SWOT ANALYSIS OF CLOUD COMPUTING PROBLEMS IN HIGHER EDUCATION

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ABSTRACT

The article analyzes the net income from electricity production in the energy system of the Republic of Uzbekistan for 2005-2020 and developed proposals for its improvement. The mathematical model of this process is analyzed, and on the basis of the goal to be achieved in 2030, the net income from the supply of electricity to the country until 2030 is determined.

CCS CONCEPTS

• **Social and professional topics**; • **Information systems**; • **Cloud computing**; • **SWOT**; • **strengths**; • **weaknesses**; • **opportunities**; • **threats**; • **E-Learning**;

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1 INTRODUCTION

Today, technological advances are affecting all aspects of life, including access to information, processing speed, and communication quality. Cloud computing is one of the modern forms of development, efforts are being made to solve existing problems in various sectors of developed countries through innovative technological solutions of cloud services. “Cloud computing is not a new technology, but a new way of delivering computing resources (networks, services, servers, data storage and processing)” [1].

Despite the demand and flexibility of the cloud-computing paradigm, the scale, and the high nature of the paradigm, Gartner estimates that the level of use of cloud-computing in higher education is very low. According to Gartner, only 4% of all cloud services are associated with the educational system. Some researchers found that 88 percent of cloud computing services should be used in schools. However, the task of moving into the cloud cannot be easily solved. Higher education system faces a number of challenges that deters the system from adopting cloud computing. [2].

Factors affecting the adaptation of cloud computing technologies in higher education.

The main objective of the IT department is providing developers, staff, students, and academics with a variety of hardware and software. Cloud technologies, in turn, allow virtualize these tools. This allows doing educational, research and many other activities online. However, there are numbers of issues that could be barrier for the cloud technologies adoption into higher education, which are mentioned below.

1.1 Security issues

The introduction of cloud computing in academic institutions, as well as in all other areas, is accompanied by serious problems related to the security of cloud computing. Cloud computing in education has stringent requirements for system integrity and availability, security and confidentiality that must be supported by cloud service providers. In most cases, these requirements include the availability of identification and authentication of accounts for administrators, faculty, students and researchers to verify and clarify every user using a username and password. In addition, priorities, resource ownership (authorization) processes and control permissions must be provided. Encryption methods should be used to protect important institution information, such as exam questions, grades, etc., from intervene or malicious actions.

1.2 Privacy

Institutions of privacy should ensure that important information is protected from unauthorized and malicious access to the cloud. A high level of confidentiality must be ensured in the process of storing student records, researchers ’intellectual property in the cloud.

1.3 Reliability

Reliability is another issue that cloud consumers usually meet. Consumers of Salesforce.com in February 2008, had been left without service for 6 hours, as one of Amazon’s services related with

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storage provision and EC2 faced three-hour interruptions and 8-hour interruptions a few days later. The main reason for this is shown as interruptions in cloud services. Disruption of services in higher education institutions may interfere with student learning and affect class schedules. Disruption of services in higher education institutions may interfere with student learning and affect class schedules. It should be noted that the risks in cloud computing may not be 100% [3].

1.4 Network bandwidth and speed

Internet bandwidth and speed are the cornerstones of education services provided through the internet. The service may require investment to provide quality in the network infrastructure as high-speed and reliable connection.

1.5 Management

There are some differences between management of cloud computing based education and traditional education systems. Thus, the implementation of cloud computing leads to management problems such as teaching and implementation, content and courses, exams and student management.

1.6 Acceptance

Convincing decision – makers of higher education to change the traditional system to another can be a daunting task. Therefore, the perception and acceptance of users (academics and senior executives) influences the implementation of cloud computing within institutions. The process is shown in Figure. 1

2 ONLINE EDUCATION THROUGH CLOUD COMPUTING IN HIGHER EDUCATION SYSTEM

Cloud computing is about advancing a new era of knowledge by taking advantage of hosting. Following the hardware virtualization features, the e-learning program in the cloud reduces the cost of construction and maintenance of training resources.

The IaaS service of cloud technologies discusses some efforts to apply it in education, which focuses on booking a virtual machine for students over a period of time [6].

Cloud computing is used as the basis for creating and configuring VM images based on the IaaS service so that students can access MySQL, PHP, and Apache websites in a Java environment for their own experiences. Using this approach to the server, testing, development and deployment of programs by students can be focused on the server base. [7].

Virtual machines offer a new model of services that increases the effectiveness of a personalized learning environment. The system is designed to subscribe to selected learning resources, as well as to create a personalized virtual classroom, allowing content learning to register their programs on the server [8].

In the modern world, the Internet has grown into more than a web reader, and has evolved into an environment that allows users to run a variety of software applications and services. The collaboration of users and the interactivity of the system have allowed web content to reach a new level. In such a complex environment, the need for education is growing rapidly, which pushes to improve and develop existing and also introduce new solutions such as e-learning.

It is customary to develop e-learning systems according to the principles of distributed applications, but this is not a mandatory process. A distributed e-learning system architecture can consist of the required hardware components such as servers, computers, or telecommunications infrastructure, as well as software components including an application server, user application, or database server (see Figure 2).

The client device can be any personal smart device as mobile phone or desktop computer. For the application in the client side custom application as well as simple web browser can be used. Service delivery can no longer be constrained by a lack of software and hardware capabilities. Since mobile phones are capable of running multimedia applications and all data processing and storage is provided by cloud resources, access to educational services is not difficult. But there are still some challenges to optimize mobile devices for education applications. The e-learning server uses a cloud computing system, so all the necessary resources are configured when needed [5].

The above model is useful for describing the stages of organizing e-learning in the higher education system through cloud technologies.

2.1 Infrastructure

Use of e-learning solutions on provider infrastructure.

2.2 Platform

The development and implementation of e-learning applications takes place based on the infrastructure of the cloud service provider.

2.3 Services

Although there is, a major security issue due to the fact that both software and data are located on remote servers that can be damaged or hacked without warning, individuals and companies that use or develop cloud computing-defined e-learning solutions provides clear advantages [5]. These advantages can be summarized as follows.

2.4 Improved improbability

It is almost impossible for any curious (thief) to know where the machine that stores the desired information (tests, exam questions, results) is located or to know which physical component to steal to get it.

2.5 Virtualization

Virtualization allows quickly replace a broken cloud server without major costs and damage. Creating a clone of a virtual machine is very easy, so cloud crashes are expected to be significantly reduced.

2.6 Centralized data storage

The cloud client lose is not a big deal any more, the bulk of data and applications are stored in the cloud, which means that new client can be connected very easily. Imagine what would happen today if a laptop that holds exam questions were stolen.

2.7 Monitoring data access

Monitoring data access is made easier, for example, because the only one location must be controlled instead of thousands of computers belonging to the university. In addition, security tasks can be easily tested and implemented because the cloud is the only access point for all customers.

2.8 Financial expenses

If e-learning services are used in a relatively short period of time (weeks, quarters, semesters), the cost savings will be huge.

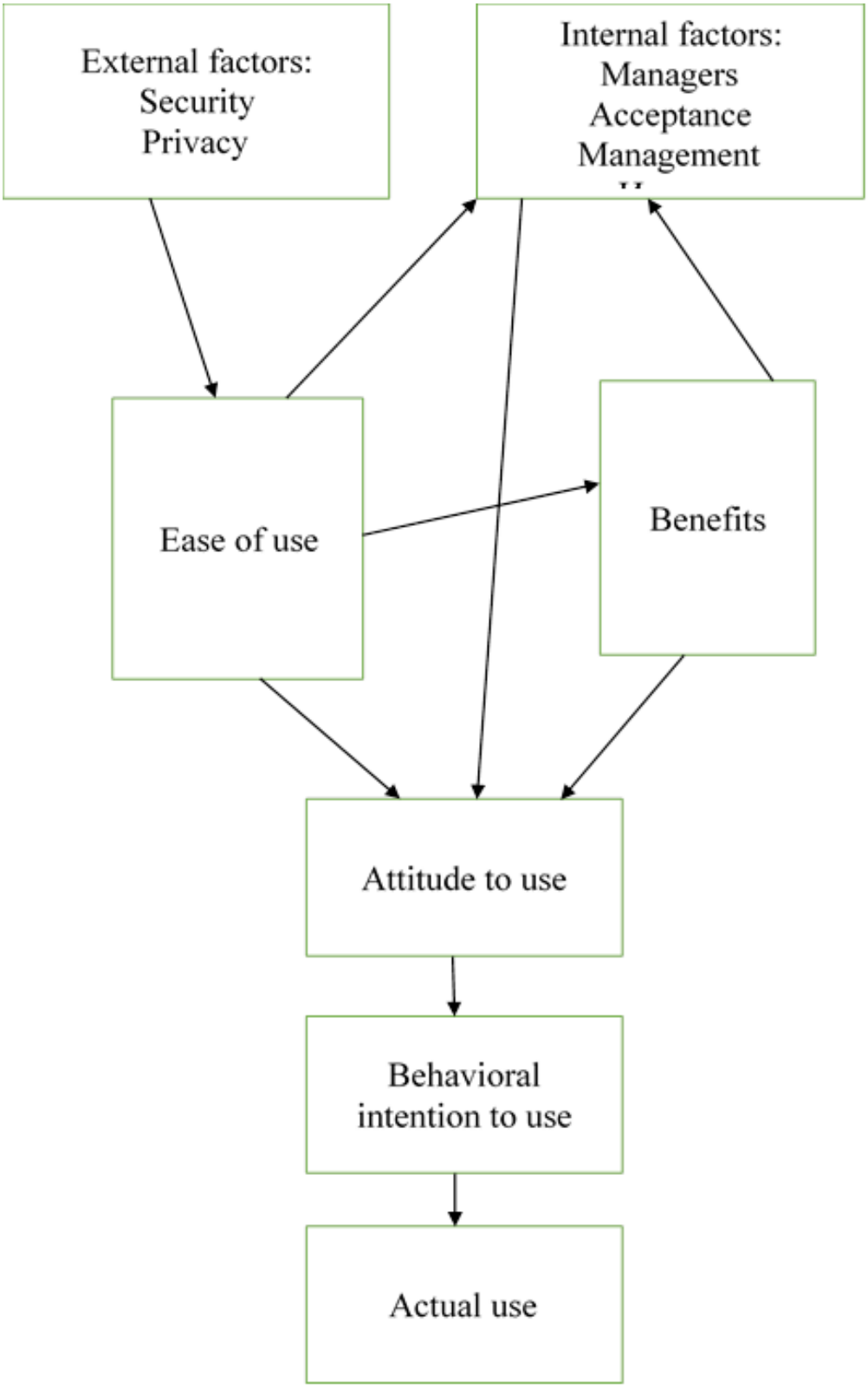

Figure 1: An integrated model proposed for the leveraging of cloud based technologies into higher education

Table 1: SWOT analysis

Strengths	Weaknesses
Cheap price.	Dependence on a high-level service provider.
Learn at your convenience (anywhere, anytime and on any device).	Technical difficulties and failures.
Backup and restore training materials.	Limited management and flexibility.
Simplicity of implementation.	Non-existent risk.
Storage capacity increases.	
Device diversity and location independence.	
Communication is easy.	
Opportunities	Threats
High level of interactive and collaborative learning. A smart environment with the ability to generate knowledge.	Data security.
	Management issues.
The highest level of integration and knowledge sharing possible.	Policy and control issues.
Paperless and digital learning experience.	Dependence on technology.
High volume of data storage and availability of resources.	Budget deficit

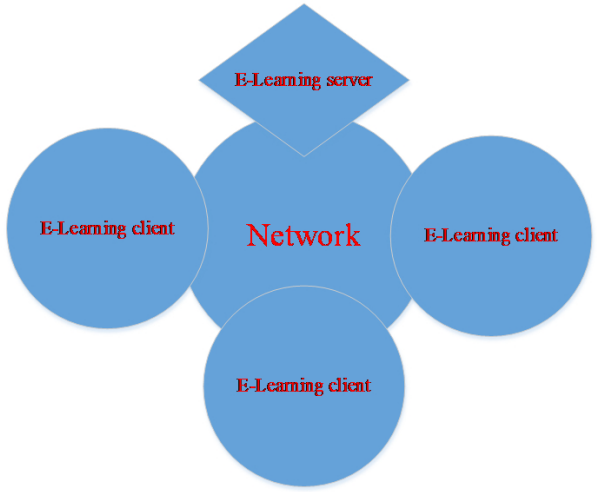

Figure 2: Electronic learning system

3 ILLUSTRATION OF CLOUD COMPUTING OPPORTUNITIES IN HIGHER EDUCATION SYSTEM THROUGH SWOT ANALYSIS

The acronym SWOT stands for strength, weakness, opportunity and threat. SWOT analysis is an effective tool used to determine the environmental conditions and internal capabilities of an organization involved in each project and is widely used in various decision-making processes. In this analysis, firstly, the purpose of the project, and secondly, its internal and external determinants are determined. This method can contribute to the study and evaluation of problems, based on all the key aspects of each issue, which can be comprehensively analyzed on the basis of the above factors [4].

As for this definition, strengths (S) and weaknesses (W) - internal factors, opportunities (O) and threats (T) - which are internal dimensions of control of the organization, are evaluated as external factors. SWOT analysis identifies what can help an organization achieve its goals and what challenges need to be overcome or minimized to achieve the expected results.

Table 1 shows the capabilities of cloud technologies through SWOT analysis. This SWOT analysis sheds light on the challenges of implementing or not implementing cloud technologies in our higher education system.

4 CONCLUSION

As mentioned above, there are many advantages of using cloud computing for e-learning systems in higher education. Higher education institutions, as stakeholders, must ensure that they offer quality education, research and public services to their students. As the number of students enrolled in public universities increases, the issue of quality is very important. The article discusses the advantages and disadvantages of using cloud technology in higher education through SWOT analysis, the method of organizing e-learning through cloud technology in higher education, how to better perform the learning process and prepare students for the necessary knowledge and skills is concluded.

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