capable to accumulate ample amount of data, to manipulate and organize it into well-structured reports for further analysis. One of the major reasons behind the adoption of this research method is it focuses on objective measurements and mathematical, numerical or statistical analysis of data that has been collected through questionnaires, surveys and polls or by manipulating pre-existing statistical data using computational techniques. The quantitative method of research is aimed at focusing on the process of collecting numerical data and generalizing it across a group of people. This aspect helps in demonstrating any particular phenomenon.
V. CONCLUSION AND CONTRIBUTION OF THE RESEARCH

This study will make some contributions to the existing literature in the attempt to comprehend students’ views about the acceptance of CloudIOT technologies. This research will commendably contribute to the academic institution in enhancing understanding and knowledge about the significance of adopting CloudIOT. This is because the current study will present elaborated information about different notions which are related to CloudIOT technology. It is hoped that this study will lead the academic institutions towards adopting this technology to improve and enhance their overall efficiency. This study also contributes to the literature on Cloud Computing and IOT technologies acceptance which plays a major role in the development and successful implementation of the CloudIOT. Besides, this study is able to fill the gap in innovation research especially Cloud Computing and IOT innovation in developing nations and attempts to quantify an area whereby research on CloudIOT acceptance is insufficient. This model by incorporating other vital factors. The implication of these findings for the academic researchers and students of the institute is it will formulate a better route for CloudIOT adoption. Finally, the limitations of this study will highlight and future research avenues, and recommendation will be proposing.

REFERENCES