

Challenges in Cloud Computing Adoption- An Empirical Study of Educational Sectors of Saudi Arabia

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Abstract

Background/Objectives: The rapid growth of cloud computing has become a remarkable in many sectors including educational sectors. Cloud computing is the essential tool, which can be used to enhance the accessibility of quality education. In reality users of cloud computing in Saudi Arabia are facing many challenges due to lacks of regulation compliance, security, privacy, and confidentiality. Research in the field of challenges and barriers in cloud computing is very limited; moreover, there is very little information available in this area especially in legal aspects. **Methods:** This study focuses on the challenges and barriers, which affects cloud computing in higher education in the Kingdom of Saudi Arabia. The study applied a qualitative and quantitative method throughout the discussion and analysis on current issues and challenges in Cloud Computing in educational sectors in Saudi Arabia. **Findings:** Majority of the respondents agreed that privacy, security and confidentiality are the issues that need immediate attention of lawmaker. These issues and challenges act as a barrier for adoption of cloud computing in education sector in Saudi Arabia. There is no specific privacy protection law in the Kingdom of Saudi Arabia, only effective laws will avoid the challenges and barriers related to the privacy and security issues in cloud computing. Cloud computing provides an opportunity for the educational institutions to share the data with students, professors, and authorized person. Sharing of information needs strict regulations on data confidentiality, security and how well the privacy of the institution is maintained. **Application:** Different threats are involved when managing the privacy and sharing of data in the cloud. It is significant to determine the causes of issues and carry out a necessary solution to solve the problem. To ensure an appropriate balance between the number and strength of controls and the risks associated with cloud computing solutions, state agencies and organizations should work together.

Keywords: Cloud Computing, Confidentially, Educational Sectors, Privacy, Regulations, Security

1. Introduction

Today, Cloud computing is the significant and emerging terminology in the information technology world and has been applied in various sectors including educational sector. Cloud computing is the fastest emerging areas in the digital economy. Integrating cloud computing in information technology strategy makes educational institutions enhance their capacity and maintaining security level and restricted infrastructural

investment. Cloud computing is a computing concept that involves network computers connected over the internet. Cloud computing has the potential to run the applications and program on various network computers. Cloud service providers can able to manage the data storage and computing facilities. Software is used to manage the daily routine and procedures of the educational environment in a scalable way that can be attained through the service level agreements¹. Educational facilitators identify the opportunity and

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transmit the pressurized work of managing composite educational technology to cloud. Moreover, the usage of clouds in educational sectors could reduce the operational and maintenance costs. Educational Cloud computing services play a very important role in reforming education. It is the most innovative and rapidly developing technology in the area of education. Because of dynamic scalability, many of the educational institutions around the world are adopting cloud computing. Cloud computing offers an effective framework to enhance the quality of education system in educational sectors. Cloud computing provides an opportunity for the educational institutions to share the data with students, professors, and authorized person. Sharing needs strict regulations on data confidentiality, security and how well the privacy of the institution is maintained. Different threats are involved when managing the privacy and sharing of data in the cloud. But the adoption and usage of cloud computing in Arab countries is significantly low when compared to other developing countries² because Saudi Arabians do not have enough knowledge about the usage of clouds and negative perception towards the adoption of cloud computing. There are some issues emerging in the adoption of cloud computing which influence the educational sector. It is significant to determine the causes of issues and carry out a necessary solution to solve the problem.

The purpose of the research is to first highlight the challenges and barriers that cloud computing provides in the education sector in Kingdom of Saudi Arabia (KSA) and then evaluate the emerging security and privacy issues and also discuss legislation related to privacy and security issues of adopting cloud computing in the education system of Saudi Arabia. Finally, the study aims to suggest some measures to reduce issues/risk emerging from cloud computing in educational sectors. The specific research objectives are:

- To determine crucial challenges and barriers which affects the slow rate of adoption of cloud computing in higher education?
- To evaluate the present data protection legislation and privacy in KSA.
- To explore the security challenges emerged by using cloud computing in the higher education.
- To implicate possible solutions to minimize the challenges emerging from cloud computing.

1.1 Literature Survey

1.1.1 Cloud Computing and Service Models

Cloud computing is the model for managing the effective access to the shared amount of configurable resources like servers, network, application, and storage³. It can minimize the management effort and the interaction of service provider. Cloud computing is used to minimize the IT infrastructure costs and maintenance. Cloud computing has service delivery and deployment models. Cloud service model is the integration of information technology resources shared by the cloud service provider. These service models provide a framework of shared resources. It consists of infrastructure as a service, platform as a service and software as a service⁴.

1.1.2 Infrastructure as a Service

Infrastructure as a Service (IaaS) indicates consisted IT environment consists of focused infrastructure information technology resources which can be organized through the cloud service based tools and interfaces. It comprises of network, connectivity, operating system and hardware. The objective of IaaS is to offer cloud users with an effective level of responsibility and control over the utilization⁴.

1.1.3 Platform as a Service

Platform as a service (PaaS) model indicates inbuilt environment consisting of deployed information technology resources. It focused on the predefined environment which accomplishes set of packaged tools and products used to provide the support for the lifecycle of custom applications⁴. Cloud users need to expand on-premise environment for economic and scalability. It uses predefined environment and configures own cloud services make available to external cloud consumers.

1.1.4 Software as a Service

Software as a service (SaaS) is used to manage the reusable cloud service into a different range of cloud consumers. The organization uses SaaS products that can be used in various aspects. Cloud users are administered by the cloud providers and legally administered. It has restricted administrative control through SaaS implementation⁴.

1.2 Cloud Deployment Model

Cloud deployment model indicates a particular type of cloud environment and differentiated by owner and access⁵.

1.2.1 Public cloud

Public cloud is the cloud environment which can be accessed by the third-party cloud provider and managed publicly. Cloud provider offers present maintenance of the public cloud. Public clouds share IT resources are managed by the cloud delivery models.

1.2.2 Community Cloud

The focused community of cloud users has limited access in the community cloud. Community cloud can be managed by the members of the community and third-party owner has limited access to the public cloud. Cloud users of this community share the responsibility for the services.

1.2.3 Private Cloud

The single organization owns private cloud. It makes the organization to use the cloud computing technology and centralized access to information technology resources by different locations and parts. If the private cloud exists, then there will be no chances of risks and challenges⁶. Management of private cloud can be an oversight by external staff.

1.2.4 Hybrid Cloud

Hybrid cloud has integration of two or more clouds, which make unique entities that are incorporated into the technology, which makes application and data portability⁷. It has community cloud infrastructure which can be shared by a different organization and provides support to the specific community.

2. Privacy and Security Issues

Privacy is right for an individual to have their personal information properly secured. It is significant to maintain the confidentiality of private data i.e., the data which is not supposed to be known to any person other than the owner without his/her consent. Private data can be influenced by present cloud services. These cloud services are accessed by the organization that is different from the data owner. Trust, compliance, and uncertainty are the issues associated with privacy in the cloud computing environment⁸.

2.1 Lack of User Control

The process of user control on data is not possible in the cloud. It minimizes the visibility and transparency. If the

personal data are managed by a person, then there will be a chance of stolen or misuse the stored data. However, cloud service provider does not have potential rights to enable the user access to the personal data, operation on the data and location of the data. Obviously, it is complex to manage the data exposure since number of law enforcement agencies administers the traffic flow. The service provider does not provide assurance on the safe removal of the data on perceiving the deletion request⁹.

2.2 Training and Expertise

Implementation of cloud services is a highly skilled job, but the employment of unskilled people poses a significant problem in the perception of information security. It is significant to make effective management procedures like training⁹. In addition, there will be chances, which students can transfer to cloud computing environment without knowing consequences and risks.

2.3 Unauthorized Use of Stored Data

Authorized secondary usage of user data can be managed by the cloud service provider. It is essential that cloud service providers and the students and teachers have entered into the legal binding agreement. It will increase the trust between the cloud service provider and customers¹⁰.

2.4 Regulatory Compliance

Deployed nature of cloud computing variations in laws and regulations in various parts of the world has made it difficult to implement cloud computing in the present cases. It becomes complex if the cloud computing could accompany the same information in various places at the same time. It is complex to understand the location where the information has transferred at given time. Redundancy is the significant issue but each copy can be controlled by different entities¹¹. There are some properties that make compliance complicates as follows

2.5 Data Proliferation

Data proliferation refers to a production of a large amount of unstructured and structured data by government and businesses at an unpredicted rate. It is characteristics of cloud computing that enunciate the data availability and the service providers replicate that data in various places. It is not guaranteed that the cop-

ies are processed or stored in some jurisdictions. Also, there won't be any assurance of deletion of copies while receiving the request. The cloud computing service that includes offshoring and outsourcing will increase crucial problems.

2.6 Dynamic Provisioning

Outsourcing is the major issue that clouds computing environment faces. Privacy and data protection laws will restrict the private data outside the national borders and remote access and physical transfer of data. Limitation of data transfers is mentioned in data protection and legislation. All countries have practiced such data protection and legislation laws in the transfers of data. Even personal data has not been determined but country regulator uses the model contracts. It comprises of data protection legislation and liability requirements of the organization. These are not suited to the cloud computing. Regulatory complexity and uncertainty in the cloud computing are significant reasons for security and privacy issues. It is complex to know that applied laws when data flows are not known. Implementing the trans-border data transfer regulation in the cloud computing is complex¹².

2.7 Legal Uncertainty

Legal frameworks help to secure the sensitive and personal data of users. The legal frameworks are neutral but it is required for the cloud computing environment. The legal frameworks require to be updated and consider present and future technologies. The nature of cloud computing environment that integrates into different national border interactions have proposed some legal aspects that must be determined while managing the data¹³. In addition, some legal uncertainties related to the right to privacy are found in cloud computing environment. Legal frameworks need to plan what data to be encrypted and ensure that process of private data be secured. These challenges have not evaluated the legal frameworks, and therefore, uncertainties related to legal situations remains the same. Government stakeholders also contribute to the research of providing privacy (which is basic right of people all over the world) for the user by using development of new system and existing measures¹⁴. The procedures are applied to evaluate the data encryption, deletion of data, access management and determine the security causes and failure loopholes.

3. Cloud Computing in Higher Education

Higher education is one of the essential pillars of the social development. Universities, government, and industry have contributed to the world economy and transformation of society. Along with internet resources, the educational institutions use cloud computing for data analysis and data storage. In the education field, cloud computing is practical for different types of reasons. The educational system has suffered from lack of resources like staffing cuts, small classrooms and lack of qualified teachers. Cloud computing is the essential tool which can be used to enhance the accessibility of quality education. These challenges will be managed in a different number of ways by using cloud computing. The problem of overcrowded classrooms will be determined by virtualizing the classroom environment¹⁴. Students can attend the classes of the classroom environment by logging into the online platform. The instructor does not need to know the way to deal with classes. They can only focus on developing contents for the students and build the student skills and help them pass the exams. Cloud allows the students to share the education infrastructure, ideas, and tools that result in effectively reducing the cost for the educational institution¹⁵. The availability of quality learning materials like software and books, which can be equally accessed by everyone in the cloud environment can help the students in improving their academic performances thereby enhancing the ability of the institution, which otherwise has insufficient physical resources, in providing quality education. Cloud computing's SaaS model has become popular in the higher education. The adoption of cloud computing is in the initial stage in Saudi Arabia. Many surveys have been conducted to encourage the country to use the cloud in the organization. Saudi is at the stage of worrying factors as there is a need for more investment in building up the data center with servers and the storage capacity for the use of the IT application. At the same time, Saudi Arabia would have increased the productivity of the resources, scalability and cost reduction for the implementation of the applications in the cloud¹⁶. The third party of the cloud that reduces the responsibility and cost of the organization do the maintenance of the IT resources and the production. The cloud computing enhances the education system by providing quality services to the students.

4. Barriers to Cloud Computing

4.1 Cost

The existing cloud technology has a cost-benefit analysis which demonstrates the high financial cost for the research and development categories in the developing countries. Cloud computing infrastructure is not maintained and installed in the developing countries. Furthermore, there is some influence on technical issues like performance and data compliance. Some research found that lack of computational resources and cloud computing expertise in the developing countries may lead to restricting the use of cloud computing technology. Cloud computing is used to minimize the administrative load and computing expertise from non-IT staff. Comprehensive deficiency of training programs, IT experts, and eLearning academics are the compliance of information security¹⁷.

4.2 Security Trepidation

When compared to other consumers, the educational and professionals in developing countries have security issues. Security trepidations considered are: data protection deficiency, and user lock control breach. According to security compliance in developed countries, the cloud technologies offer effective law and regulations, but they are restricted in the legal regulation in developing countries. It is a significant concern related to the business in the developing countries¹⁸. The employees in public institutions should ensure the characteristics of paying for usage with respect to the liability, insurance, and guarantee. With respect to reliability concern, the data storage has become a significant issue in the Arabian Gulf countries and Saudi Arabia. Some countries have own legislation on managing the data storage in the computer servers.

Academic institutions face many challenges in the use of clouds related to the underdevelopment and newness of the marketplace. The decision taken to adopt cloud computing will be impacted by the cost and technical considerations in the higher education. Information flow is significant in the decision and academic system on how to maintain the information; moreover, social and economic factors influence the students, society, and faculty¹². Some risks and challenges, such as control performance, security, integrity, and reliability have emerged from adoption of cloud computing. The academic institutions require balancing the costs and

benefits but trust is the significant factor in this decision in cloud deployment model.

5. Legislation Related to Data Protection and Privacy in Saudi Arabia

Saudi Arabia does not have an extensive legislation and reforms on data protection and privacy and planned strategic decision on privacy protection. Certain laws are used to protect the education data privacy. The anti-cybercrime law refers to the command, message, voice, and information that have been developed for use in the systems¹⁹. It consists of processes, save, and transmitted data. If the personal information will be processed by the computers, this private data need to be protected. Personal data is mentioned in the existing legislation and the information determines the identifiable and living person. Legally, privacy is not described but could be integrated as the right related to the rights of the person. Under article 3-5, Anti Cybercrime law penalizes the breaches of personal data that are transmitted through the information networks without authorized consent¹⁹. If anyone acts against this violation, they will get a penalty of SAR 3000000 as fines and four years of imprisonment. Personal information like student course materials which are available on the cloud will be protected against the misuse collection. Article 40 of the constitution of Saudi Arabia refers to the law of governance that offers privacy protection. It strictly restricts the stealing or eavesdropping of the private communication. Under article 12, civil service regulation restricts the civil servants in managing the confidential information what they obtain at work. The constitutional provision is used to secure the educational data of teachers and students in the private sector. This law could be applied to the students and educational institutions as they need to maintain the private information of each student. The Telecommunication Act and their laws will be applied to data privacy and privacy protection. Under the article 37, section (7), this article restricts the telecommunication service providers should be aware of calls when they accessed to public communication networks²⁰. Under the article 56, section (1), the service providers should not disclose the data other than their basic information like name and address, telephone number without earlier notification. It needs to make the reasonable initiative

to make sure the user's confidentiality communication. Article 58 (2) and (3) and their laws manage the facilities of telecommunication and networks to manage the privacy users. The bylaws represent that information of user should not be collected without informing users. Telecommunications service provides offers cloud services for the educational service facilities. They are expected to follow the data protection or privacy under Telecommunications Act and their laws²⁰.

Electronic transaction act refers to the protection of user's privacy and service of certified service providers. Article 1 (11) describes the electronic data with the inclusion of electronic features like codes, images, codes, sounds, and graphics. Article 18(5) need certification authority to enunciate the staff maintains the confidentiality of the information managed by the certificate holders²¹. The authorization must be in electronic or writing form. Article 23 (2-4) defines offense as follows,

- Certificate holder should make applicant information in electronic or written forms
- Disclosure of information managed by the ethics of works without applicants' consents in electronic or written form.
- Provider's provision of misleading information or misuse of the certification services.

Education cloud providers may acquire certification from the certification authority. The certification authority secretly identifies the breaches of private information in business or management. Misleading or abuse will have fine of SAR 5000000 as fine and five years of imprisonment. KSA's education law needs that academic institutions protect the student information when they carry out the classes²². Violators of the confidentiality requirements will be subjected to the fine of 20000 SAR and other penalties like suspension of managing license. The legislation in the Kingdom offers civil and criminal liabilities for the violation of data privacy. It needs to demonstrate that the damages are direct and tangible.

6. Methodology

The study applied a qualitative and quantitative method throughout the discussion and analysis on current issues in Cloud Computing in educational sectors in the Kingdom of Saudi Arabia. The qualitative research focused on evaluating reasons, motivations, and opinions of the study through

survey, observations, and interviews²³. A qualitative survey was used for finding the risks and challenges involved in the use of cloud computing in higher education in Saudi Arabia. The responses from the survey were then analyzed quantitatively by statistical analysis to draw conclusion²⁴. Questionnaires were distributed to two types of people in the educational sectors, namely to Faculty and to IT Staff in Saudi Arabia. The objectives of the survey were to highlight the challenges and barriers in adopting cloud computing and evaluate the privacy, security issues and existing legislation practiced for data protection and privacy. The survey consists of open-ended questions. A total of 100 people participated in the survey. The respondents were contacted in person and through e-mail.

7. Statistical Analysis

All the collected data were subjected to statistical analysis using SPSS version 21. Descriptive statistics including frequency, percentage and 95% Confidence Intervals (CI) were used to describe the data. Association between various categorical data was analyzed using Chi-square statistics. A p value ≤ 0.05 was considered statistical significant.

8. Theoretical Framework

Here, an integrated theoretical framework for adoption of cloud computing by educational institutions in Saudi Arabia is proposed through analysis of perceptions of different types of staff (Faculty and IT staff) of different age group of males and females from six different universities in Saudi Arabia. The survey tried to find the benefits of cloud computing in educational sector in Saudi Arabia and factors affecting its adoption in the educational sector. In this framework, the factors of and the barriers to cloud computing adoption are categorized into three contexts such as technology, organization and environment. Since the survey is conducted among faculty and IT staff who are at the forefront of any such change in technology, we believe that their perception and analysis will provide more realistic insights into barriers in adoption of cloud computing in educational sectors in Saudi Arabia.

9. Results and Discussion

The survey questionnaire (Table 1) was distributed among the educational institutions. The questions were related to

familiarity with cloud computing and their risks related to security, confidentiality, and privacy.

There were 54% faculty and 46% IT staff. A majority of the participants (62%) were in the age group of 35 – 40 years. There were only 2 participants between 45-50 years age group. The number of participants from each of the six universities was comparable and varied between 14-20%. Table 2 shows the characteristics of the study population that participated in the questionnaire survey. The responses to the survey questionnaire are summarized in Table 3.

Saudi Arabia is considered as leading economy in the region of Middle East Asia. It has well reputed IT infrastructure, but the adoption of cloud computing in Saudi Arabia is low. Overall, more than 58% of the participants responded “Yes” to all the questions in the questionnaire. More than 90% of the respondents believed that cloud computing uniform policies should be adopted by all universities in Saudi Arabia (Q17), the Strong law dealing with privacy in cloud computing is the demand of hour in Saudi Arabia (Q18), international framework dealing with privacy in cloud computing should be taken

Table 1. Questionnaire used for the survey

Question Number	Item	Response		
		Yes	No	No answer
Q1	Most of the Universities InSaudiArabia are using Cloud computing			
Q2	Cloud computing is an emerging concept which is helpful in higher education in universities			
Q3	Cloud computing has the potential for improving efficiency, cost, and convenience for the universities, especially in higher education.			
Q4	cloud computing deployment model is more suitable for higher educational institutions			
Q5	Cloud computing will bring drastic changes in educational institutions.			
Q6	Cloud Computing reduce the operational and maintenance cost of the universities.			
Q7	Cloud computing provides universities a centralized, virtual data center that is accessible to faculty and admissions personnel.			
Q8	Security risk is the main challenge in cloud computing			
Q9	Privacy and confidentiality is an issue which demands immediate attention of lawmaker in cloud computing			
Q10	Data is properly not maintained, handled used or disclosed by service provider in cloud computing			
Q11	Security and protection of sensitive data are the limitations in using cloud computing.			
Q12	There should be adequate security and accountability in cloud computing			
Q13	There is no legal Privacy protection in cloud computing,			
Q14	Shared resources compromised with the privacy.			
Q15	Cloud service provider should abide by the educational institution’s privacy policies,			
Q16	Cloud Service Provider should agree to maintain the confidentiality of the data.			
Q17	cloud computing uniform policies should be adopted by all universities in Saudi Arabia			
Q18	The Strong law dealing with privacy in cloud computing is the demand of hour in Saudi Arabia.			
Q19	International framework dealing with privacy in cloud computing should be taken into account			
Q20	Implementation of privacy law will generate a future growth of the cloud-based systems in educational sectors			

Table 2. Characteristics of the study population

Characteristics	N (%)
Staff Type	
Faculty	54 (54.0)
IT Staff	46 (46.0)
Age (years)	
30-35	20(20.0)
35-40	62 (62.0)
40-45	16 (16.0)
45-50	2 (2.0)
Gender	
Male	40 (40.0)
Female	60 (60.0)
University	
Prince Sultan University	20 (20.0)
Princess Nourah University	16 (16.0)
King Saudi University	20 (20.0)
Taibah University	14 (14.0)
King Faisal University	14 (14.0)
Umm Al-Qura University	16 (16.0)

Table 3. Responses to questionnaires

Question	Response	
	Yes (%)	No (%)
Q1	60 (66.7)	30 (33.3)
Q2	73(81.1)	17(18.9)
Q3	67(83.8)	13(16.3)
Q4	55(74.3)	19(25.7)
Q5	63(67.7)	30(32.3)
Q6	70(77.8)	20(22.2)
Q7	47(82.5)	10(17.5)
Q8	80(80.0)	20(20.0)
Q9	80(88.9)	10(11.1)
Q10	50(62.5)	30(37.5)
Q11	51(58.6)	36(41.4)
Q12	80(86.0)	13(14.0)
Q13	77(88.5)	10(11.5)
Q14	77(91.7)	7(8.3)
Q15	77(85.6)	13(14.4)
Q16	80(94.1)	5(5.9)
Q17	95(95.0)	5(5.0)
Q18	98(98.0)	2(2.0)
Q19	95(95.0)	5(5.0)
Q20	93(93.0)	7(7.0)

into account (Q19), and implementation of privacy law will generate a future growth of the cloud-based systems in educational sectors (Q20). About 66.7% believe that most of the universities in Saudi Arabia are using cloud computing (Q1). Majority of them believe that cloud computing is an emerging concept which is helpful in higher education in universities (81.1%) (Q2); cloud computing has the potential for improving efficiency, cost, and convenience for the universities, especially in higher education (83.3%) (Q3); cloud computing deployment model is more suitable for higher educational institutions (74.3%) (Q4); and cloud computing will bring drastic changes in educational institutions (67.7%) (Q5). The majority of the survey respondents strongly agreed that cloud computing is the effective technology in education and enhance student's technical skills and also make them lead a contemporary life. 77.8% respondents believe that cloud Computing reduce the operational and maintenance cost of the universities (Q6) and 82.7% believe that cloud computing provides universities a centralized, virtual data center that is accessible to faculty and admissions personnel (Q7). The technology enhances the cooperation skills of students in learning and enhances the monetary resources for education. It also provides the effective direction and makes an effective interaction between teachers and students²⁵. Despite this, about 33.3% of the respondent said that they have no knowledge about cloud computing (Q1). 10% respondents agreed that they would be transferring to cloud in next two to three years. Some of the respondents indicated that they have no idea whatsoever to move to cloud. Security risks (Q8, Q11), concerns related to privacy and confidentiality (Q9, Q13, Q14, Q15) and improper handling of data (Q10, Q12, Q16) in cloud computing and insufficient laws and lack of knowledge are the real issues serving as barrier to the adoption of cloud computing in educational sectors in Saudi Arabia (Q17-Q20). The survey indicated that most of the respondents (88.9%) agreed that privacy and confidentiality are the issues which make immediate attention of lawmaker in the cloud computing (Q9). Only some of the respondents (11.1%) stated that privacy and confidentiality do not matter a lot in the cloud computing as they used protection techniques. Significant barriers to use of the cloud in Saudi Arabia are requirement of infrastructure like safety, internet connection, security of data and financial and administrative considerations²⁶. Cloud computing also influences the computing service personnel who may fear the outcomes of the roles

being outsourced. Some developers feel uncomfortable about the transmitting the critical data and services of business outside the institution. However, outsourcing is a common issue that cloud computing environment faced often²⁷. This need to be avoided and get rid of fear while outsourcing essential data.

9.1 The Security Risk is a Significant Challenge

The survey results indicated that most of the respondents (80%) agreed security risk is the significant challenge which acts as a barrier for computing educational services in Saudi Arabia (Q8). 20% of the respondents stated that they are not aware of the usage of cloud services and technologies. Some respondents indicated that they did not adopt cloud computing technology in the educational institutions. Hence, the survey results clearly indicated that security is the major concern in the computing educational services. Security threats like leakage of sensitive data on cloud and tampering, unauthorized access by the cloud providers and loss of privacy are considered as major obstacles in cloud computing²⁷. Security requirement must be fulfilled by educational cloud computing to secure information/data from the threats.

9.2 No Legal Privacy Protection in Cloud Computing

The survey results indicated that majority of the respondents (77%) agreed that no specific privacy protection law has been followed in the Kingdom of Saudi Arabia (Q13). This inadequate law will lead to misuse or mislead the data. 10% of the respondents agreed that they do not rely on privacy protection as they do not have knowledge of using cloud computing services. 13% of the respondents had no idea of the adoption of cloud computing.

9.3 Strong Law will enhance the Security

The survey results indicated that majority of the respondents (98%) agreed that only effective laws will avoid the challenges and barriers related to the privacy and security issues in cloud computing. There should be an effective or strong law against the misuse of data and unauthorized consent. In future, Saudi Arabia needs to adopt a strong law to protect the data of educational sectors in Kingdom of Saudi Arabia. All educational

institutions use cloud computing to promote academic missions and offer a standard of education to determine the existing legislation. The institution needs to check the existing legislation and should be aware of current legislation practiced in the country²⁸. Saudi Arabia needs to adopt a strong law for data protection and privacy to maintain confidentiality and security of user's data. European Union laws of protection could be applied to avoid privacy and security issues in cloud computing environment.

10. Conclusion

While considering the survey findings, it is significant required to adopt cloud computing in the education community to offer IT enable education services in Saudi Arabia. It is the best time to use cloud computing as a strategic framework to promote effective academic missions. Cloud computing technology provides an educational system and economic benefits over the deployment models. Cloud computing helps to reduce the cost and time. It is effective technology to manage the significant problems in the application of IT in the educational system. It provides various opportunities by using creative approaches to enhance the educational system of Saudi Arabian by making finite resources in a fashioned manner. Cloud allows the service provider to manage the educational system and focus on organizing IT enable the system. The individual should use the essential cloud model and enunciate that the service level agreements with the vendors are effective and also ensure that privacy and security controls are in right place. In Saudi Arabia, education institutions need to modernize the IT infrastructure to offer faster and effective educational services that need essential upgradation of existing IT infrastructure. Cloud technology is essential which need an investment in IT infrastructure and offering computing resources and applications. It also reduces the cost and expands the adoption of technology. The education system offers viability of cloud-based solutions which needs confidential private data. Therefore, cloud computing for the educational system will require offering a high level of privacy and security to make it acceptable in the educational sectors in the competitive marketplace. It is essential to develop an educational specific cloud which determines the privacy and security requirements for educational sectors. Saudi Arabia does

not have effective legislation on the data privacy. The research implicates that European Union form of data protection is necessary to adopt and manage the personal data by the users. By offering protection to the data, the government can build confidence among the students and teachers as well as both non-network and network users.

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