IMPLICATION AND APPLICATION OF CLOUD COMPUTING IN THE SAUDI HIGHER EDUCATIONAL SECTOR

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Abstract
Cloud computing in Saudi Arabia is becoming more and more visible day after day, due to its ability to create better opportunities to improve productivity, efficiency, thus fulfil the ever-growing demands of organizations of every size and sector. However, such technology poses great challenges in terms of privacy and security. To date the Kingdom’s legislative framework, does not clearly nor comprehensively regulates the cloud or its service providers or customers.

Keywords: Cloud computing, Higher Education Privacy, Security, legislation, Saudi Arabia.

1 INTRODUCTION
Cloud computing is a new paradigm, which provides applications and services being accessed through the internet with the ability of sharing, storing and managing data [1]. There are potential benefits of adopting Cloud Computing model. It is adopted at a larger scale all over the world and it offers a shift from computing as a product that is owned, to computing as a service that is delivered to the consumer over the network from large scale data centers or clouds Moreover, nowadays the technology advancements have an important impact on industry development, affecting all sectors, even the most traditional systems, such as education. Many hardware and software industries, such as Microsoft, IBM, Cisco as well as other Internet technologies industries, including Google and Amazon want to explore the opportunities and benefits of Cloud Computing are joining the development of cloud services.

Generally, cloud computing may be defined as a set of hardware and network resources that combine the power of multiple servers to deliver different kinds of services via the web. It was defined by the NIST, the US National Institute of Standards and Technology as “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. Computing facilities and applications will increasingly be delivered as a service, over the internet. We are already making use of cloud computing when, e.g., we use applications such as Google mail, Microsoft office 365 or Google docs. Nowadays government, companies and individual increasingly turn to the cloud [2].

Developing and developed countries are moving to the cloud and Saudi Arabia, among the developing countries, which adopted cloud computing because it allows accessing advanced technology and sophisticated infrastructure without the need for large investment.

Saudi government has made a lot of effort to enhance the education system over the last decade by introducing different development initiatives and building numerous universities. Therefore, the Ministry of Higher Education (MOHE) works to create, regulate, and enforce law penetrating the higher education system in Saudi Arabia. E learning is considered a major component of an integrated education system in modern societies. It represents an advanced stage in the development of a knowledge-based society. It is becoming a source of vital support to the Kingdom's educational system. Saudi universities are rapidly adopting e-learning services in order to provide quality education to its students. Moreover, adopting cloud computing for Saudi educational institutions represents an opportunity to access high-end technologies with minimal expertise and investment [3].

2 METHODOLOGY
The study will research the impact of cloud computing on the Saudi educational sector in terms of opportunities and challenges from the viewpoint of security, transparency, control and legality. Hence, before moving to the cloud, this model should be rigorously evaluated before its widespread adoption.
The study will then focus on cloud computing opportunities, from a financial and operational perspective, such as its low cost to the educational institution, that need to focus on critical tasks without having to bear excessive financial obligations for IT infrastructure, management, staffing and training. In addition, cloud computing will maintain vital flexibility in terms of rapid elasticity and easy access to educational resources.

The researcher will focus on cloud computing challenges faced by educational institutions in terms of privacy and security issues.

3 RESULTS

The use of the cloud can enhance productivity, reduce cost and create employability in Saudi educational sectors.

Suitable law of privacy guidelines and recommendations for the protection of threat in respect of cloud computing in Saudi educational sectors is to be enacted.

Most important barriers to cloud adoption in Saudi Arabia are privacy concerns, jurisdiction complexity, data protection and trustworthiness of data.

An enabling environment including policies, such as privacy and security to be ensured in order to secure platform and protect the customer data.

3.1 Cloud Computing and Transformation in Higher Education

The education sector has gone through a large-scale transformation over the last few years. A set of turbulences in the education sector was triggered by the emergence of cloud computing technology, which took the worldwide classrooms by storm and reshaped most of the processes related to learning, teaching and administration [4]. Cloud adoption has particularly affected the higher education sector, where the benefits of introducing these innovative systems are even more noticeable. Higher education has always been about more than information, no matter how quickly that information can be disseminated or how much of that information can be stored. Our institutions have always been communities driven by connections among faculty, students, research, education, disciplines, communities, and the institutions themselves. In the connected age, it does not matter where to collect the information where the student is, or where the faculty member is. The most important is the value that comes from the connection. In the connecting, age, data, collaboration tools, and communities can come together in ways, which never exist before possible.

Although the cloud includes a broad set of different services, its most widely used applications in educational sector are:

- Email services such as Gmail or Yahoo! Mail.
- Online data storage solutions such as Drop box or Box.
- Other kinds of applications accessible online.

It is important to mention that currently three service models are being differentiated; Software as a Service (Saas). This is the most widely known and widely used form of cloud computing. It provides all the functions of a sophisticated traditional application to many customers and often thousands of users, but through a Web browser, not a “locally-installed” application. The Platforms as a Service (Paas) delivers virtualized servers on which customers can run existing applications or develop new ones without having to worry about maintaining the operating systems, server hardware, load balancing or computing capacity. Infrastructure as a Service (Iaas.) is designed to augment or replace the functions of an entire data center. This saves cost (time and expense) of capital equipment deployment but does not reduce cost of configuration, integration or management and these tasks must be performed remotely.

Each of these three models plays an important role in education transformation. By storing complex IT infrastructure on remote servers, cloud vendors make advanced computing tools available to institutions, companies or organizations at low prices, which is what contributed to a rapid adoption of these services. Furthermore, new provisioning models have triggered proliferation of various cost-efficient business intelligence software programs, collaborative platforms and web applications, the adoption of which is often seen as a major form of innovation in different settings, including education [5].
3.2 Cloud computing indispensable for Higher Education in Saudi Arabia

Cloud computing is becoming more visible due to its potential to facilitate information access, improve collaboration and reinvent traditional IT structures. The concept of cloud computing has its various interpretations and applications, but it primarily refers to technology that delivers powerful computing resources via the web. The benefits of introducing these systems are most frequently discussed in relation to business, but its impact on the education sector is no less significant. Educational institutions all over the world have already adapted the cloud to their own settings and made use of its great potential for innovation.

Cloud computing in Saudi Arabia is becoming indispensable in higher education, due to its ability to create better opportunities for more productive and more efficient teaching and learning, thus fulfilling the growing demands of organizations of the educational sector. Moreover, the mobile learning and the mass adoption of mobile devices is often used put with cloud computing.

The management for AlFaisal University for example took an initiative to develop the first official Mobile e-learning Application. This application acts as the shortest bridge between faculty and the student to provide them with best of functionality available.

The application provides the course content, covers also the interactive access to students for the services on their screens, which include their schedules, results, attendance and calendar events.

Cloud computing has brought many benefits to higher education and e-learning in Saudi Arabia, however such technology poses great challenges as to privacy and security.

Until today, Saudi Arabia’s legislative framework, does not clearly nor comprehensively regulates the cloud or its service providers or customers.

3.3 Benefits of Cloud Computing in Higher Education

There are numerous advantages when the e-learning is implemented with the cloud computing technology, they are:

- Low cost: E-Learning users need not have high-end configured computers to run the e-learning applications. They can run the applications from cloud through their PC, mobile phones, tablet PC having minimum configuration with internet connectivity
- Instant software updates: Since the cloud based application for e-learning runs with the cloud power, the software’s are automatically updated in cloud source. Therefore, always e-learners get updates instantly.
- Improved document format compatibility: Since some file formats and fonts do not open properly in some PCs/mobile phones, the cloud powered e-learning applications do not have to worry about those kinds of problems. As the cloud based e-learning applications open the file from cloud.
- Benefits for students: Students get more advantages through cloud based e-learning. They can take online courses, attend the online exams, get feedback about the courses from instructors, and send their projects and assignments through online to their teachers.
- Benefits for teachers: Teachers also get numerous benefits over cloud based e-learning. Teachers are able to prepare online tests for students, deal and create better content resources for students through content management, assess the tests, homework, projects taken by students, send the feedback and communicate with students through online forums with their teachers [6].

4 CHALLENGES TO CLOUD COMPUTING IN HIGHER EDUCATION

The Internet Service Providers (ISP); such as Microsoft and Google are investing huge amount of money in research and Development (R&D), however foreign, local companies and higher education institutions are still grappling with legal issues to make use of cloud computing due to the legal vacuum and the absence of legislation as to privacy and data protection.
4.1 Privacy law and data protection in Saudi Arabia

Saudi Arabia’s data protection and interception laws and implementing regulations are still relatively new and developing. They reflect, however, the growing global recognition of the importance of control over private data in the digital age. Every organization possessing such data should be aware of information where that disclosure results in loss or harm to the individual.

Saudi Arabia up to date has not passed a comprehensive legislation on privacy or data protection per se though it devised a strategic plan for privacy protection. However, there are certain general available laws that can be extended to protect education data privacy. “Data” under article 1(4) of the Anti-Cyber Crime Law is defined as information, commands, message, voices or images, which are prepared or have been prepared for use in computers. This definition could include a saved, processed, transmitted or constructed data. If computers process the private information of a person then this definition could include private data within the definition.

However, there is no available definition of “personal data” given in any existing legislation though one could define it as any information relating to a living and identifiable individual. Similarly, privacy is not legally defined but could be interpreted as a right associated with the dignity of an individual. Anti-Cyber Crime Law in articles 3-5 penalizes violation of private data that are transmitted via information networks without consent or authorization. Violation of these provisions will warrant a penalty up to SAR 3,000,000 in fine and a maximum of four years of imprisonment. Thus, any personal information including e-health data that are available via cloud will be protected against unauthorized collection, cloud usage or misuses in higher education institutions, Saudi Arabia until today doesn’t have a privacy law and data protection.

4.2 The Basic Law of Governance and the Protection of Privacy

The Basic Law of Governance, which is the Constitution of Saudi Arabia in article 40, provides protection of privacy. The protection covers privacy of telegraphic, telephonic, postal and other means of communication. It prohibits interception or eavesdropping of private communication except for legal purposes. Similarly, the Civil Service regulation in article 12 prohibits the civil servants to disclose secret or confidential information they acquired while at work. The Constitutional provisions could be applied to protect e-health information of patients in private sector and the public sector employees are bound by the Constitution and Civil Service regulation. These two laws could be easily applied to cover any unlawful use, collection and disclosure of information of e-health patients or educational institutions or the students.

4.3 The Other Specific Sector Laws and the Protection of Privacy

The Telecommunications Act and its Bylaws also could be applied in protection of privacy or data privacy. Article 37(7) prohibits the telecommunication service providers from intercepting data or calls carried on public telecommunication networks. Article 37(13) criminalizes intentional disclosure of information or content that have been intercepted. The bylaws in article 56(1) state that a service provider shall not disclose information other than users’ name address and telephone number without prior consent from the users or otherwise required by law. It also requires to take all reasonable steps to ensure the confidentiality of uses’ communication (article 57 (1)). Article 58 (2) and (3) of the bylaws mandates the operators of telecommunication facilities and networks to respect privacy of users. The bylaw also states that user information shall not collect without informing the users the purpose for which the information is collected. It also prohibits collection, usage, maintenance and disclosure of personal information for undisclosed purposes. Thus if the telecommunication service providers are also providing cloud services for healthcare facilities or educational service facilities, they are expected by law to adhere to privacy or data protection rules under Telecommunications Act and its Bylaws. Any unauthorized use, disclosure and transmission of information will be punishable by this law. This law imposes a fine not exceeding SAR 5,000,000.

The Electronic Transaction Act also mentions about the privacy protection of users of the services of certification service providers. The law in article 1(11) defines “electronic data” as data with electronic features in the form of texts, codes, images, graphics, sounds or any other electronic form, either collective or separate. Article 18(5) requires the certification authority to maintain and ensure that their staff maintains the confidentiality of information obtained in the course of business unless authorized by the certificate holders. This authorization must be either in writing or electronic form. Oral authorization is not considered as authorization under this law. Article 23 (2 -4) states the following as offence:
A certificate holder’s use of information concerning the applicant, for purposes other than certification without the applicant’s consent in a written or electronic form.

2 A certificate holder’s disclosure of information accessed by virtue of his work without the certificate holder’s consent in a written or electronic form, or as provided for by law.

3 A certification service provider’s provision of false or misleading information to the Commission, or misuse of certification services.

In the event education cloud service providers or the users obtain certification from a certification authority, any breaches of private information provided in the course of business needs to be kept secret by the certification authority unless authorized. Any abuse will warrant a fine up to SAR 5,000,000 fine and a maximum of 5 years of imprisonment or both [7].

5 CONCLUSIONS

Whilst the government of Saudi Arabia is determined to provide best education facilities and spent billions to upgrade the systems including IT infrastructure, until today Saudi Arabia does not have any data protection law. Most important barriers to cloud adoption in Saudi Arabia are privacy concerns, jurisdiction complexity, data protection and trustworthiness of data.

In fact, the Saudi courts are left with considerable discretion to deal with privacy breach complaints and in the absence of a comprehensive legislation on data privacy, the general principles of Sharia law will prevail. In addition to that, there is no central place where decisions are continuously indexed, collected and made available for the public. Some consider that the lack of a binding precedent system makes the situation more complex [8].

The recommendations will address raising awareness of the importance of the use of cloud services to enhance productivity, reduce cost and create employability in Saudi educational sectors. Moreover, creating an enabling environment including policies such as privacy and security to ensure a secure platform and protect the customer data. Thus, a suitable law of privacy guidelines and recommendations for the protection of threat in respect of cloud computing in Saudi educational sectors is to be enacted.

Hence, a number of security requirements should be satisfied by educational cloud computing systems to protect data from these threats. Cloud Service Providers (CSP) should establish accounts for faculty, students, and staff that should be individually verified and validated by employing usernames and passwords to protect their profiles on the cloud.

Moreover, encryption techniques should be employed to protect sensitive data of institution such as exams, grades, etc from tampering or unauthorized access. Data should be also available, accessible and obtainable at all times on the educational cloud.

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REFERENCES


