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Cloud Computing Adoption in the Higher Education (Sudan as a model): A SWOT Analysis

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Abstract The use of cloud computing technology in higher education in the least developed countries represents a real opportunity for those countries. This study aims to perform SWOT analysis to determine the impact of the cloud computing implementation such as Strengths, Weaknesses, Opportunities and Threats (SWOT) in higher education institutions of the least developed countries, Republic of Sudan as model, and that from the perspective of Directors, Teachers and Students, to find the effect of strengths, weaknesses, opportunities and threats when using cloud computing technology in higher education. The study revealed positive results, because of the advantages offered by such as the flexibility and efficiency, and the ability to acquiring knowledge. There were drawbacks in the implementation of cloud computing such as privacy and security issues, and give this paper solutions to benefit from the opportunities, and to overcome the threats mentioned.

Keywords: *cloud computing, SWOT, strengths, weaknesses, opportunities and threats*

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1. Introduction

At present, technological development affects all aspects of life. It affects the access to information, processing speed, and communications. Cloud computing is one of the forms of modern development. Which are used in developed countries to deliver innovative technology solutions to the problems faced by the users of the services in various sectors.

The Cloud computing is the development of applications that provide a solution for the development of infrastructure for higher education at a lower cost and fewer time requirements.

The Definition for Cloud computing is that "Cloud computing is a new way of delivering computing resources (network, services, servers, data storing), not a new technology" [1].

The least developed countries (LDCs) are a group of countries that have been classified by the UN as "least developed" in terms of their low gross national income (GNI), their weak human assets and their high degree of economic vulnerability [2].

SWOT is a basic, straightforward model that assesses what an organization can and cannot do as well as its potential opportunities and threats. The method of SWOT analysis is to take the information from an environmental analysis and separate it into internal (strengths and weaknesses) and external issues (opportunities and threats) [3].

SWOT Analysis or IE Matrix is a method of analysis to figure out strengths, weaknesses, opportunities, threats the company (whether they actually exist, or just an idea only), and put into the study and analysis, which relies on a simple idea, a look at the sources of power and opportunities for the company, It is then activated and supported and developed, and look at the weaknesses and threats to the company, and then eliminate or minimize the weaknesses or to get away from sources of threat if it is not possible to avoid them entirely.[10]

2. A Review of Literature

Mohmed S. Adrees, Majzoob K. Omer and Osama E. Sheta [4]. This paper aims to discuss and analyzing: concepts of cloud computing, cloud computing models, cloud computing services, cloud computing Architecture and the main objective of this paper is to how to use and applied cloud computing Architecture in higher education, in third world countries, the republic of Sudan as a model.

Ibe-Ariwa, K. C., & Ariwa, E.[8]. It is obvious that the effective application of cloud computing in developing economy will transform the traditional education model to computer based virtual applications with a focus on e-pedagogy. The knowledge domain and competencies required in the HEIs continues to act as draw backs in terms of skill acquisition and the development of sustainable innovative technological practices

Asiimwe, E. N., & Khan, S. Z [9]. Results show positive perceptions. Respondents revealed that ubiquitous computing and computer-mediated social interaction are important in their education due to advantages such as flexibility, efficiency in terms of cost and time, ability to acquire

computer skills. Nevertheless disadvantages where also mentioned for example health effects, privacy and security issues, noise in the learning environment, to mention but a few. This paper gives suggestions on how to overcome threats mentioned.

3. Significance of the Study

Cloud computing is considered more threads interesting at the present time among the technological communities and educational, but its impact on higher education institutions Not scouted especially in Sudan one of the developing countries, this study will explore the impact of cloud computing in higher education institutions, through the use of SWOT analysis .

3.1. Research Objectives

1. To explore the strengths and benefits of using cloud computing in higher education in Sudan
2. To explore weaknesses, and challenges facing the application of cloud computing in higher education in Sudan.
3. To assess the opportunities in the application of cloud computing in higher education in Sudan.
4. To assess the threats that prevent the implementation of cloud computing in higher education in Sudan.

3.2. Proposed Contribution

This research aims to show the way that use cloud computing in higher education in Sudan, identifying the benefits, and the current usage scenarios and suggest the style of the successful implementation of cloud computing in higher education institutions in Sudan.

3.3. Method

This study takes a deductive approach. It has been chosen method of interviews to collect data. The sample was grouped into three categories: (senior management, teachers and students). It included senior management group (36) members. The group included 47 teachers from Sudanese universities. The group included 320 students.

3.4. Survey

The study examined the following areas:

Strengths: What are the top five things that must be preserved and strengthened?

Weaknesses: What are the top five things that must be improved?

Opportunities: What opportunities can benefit from them?

Threats: What are the variables that can negatively affect the use of cloud computing?

Table 1. Highlights Result by categories

Category	Strengths	Weaknesses	Opportunities	Threats
Directors	Instruction quality , The possibility of application, value, Ease of administration, The possibility of execution, Solving technical problems	Digital literacy is required, Privacy, Data security, Training requirement, A new item in the budget	Increase knowledge, User can use latest technology, Distance Learning, The expansion of educational programs	Competition from other higher education institutions, US sanctions on Sudan, Budget cuts, Security concerns
Teachers	Student support services, value, Technology, Instruction quality, teachers support,	Process improvement, Tackling poor infrastructure, Collaboration between students and teachers, High speed internet connection requirement	Increase (students, knowledge, programs, technological literacy), New technology, Adaptive to future requirements	Affordability, Budget shortfalls, The culture of traditional education, There is no planning and strategies, Loss of connectivity, Data security
Students	Student support services, value, Technology, Increase their technical skills	Instruction quality, Lack of interest by students, Technological illiteracy	Technological literacy, Enhance knowledge, Easy access to resources,	Student issues, internet costs, Internet Services, lack of tools, Addiction to technology

4. SWOT Analysis of Cloud Computing with View of Institutions of Higher Education

The SWOT analysis of cloud computing with View of institutions of higher education result divided into four Categories:

4.1. Strengths

The strengths of cloud computing in the Sudanese higher education institutions include: the quality of education, value, solving technical problems, reduce costs, improve control over time and space.

The most important strengths to use cloud computing is reducing the cost in terms of educational institutions suffer in the least developed countries and Sudan as one of these

countries, a significant lack of education budgets. Shown in Figure 1.

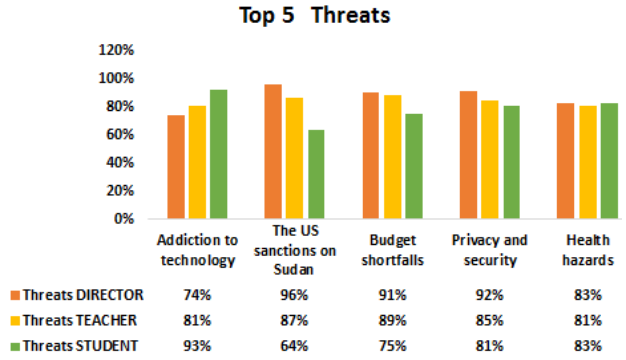

Figure 1. Top Five Strength Evaluation

Easy access to educational resources through cloud computing at any time and in any place leads to increased cooperation between students and teachers, leading to an increase in knowledge and achieve make the most of available resources.

Facing higher education institutions lack adequate resources and expenses. Cloud computing has the ability to provide all of them.

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Facing higher education institutions lack adequate resources and expenses. Cloud computing has the ability to provide all of them.

4.2. Weaknesses

Weaknesses of cloud computing in higher education institutions include: training requirements, technical erase illiteracy, lack of internet access, integration with local programs is difficult, lack of physical control of the data, the lack of commitment to service quality and availability.

While the main weakness of cloud computing in higher education institutions as follows:

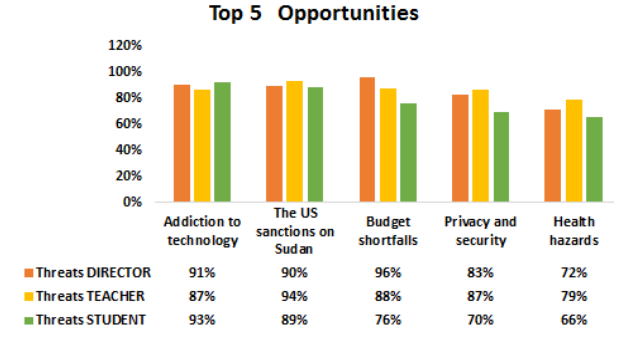

Figure 2. Top Five Weakness Evaluation

Implementation of cloud computing in higher education is not an easy task because they are many factors with the adoption and implementation more dependent on cloud service provider. Many universities and colleges do not have an Internet connection to connect to the cloud, in this case, it is difficult to implement cloud computing. Communication is a prerequisite to the Internet. Shown in Figure 2.

4.3. Opportunities

Opportunities in cloud computing in higher education institutions include: increasing knowledge, increasing the number of beneficiaries of university education, distance education, the expansion of the educational programs, ease of access to resources, data storage capacity, reducing the digital divide.

Two main and important opportunities of using of cloud computing in higher education institutions as follows:

With the use of cloud computing in the Sudanese institutions of higher education, access to opportunities to learn new technology.

In the event of any problems, the cloud provider to provide a quick fix without service interruption. Shown in Figure 3.

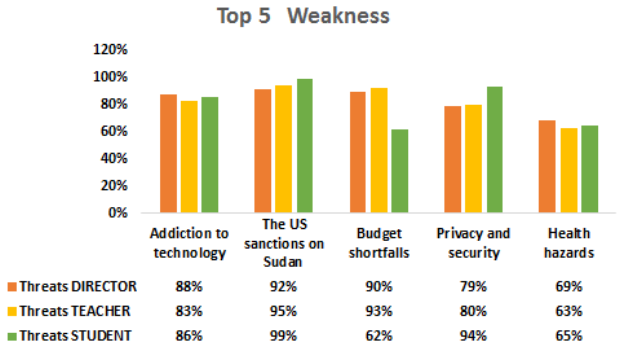

Figure 3. Top Five Opportunities Evaluation

4.4. Threats

Threats of Cloud Computing in Higher Education Institutions include: security concerns, data security, and the loss of contact, addiction to technology, US sanctions on Sudan, and the budget deficit.

The main threats in the adoption of cloud computing in the Sudanese institutions of higher education are security concerns relating to the security of student data because the data value and must be preserved, security is very important in the cloud, the main barrier to adopt cloud computing in education. Shown in Figure 4.

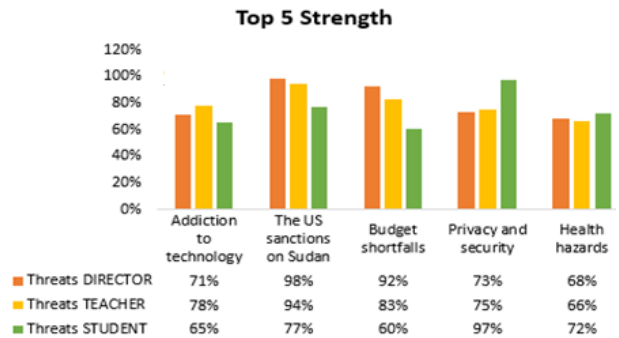

Figure 4. Top Five Threats Evaluation

Table 2. study result for strength and weaknesses

Top 3 Strengths	Top 3 Weaknesses
Better control of the resources	Data transfer bottlenecks
Environmental protection	lack of physical control of data
Cost effective	post training required

Table 3. study result for Opportunities and Threats

Top 3 Opportunities	Top 3 Threats
Adaptive to future needs	Data security
Quick solution of the problem	Hidden Cost
Standardized process	Compatibility reduction

Table 4. SWOT analysis Result

Top 5 Strengths	Top 5 Weaknesses
Accessibility: 24/7	poor infrastructure
Help in getting knowledge quickly	technology/equipment breakdowns
Mobility: Anywhere	Digital Divide
Easily communicate	Data security
Cooperative	Technological illiteracy
Top 5 Opportunities	**Top 5 Threats**
Increase knowledge	Addiction to technology
data storage capacity	US sanctions on Sudan
Reduce the digital divide	Budget shortfalls
Digital literacy	Privacy and security
Advantages of distance education	Health hazards

5. Discussion and Conclusion

To Support for this technology must develop a strategic plan aimed at supporting better use of cloud computing and the creation of uniform rules for the use of, and develop appropriate calibrated for optimal use.

Cloud Computing in higher education can generate multiple features that will enable the Sudanese higher education institutions to compete with each other and compete with global institutions, also contribute to the creation of a knowledge generation contributes to the development of his country.

In order to increase the acceptance of cloud computing, it is necessary to take measures are:

- Clear rules in dealing with the serviceprovider.
- secure data, applicability.
- Contact more reliable Internet.

We suggest, multi solutions to overcome the threats and take advantage of opportunities:

- enforce privacy and security policies.
- impose control and prevention of cheating in exams and assessments methods

Invest in technology cloud computing.

- reduce the digital divide through the use of cloud computing technology.
- erase technical illiteracy.
- encourage research, which aims to provide education accessible to everyone using computers.

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