Cloud Computing in Education: A Survey on the Adoption and the Challenges for the Faculty of IT at the Benghazi University-Libya

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Abstract— **Cloud computing provides reliable computing environments and highly scalable resources are accessible to users. Cloud computing in education is the next big trend for efficient e-Learning systems. In fact, educational institutions in developing countries should benefit from the application of cloud technologies to improve the quality of their education. In this paper investigates challenges being encountered in the adoption of cloud computing in University of Benghazi. It implores the use of questionnaire to generate the data. In all, 500 copies of the questionnaire were administered to 303 students, and 80 teachers across to the 6 departments in IT. While 300 copies were returned this represents a respondent rate of 53% student and 30% teachers. The result of the analysis obtained reveals that 66.7% of the teachers and 48.5 % of the students' advowson the use of cloud services in support of curricula in University. The study showed the willingness of both students and teachers to apply cloud computing services in education at the Faculty of Information Technology at Benghazi University.**

Keywords— *Cloud computing, Education, Educational institutions, Research Survey, Challenges of Cloud Computing.*

I. INTRODUCTION

The main goal of any educational institution is the quality of education. However, the cloud computing solves many problems and opens many opportunities to the educational establishments. The main objective of any educational institution is the quality of education. Cloud computing offers a great opportunity for educational institutions in developing countries to improve their education by providing an interactive cloud of lessons and multimedia through the ability to the combination of media.

Cloud Computing is the third revolution after PC and Internet in IT. Specifically, Cloud Computing is the improvement of Distributed Computing, Parallel Computing, Grid Computing and Distributed Databases. In fact, the basic principle of Cloud Computing is making tasks distributed in large numbers of distributed computers but not in local computers or remote servers. The Cloud Computing is capable of integrating large quantities of information and resources stored in personal computers, mobile phones, and other equipment, and putting them on the public cloud for serving users [1]. In other words, cloud computing is Internet-based computing and it provides resources, software, and information to computers and other devices on demand.

The most common definition of cloud computing according to the definition of the National Institute of Standards and Technology (NIST)[2], "Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources [e.g., networks, servers, storage, applications, and services] that can

be rapidly provisioned and released with minimal management effort or service provider interaction".

According to the United Nation's Human Development, Libya has the highest rate of literacy in the ranks of the Arab world that the standard of living, social security, health care and other factors for development .Internet users as of 30-June-2012 stood at 17.0 % of the population. As of 31-Dec-2012, the country had 13.9% Facebook users [3]. There are 108 higher education institutions in Libya, including 12 government universities and another 96 government funded institutes that provide education in the areas of administration and management, technology, creative art, and teacher development. The universities such as Benghazi University, Tripoli University, and Academy of Postgraduate Studies and Economic Research have their basic ICT infrastructure such as computers, Internet access, and a local area network [4].

In fact, the need to adopt new and emerging technologies in higher education is increasingly needed to meet students' educational needs, to provide quality education and to prepare students to meet the challenges of the 21st century. The internet services in Libya provider only by Libya Telecom & Technology LTT is the state-owned company. However, the recent uprising disrupted Libya's telecommunications sector, reconstruction efforts are underway.

Therefore, in this paper, challenges are being investigated in the adoption of cloud computing at Benghazi University. The assessment of trends examines the current level of awareness and adoption of cloud computing in the Faculty of Information Technology at Benghazi University, and the challenges assessed by investigating the problems and limiting factors for successful application and using cloud computing in college. This concludes by suggesting the recommendations of the study the effective adoption and use of cloud computing at Benghazi University.

II. USING CLOUD COMPUTING IN EDUCATION

Cloud Computing offers universities the possibility of concentrating more on teaching and research activities through a fast IT implementation and complexity can be reduced with Cloud Computing. Many universities recognize the potential and efficiency of using cloud computing in education, which we mention the University of California, the School of Electrical and Computer Science at Washington State University, the higher education institutions of the United Kingdom and Africa, U.S and others [5].

For example on the successful use of cloud in education: in Virginia, many colleges and universities had collaborated at the formation of Virtual Computing Lab. This allowed institutions to reduce IT expenses by reducing licensing requirements and software upgrades. Also, improve IT resources for researches and students. The University of North Carolina has made a significant reduction in expenses with software licensing by including cloud services, and also reducing the number of IT staff on the campus from 15 to 3 employees with the full working schedule [6].

There are several previous studies on cloud computing in education in terms of ease and difficulty as well as how to use and apply them. Masud and Huang [7], proposed the construction of e-learning system based on cloud computing, The infrastructure layer includes physical devices and networks, the software layer contains a unified interaction display for e-learning developers. They recommend that the use of cloud computing technology in e-learning systems to take advantage of the potential and the advantages of this technology. Al-Zoube [8] using library applications through cloud computing to build a virtual and virtual e-learning environment. The proposed environment includes the design and control of educational content, the creation of a system that allows the exchange of educational content and the integration of many educational and learning curricula in the same environment.

Al Shetty[9], was finds that all universities and colleges seek to pursue the rapid technological development in the field of education. Cloud computing is the new and important alternative to educational aspects. The research concluded that the use of cloud computing techniques in e-learning is necessary to give students the opportunity, Students and teachers to quickly access various applications, systems and resources through the Internet, file sharing, documents, exchange of

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duties, and projects between students. Research has shown that cloud computing technologies help universities and colleges solve many problems Manage and maintain IT resources and improve the learning process. And that cloud computing technologies will help universities and colleges solve many of the problems of managing and maintaining IT resources as well as improving the process of teaching and self-learning.

Matthew[10] presented a study investigates the challenges being encountered in the adoption of cloud computing in Nigerian Universities. It implores the use of a questionnaire to generate the data. Microsoft Excel was used to capture the data while frequency and percentage distributions were used to analyse it. In all, 10, 800 copies of the questionnaire were administered to 54 public universities across the 6 geopolitical zones in Nigeria while represents a respondent rate of 81.1%. The result of the analysis obtained in this research work indicates that 92% of the total respondents are aware of cloud computing in education, 82% of the universities adopt the use of cloud.

III. BENEFITS AND OF USING CLOUD COMPUTING IN EDUCATION

A. Benefits

There are several benefits of using this technique in education can be summarized as follows:

- Access to applications from anywhere. The use of applications for students and teachers without loading them onto their devices, and also help them to access their files stored from any computer through the Internet.
- Support students learn in new and modern ways to help them manage their projects and duties.
- Ease of communication and interaction between students.
- Software free or pay per use.
- Protection of the environment by using green technologies

B. Limitations

The difficulties of the use of cloud computing includes the following:

- The main problems are speed/lack of Internet can affect work methods.
- Dissemination politics, intellectual property, protection of intellectual property rights is also one of the problems that raise the concerns of users; there is no guarantee that these rights will not be violated for users.
- Risks related to data protection and security and accounts management and standards adherence.

IV. MATERIALS AND METHOD

The methodology and approach adopted in this paper are described below. In this section, the research questions are highlighted and research techniques used are discussed.

C. Research Questions

In this paper we have formulated four research questions to achieve the purpose of this study as follows:

What is the level of awareness about cloud computing in education?

Is there acceptance and willingness to use cloud computing technology in college by both student and professor?

What cloud computing services are used to support scientific research?

What are the challenges to successful adoption and use of cloud computing at Benghazi University?

D. Method and procedures

This study is an empirical research which investigates the level of awareness and adoption of cloud computing at Benghazi University. The data collection tool was questionnaire and an electronic questionnaire[1] titled "The difficulties of employing cloud computing in the Faculty of Information Technology at Benghazi University as seen by teachers and students" in four (4) parts. The first part presents an assessment of the level of awareness about cloud computing, while the second part provides information on assessing the trends of awareness and benefits of using cloud

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1 The questionnaire is available on:

https://docs.google.com/forms/d/e/1FAIpQLSdjlsEr0OLSZrk5sKWJSRs31GeWVTGr0R6Q5xRZYyH5EJDleQ/viewform

https://docs.google.com/forms/d/1gXqU2R_77i1W_p3_TFUiU0rQmpVtUjktt7R_5kefAc/edit?ts=5ba23f6f#responses

computing at the University. The third part assesses the difficulties of adopting cloud computing by decision makers at Benghazi University while the fourth part investigates the challenges of using cloud computing at Benghazi University.

The study community the Faculty of Information Technology Benghazi University for the academic year 2016-2017:

1) Students: It targeted a sample of 303 students out of the size of the community 1288 students as shown in Fig. 1. Actually, we collected 53% of the target sample size.

Teachers: It targeted a sample of 80 *Teachers* out of the size of the community 101 Teachers as shown in Fig. 2. Actually, we collected 30% of the target sample size.
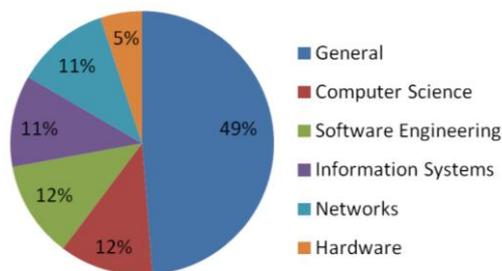

Fig. 1 shows the size of the community, the relative weight and the size of the sample for each department section of the Faculty of Information Technology.
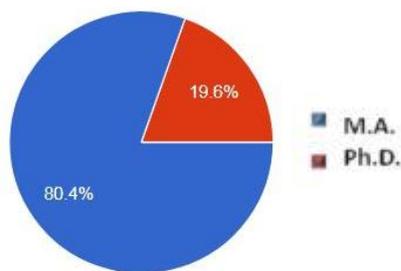

Fig. 2 shows the size of the community, the relative weight and the sample size of a full time faculty member of staff and a part time faculty member of staff.

The questionnaire was validated and tested for reliability using the Pearson Product Moment Correlation. A Cronbach alpha reliability coefficient (α) of 0.882 was obtained, an indication that the instrument was reliable for data collection.
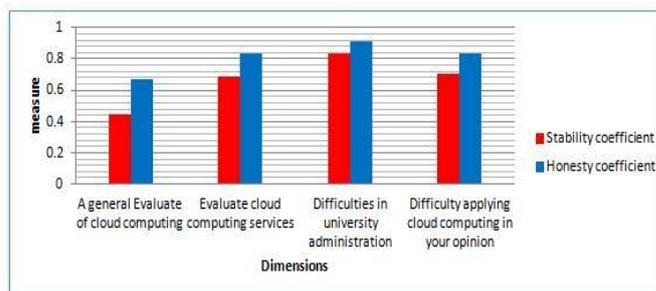

Fig. 3 shows the measurement of honesty and persistence using the alpha-kerobh coefficient of the study variables.

It is clear from the above figure that they are credible and reasonable transactions that reflect the ability of the meter to measure what is designed for it. The stability coefficient for the dimensions as a whole is 77.8%, and the truthfulness coefficients extracted from the square root function is 88.2%. This confirms the validity of the measurements for this study. The dimension is a general estimate for cloud computing. The stability coefficient is 45.5%. It is reasonable and the dimension difficulties in university administration where the stability factor is 83.3 and the honesty factor 91.2%.

V. RESULTS AND INTERPRETATION

The paper sample was dump on Google forms to capture and analyse the data the descriptive techniques used. The descriptive survey was adopted to obtain the opinion of a representative sample of the target population so as to be able to infer the perception of the entire population.

A. Descriptive statistics

As illustrated in Fig. 4, that most of the respondents hold the degree of assistant lecturer with a total number of 27 by 55.1%. Followed by 11 lecturer with 22.4%, and the lowest number of teachers in the degree of associate professor, where the number reached 2 by 4.1%.
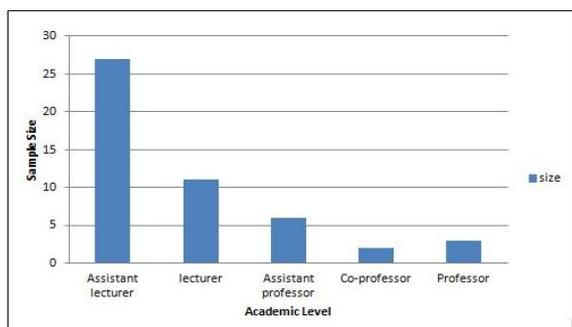
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Fig. 4 shows the frequency and percentage of the degree.

The Fig. 5 shows that most of the general department, where the number of 16, by 32.7 followed by the department of Software Engineering, where the number of 8 by 16.3% and the Department of Computer Science, where the number of 8 by 16.3% and less section of the networks, 8.2 The following figure illustrates this.
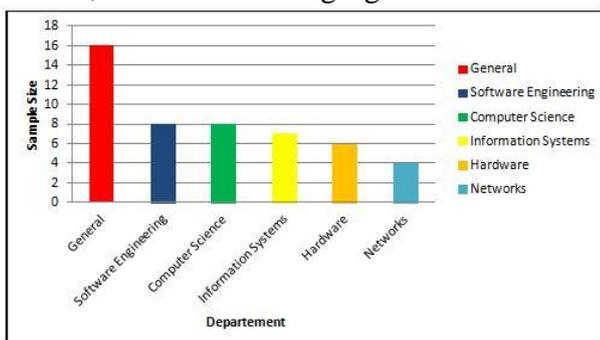

Fig. 5 Shows the frequency of the department of the faculty members.

Fig. 6 shows that most of the students from the fourth grade and graduation were respectively 47 and 45 students with 22% and 21% respectively, followed by students of the sixth grade and above the seventh were respectively 30 and 28% by 14% and 13.1% Respectively for the target sample of the study.
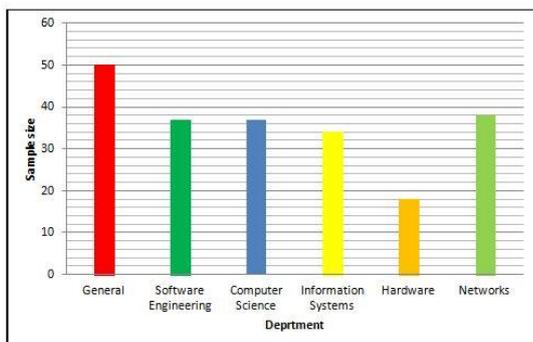

Fig. 6 Shows the frequency of the class for students.

B. Analytical Statistics

We used SPSS Statistics to obtain correlation coefficients. Below we present research hypotheses.

o *There is significant difference in a general evaluate of cloud computing*

In Table 1 illustrated that the arithmetic average of the study sample is 3.3317 in the direction of knowledge in the cloud computing assessment of the target sample of the students and the teacher. It is larger than the theoretical computational average of the Likert scale 5 and the standard deviation is 0.8529 in homogeneity on the probability value (0.00), which is less than the significance level (0.05). The difference is significant in the responses of the students and the sample teachers.

TABLE I
A GENERAL EVALUATE OF CLOUD COMPUTING AMONG STUDY MEMBERS

Probability Value	N	Average	Standard deviation	T	The degree of freedom	Probability value
A general Evaluate of cloud computing	362	3.3317	0.8529	6.307	262	0.000

o *There is a significant difference in evaluating cloud computing services*

In Table 2 illustrated that the arithmetic average of the study sample is equal to 3.9772. A significant knowledge trend in the evaluation of the cloud computing services in the sample of the target study of the students and the teacher is greater than the theoretical computational average of the Likert scale 5 and the standard deviation of 0.8052 in their homogeneity Based on the probability value (0.00), which is less than the significance level (0.05), the difference is significant in the responses of the students and the sample teacher, the study on their opinions on evaluating cloud services.

TABLE II
A GENERAL EVALUATE OF THE CLOUD COMPUTING SERVICES OF THE STUDY MEMBERS

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Probability Value	N	Average	Standard deviation	T	The degree of freedom	Probability value
Evaluate cloud computing services	362	3.9772	0.8052	19.68	262	0.000

o *There is a significant difference in the extent of difficulties related to university administration*

Table 3 illustrated that the arithmetic average of the study sample is equal to 3.9772. A significant knowledge trend in the evaluation of the cloud computing services in the sample of the target study of the students and the teacher is greater than the theoretical computational average of the Likert scale 5 and the standard deviation of 0.8052 in their homogeneity Based on the probability value (0.00), which is less than the significance level (0.05), the difference is significant in the responses of the students and the sample teacher, the study on their opinions on evaluating cloud services.

TABLE III
THE EXTENT OF THE UNIVERSITY'S DIFFICULTIES WITH THE STUDY MEMBERS

Probability Value	N	Average	Standard deviation	T	The degree of freedom	Probability value
Difficulties in university administration	362	3.9309	0.91321	16.532	262	0.000

o *There is a significant difference in the difficulties of implementing cloud computing in your opinion*

In Table 4, illustrated that the sample arithmetic means for a study is 3.7909. A trend in assessing the difficulties of applying cloud computing. In your opinion, individuals in the target study sample of students and the teacher are larger than the theoretical computational average of the Likert scale 5 and the standard deviation is 0.8253 (0.00), which is less than the significance level (0.05). The difference is significant in the answers of the students and the sample professor. The study is

based on their opinions on evaluating the difficulties of applying cloud computing in your opinion.

TABLE IV
HOW DIFFICULT IT IS TO APPLY CLOUD COMPUTING TO YOUR SAMPLE

Probability Value	N	Average	Standard deviation	T	The degree of freedom	Probability value
Difficulty applying cloud computing in your opinion	362	3.7909	0.8253	15.54	262	0.000

C. *Discussion of research questions*

1) *Awareness of Cloud Computing in education*

On the results of the study, we have acquired 37% of the total respondents of the professors and 11.7% of the students that they are aware of cloud computing in education. The results reveal a readiness to use electronic tests in courses of 37.3% for teachers and 41.1% for students.

2) *Willingness to use cloud computing technology at the University of Benghazi.*

The responses obtained indicated that the responses obtained were 66.7% of the teachers and 41.1% of the students, they are ready to use cloud computing services to support the curriculum in the future. Both students and teachers mentioned the use of a cloud service in one of the previous courses at 25.5 % of the teachers and 30.4% of the students.

3) *Cloud computing services have been used in education*

- Cloud services scientific research tools (Google scholar): 65.9% of the teachers and 36.1% of the students.
- Cloud services presentations and videos (youtube): 60.8% of the teachers and 76.3% of the students.

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- Cloud social networking services (Facebook): 84.3% of the teachers and 81.3% of the students.
- Cloud storage services (Google Drive): 74.5% of the teachers and 45.2% of the students.
- Cloud services desktop applications (MS office online): 47.3% of the teachers and 21.7% of the students.
- University Mail Service: 47.1% of the teachers and 15.7% of the students.

4) Challenges facing University adoption Cloud Services in Benghazi

Based on the analysis of the findings obtained for the research question 4 in this study as presented in Table 5, a number of challenges currently embattling Benghazi University to used cloud services. These factors include: data insecurity, privacy concerns, and fear of downsizing staff positions, reliability challenge and resistance to change in modern technologies in education, and infrastructure problems in the country.

TABLE V
CHALLENGES OF CLOUD COMPUTING ADOPTION IN BENGHAZI UNIVERSITY

S/N	Challenges of adoption cloud computing in Benghazi university	% of Respondents	
		Teachers	Students
1	Data insecurity and privacy concerns	33.3	28.1
2	Resistance to renewal and development of the use of modern technologies in education.	31.4	29.8
3	Weak Internet currently available.	68.6	38.8
4	The lack of support and adequate funding	62.7	37.5
5	Lack of awareness of the importance of cloud computing in education.	54.9	36.8

VI. STUDY RECOMMENDATIONS

There are two recommendations limitations of this study:

- Recommendation is on the university administration to equip the infrastructure of the colleges before the application of e-learning, and the processing of the internal network of high speed.
- Teachers publish e-culture among students to achieve maximum interaction with this cloud computing technology of education; it can be used to present curriculum, annotations and examinations.
- Finally Adopting some cloud computing services by the College of Information Technology to provide a model that contributes to the encouragement of the other faculties and departments of the university, then it can make easily by hybrid Cloud between Libyan universities to share sources and cost minimize.

VII. CONCLUSIONS

Modern education is changing as is an education in the classroom due to the advent of technology. Students expect and require more services from their institutions. The future success of a country depends on the development of the education given to its students. The future world will be a technology-based world so applying the technology in the learning session will help a student to be fully ready for the future world. Therefore, we conducted a study on the extent accepted of cloud computing technology in education. This study aimed to identify the difficulties of employing cloud computing in the Faculty of Information Technology at Benghazi University as seen by teachers and students. The study sample consisted of 250 students, 50 of his professors. The sample of the study community in a random way, and we have built a performance of the study is a questionnaire to measure the difficulties of employing cloud computing at the University of Benghazi. Through the results obtained in this survey, we found that both students and faculty members are ready to use computing technology.

Future work may focus on design an experiment in a subject so that it is divided into two groups. A group is taught using computing and other computing services in the traditional way. Through these two groups, students' educational quality is studied and evaluated.

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