

# CLOUD COMPUTING IN EDUCATION SECTOR WITH SECURITY AND PRIVACY ISSUE: A PROPOSED FRAMEWORK

Atif Ishaq<sup>1</sup>, Muhammad Nawaz Brohi<sup>2</sup>  
<sup>1</sup>MS (Information Technology), <sup>2</sup>Head of campus  
SZABIST Dubai, UAE

## ABSTRACT

*Cloud computing is vast technology and enhancing day by day. Different author have different point of view for cloud in education. In this paper different proposed architectures for cloud and did comparative analysis to make more secure data over cloud. Every technology have threats so this cloud technology has security threats. In the middle of the paper mapping of Common security framework with cloud computing technology and on that basis authors conduct survey. In the end proposed framework is proposed to make more secure.*

**KEYWORDS:** Cloud, E-learning, framework, Threats, framework

## I. CLOUD COMPUTING

Computing is transmitted to a mode commoditized and considerate conveyed alike to custom, for example, water and power .in this sort of models administrations access relies on the utilized prerequisites without admiration to where offices have been facilitated and how they will be conveyed. Numerous processing models have guaranteed us convey this utility figuring vision and these incorporate Grid, bunch registering, and as of late distributed computing There are numerous meanings of the cloud and the endeavors from the showcasing some way or another obscured. Cloud is much than only a money related model. Advances like cloud can be passed on in numerous systems and in distinctive courses of action and configurations. [1]

In the second part of the paper we deeply more discussed what is e-learning and different architecture which proposed by different authors. In the middle part of the paper did the Mapping of the Common security framework controls with the cloud computing security and risks which are involved .On the basis of the common things between CSF(common security framework) we conduct a survey in different colleges and academies. In the last part of the paper we proposed a framework to make more secure data on the cloud for education system which is necessary to for education on cloud or e-learning.

## II. ONLINE EDUCATION OR E-LEARNING

Amid the most recent years, the nature of the Internet was continually hinting at change from a spot used to scrutinize site pages to a circumstance that allows end-customers to run programming applications. Instinct and participation have transformed into the watchwords of the new web content. There is surely the future fits in with the Web 3.0 (furthermore called the sagacious Web).

There are a couple appropriated processing organizations suppliers that offer sponsorship for enlightening systems. Among them are Amazon, Google, Yahoo, Microsoft et cetera. (Utilizing Cloud Computing for E-learning Systems) Information advancement guideline of schools was generally coordinated in PC classroom. [2]

## III. CLOUD BASED E-LEARNING ARCHITECTURE

The e-learning can't totally supplant educators; it is just a redesigning for innovation, ideas and instruments, giving new substance, ideas and techniques for instruction, so the parts of instructors

can't be supplanted. The instructors will even now assume driving parts and take an interest in creating and making utilization of e-learning cloud. The mixed learning methodology ought to enhance the instructive demonstration.

E-learning cloud building design is appeared [3][4].The proposed e-learning cloud structural engineering can be isolated into the accompanying layers: Infrastructure layer as a dynamic and adaptable physical host pool, programming asset layer that offers a brought together interface for e-learning designers, asset administration layer that accomplishes free coupling of programming and equipment assets, administration layer, containing three levels of administrations (programming as an administration, stage as an administration and foundation as an administration), application layer that gives content generation, content conveyance, virtual research center, cooperative learning, appraisal and administration highlights.[5]

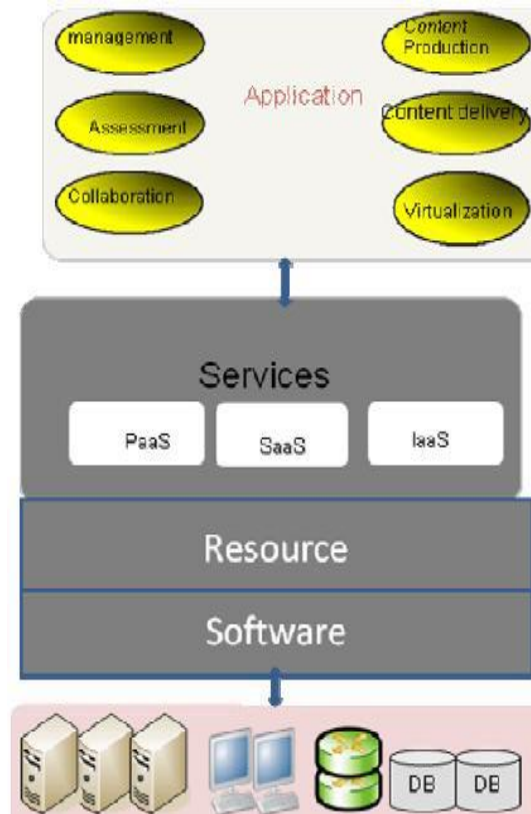


Fig 1: Cloud based e-learning Architecture

#### IV. COMPARATIVE ANALYSIS OF PROPOSED CLOUD SYSTEM WITH THE EXISTING SYSTEM

##### a. Data Portability

Data portability is very important in educational sectors. Student does several projects and research works on diverse fields. Moreover they collect several materials associated with their study like lecture, slides and various supplementary documents. [6]

##### b. Overseeing and Reporting:

Information movability is critical in instructive areas. Understudy does a few ventures and research deals with assorted fields. In addition they gather a few materials connected with their study like address, slides and different supplementary archives[6]

##### c. Economical Feasibility:

Because of the poor prudent condition the legislature can serve just couple of PCs to every organization which is around 0.782 for every 100 individuals. Besides the study performed by the association Amader

Gram demonstrates that the legislature can give PC just 35% school out of its aggregate school. However the satisfaction of programming prerequisite is much more extreme than equipment satisfaction. Since the Government cannot manage the cost of the high cost programming for every establishment consequently the utilization of pilfered programming is increasing day by day.[7][8][9]

## V. INFORMATION SECURITY THREATS ANALYSIS FOR E-LEARNING

Point of interest of e-learning is that clients can be anyplace and at whatever time to get to the learning materials. Then again, given that the Internet is constantly presented to the data security dangers, the shots of clients confronting the dangers are likely high. In late 2002, the Knowledge ville University in Southeastern US encountered an assault brought about the server facilitating the e-learning framework application closing down amidst semester. This circumstance has putting stop to understudies and employee to perform the showing and learning procedure. [10]

- **Threat Analysis[11]**

Threat analysis is a procedure of Detection, identification and assessment of vulnerabilities of an operation or framework. Dangers are investigated as for their probability of event, their conceivable effect on individual clients and framework and the worldwide risk they represent

Threats analysis model for e-learning for this study consists of 5 steps.

- **Step 1- Identify security objectives:**

The threats analysis starts with identifying the objectives of security in e-learning application.

The main elements of security are confidentiality, integrity and availability

- **Step 2-Application overview**

In this step, applications in the e-learning environment were recognized. Applications recorded are: Virtual Learning Environment (VLE), enlistment, account, understudy organization, affirmation, portable learning and virtual learning. VLE comprise of online course Administration, course administration and specialized instruments. The performing artists and parts in every application are likewise recorded in this stride. The performers are separated into two gatherings that are enlisted and unregistered clients. The enrolled clients are: Delivery Coordinator, (System) Administrator, Online Course Coordinator, Course Manager (Instructors or Facilitators), Discussion Facilitator or Moderator, Students, Stake Holder or Top Management. The unregistered clients are the visitor or guests and the supports.

- **Step 3 –Identify Application Vulnerabilities**

The security vulnerabilities for each application in e-learning were identified. This step uses the classes of common application vulnerabilities categories

- **Step 4 -Identify Threats**

The details of threats were characterized in this step. The possible attacks is defined whether it is intentional threats or unintentional threats. These attacks were also reflected whether they will give effect of fabrication, modification, interruption or interception to the information.

- **Step 5 –Analysis of Threats:**

After completing the four steps, risk of each threat is measured by allocating the probability of event and effect to individual or framework. The danger assessment is utilizing the danger assessment matrix proposed by Barbeau [2]. Dangers got from the risk examination were ordered in three fundamental gatherings to be specific minor, major and basic. The rundown of the dangers investigation result has been changed over to the e-learning threats risk framework.

## VI. MAPPING OF THE COMMON SECURITY FRAMEWORK CONTROLS WITH THE CLOUD COMPUTING SECURITY AND PRIVACY ISSUES

- **Common security framework:**

CSF providing us a control framework and best practices for the online education information security. The requirements designed for the education sector and the environment of educational information. All the educational organizations must use and can securely share and protect the data with the option of CSF for better quality. [12]

Educational organizations in order to evaluate and test the cyber security level can use CSF's controls as they are related to cyber security. For data collection and reporting, the organizations can also opt for MyCSF assessment option.

- **CSF Controls:**

CSF has several controls which are listed below:

- access control
- human resources
- security program
- risk management
- physical environment
- asset management
- information security incident management
- business continuity
- organization of information security
- security policy

## VII. CLOUD COMPUTING SECURITY ISSUES AND PRIVACY RISK

In the cloud computing security and privacy issues are much. Different authors discussed in detail in literature review. There are many security and privacy issues are in cloud computing few are mentioned below.

- Confidentiality
- Availability
- Integrity
- Privilege user access
- Data disposal
- Assuring cloud security
- E-investigating and proactive monitoring
- Information-centric security
- Application security
- access control
- organization of information security

With the use of mapping technique we come to know that there are many factors are common between CSF controls and cloud computing security and privacy issues:

**Table 1:** Common between CSF and cloud security and privacy

Issues	Cloud computing issues	CSF Controls
Access control	✓	✓
Human resource	✗	✓
Security program	✓	✓
Risk management	✗	✓
Communication management	✓	✓
Physical environment	✗	✓
Asset management	✓	✓
Application security	✓	✗
availability	✓	✗
Information security incident management	✓	✓
Business continuity	✓	✓
Security policy	✓	✓

After using mapping technique there are many factors are common between CSF and cloud computing security and privacy issues. Hence I gathered more data from different schools and colleges where cloud already implemented. The data gathered from the 7 different educational firms. This qualitative research

conducted on IT staff of 29 from the different schools/Colleges. The survey was conducted personally interviews with the department. The Survey was conducted to identify which security problems they faced before or after implementing which are deemed necessary according to the available literature.

### VIII. SURVEY RESULTS

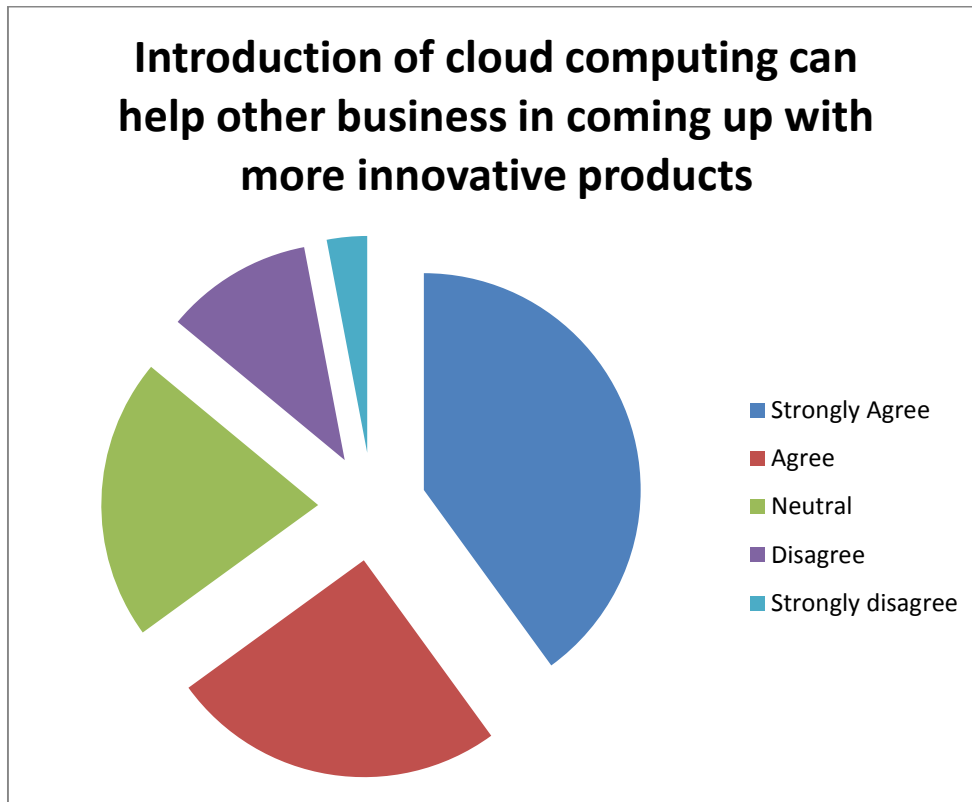
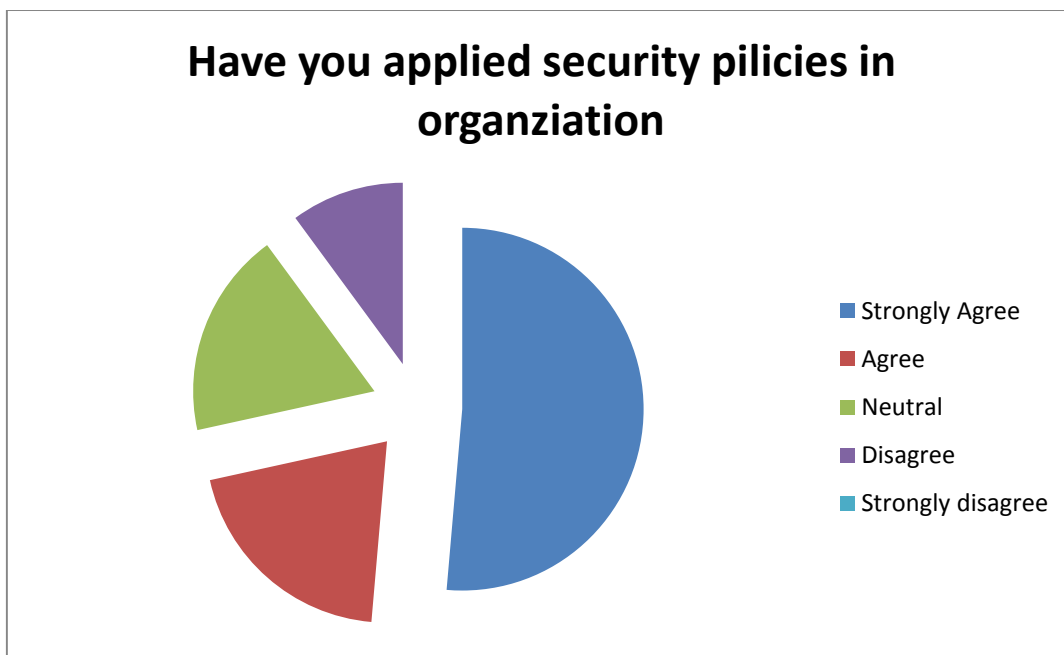


Figure 2: cloud computing can help other business in coming up with more innovative products



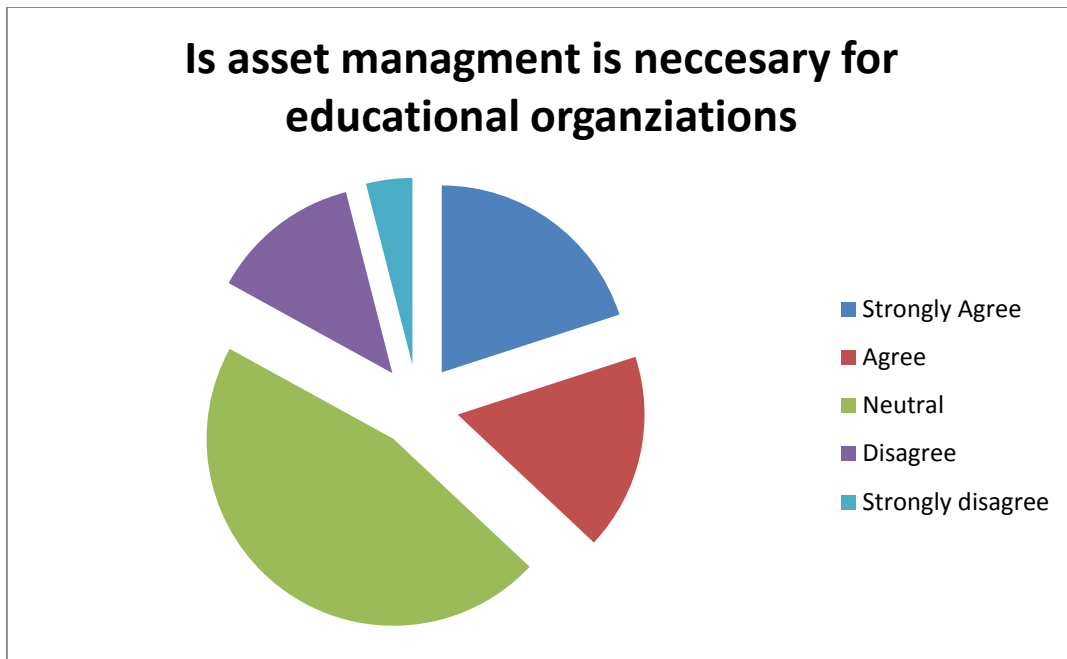


Figure 3: asset management is necessary for educational organizations

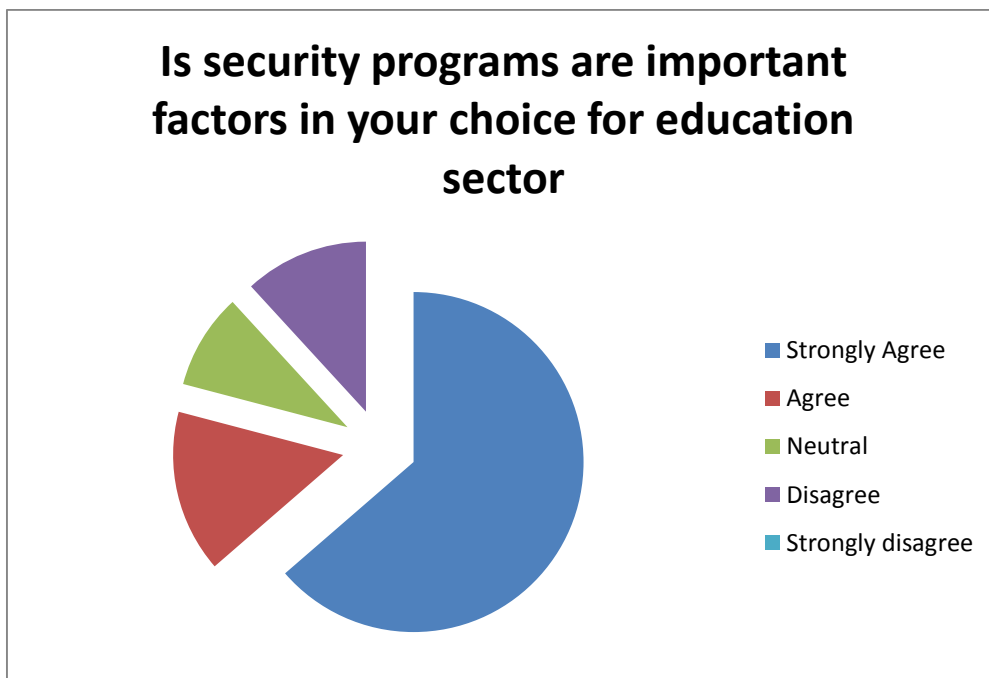
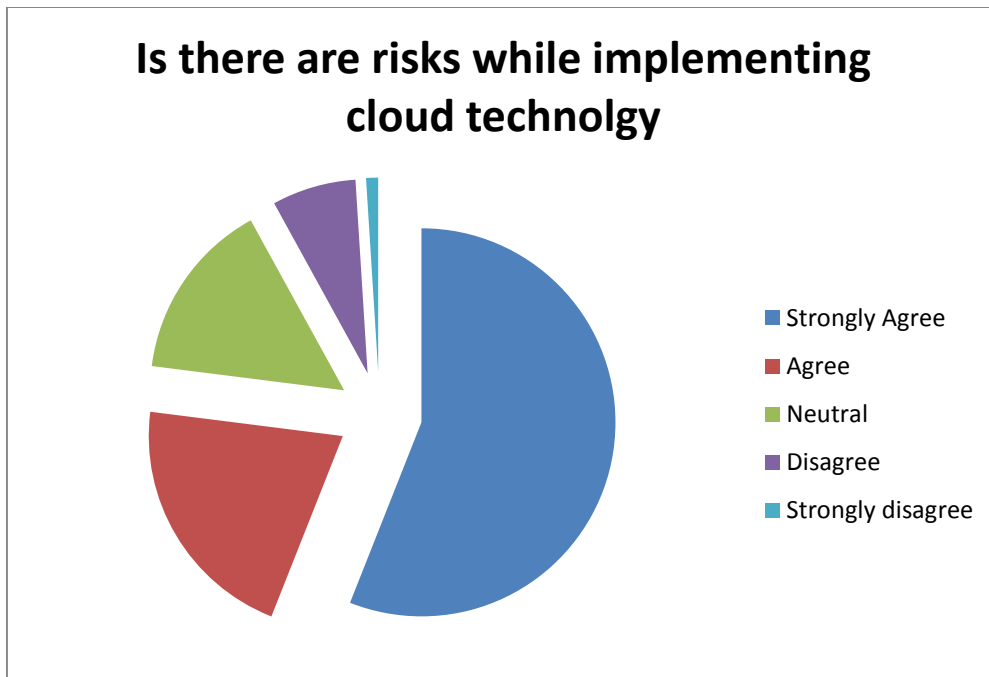
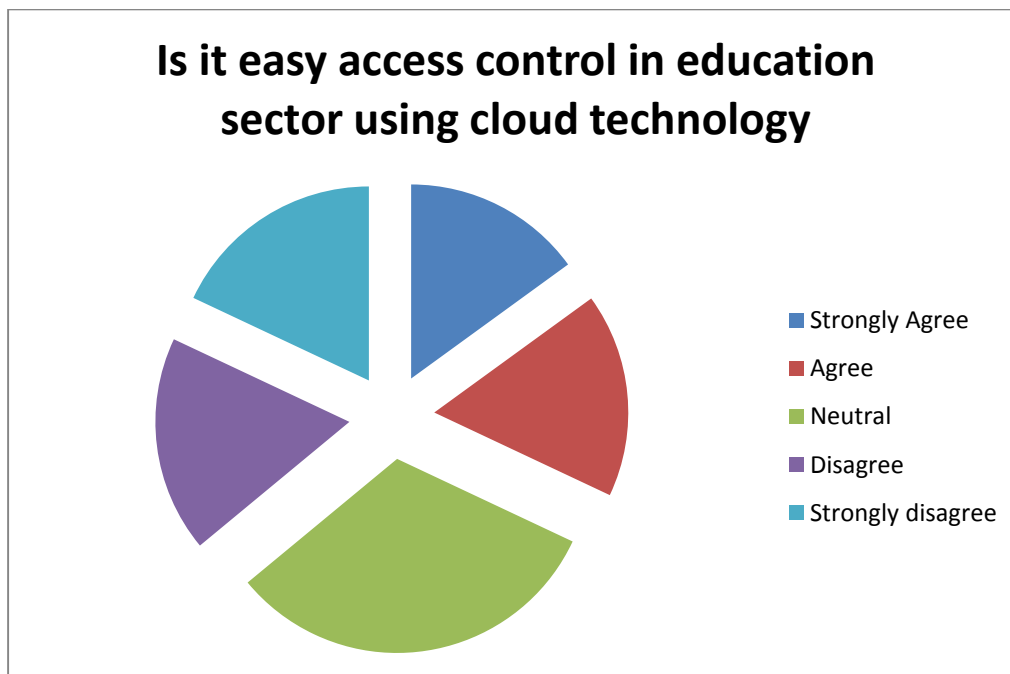


Figure 4: security programs are important factors in your choice for education sector



**Figure 5:** There are risks while implementing cloud technology



**Figure 6:** It easy access control in education sector using cloud technology

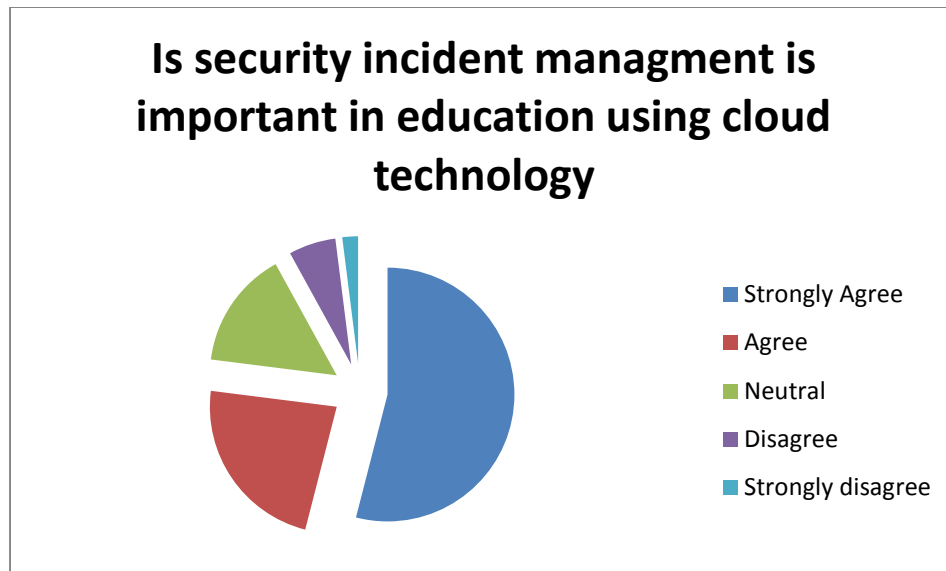


Figure 7: security incident management is important in education using cloud technology

### IX. PROPOSED FRAMEWORK

On the basis of the mapping technique and then with the help of survey which is taken from different school and college the researcher has proposed a modified Cloud Computing in education industry framework includes all the security and privacy features of information security thus improving and providing more security for the students and the teachers in a way that will help organizations in implementing effective cloud technology service along with ensuring information and data security. Using Controls of the CSF on the clouds we can make more secure education system Cisco is agreed to provide and support education sector with good and better experiences and the important help and guidance needs of their secure information.

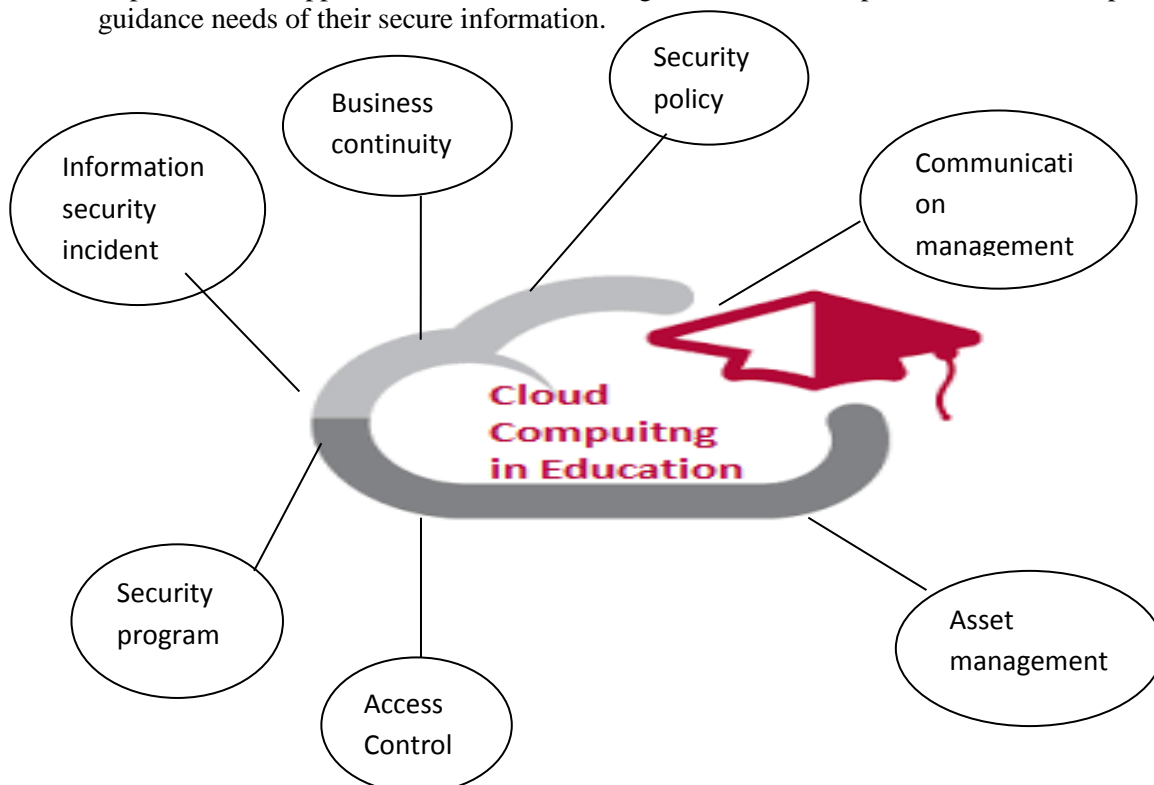


Fig 8: Proposed Framework for the cloud computing in education with security and privacy issues



## X. FUTURE WORK

Every Technology is updating day by day and so the cloud technology or e-learning is updating with different measures. So for the keeping safe e-learning there are many other technologies which can help e-learning to make secure or keep data safe on cloud.

## XI. CONCLUSION

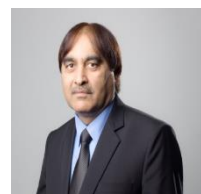
Nowadays there is an increase of use of cloud based practices and so over the past few decades as they require bringing into line business with IT has been realized. Cloud has its own determination with advantages which focus and forces the education sector to implement many standards to achieve their business placement, improve security quality and to achieve reliable cloud processes throughout the originality. This study compared the processes of other cloud in education sector with best proposed framework. It is evident from the study off all frameworks and considered for this study have some similarities with online or e-learning security, which may help enterprises to implement cloud concurrently with e-learning to improve their security and business productivity. Infrastructure security that will result in better IT service management and eliminate the need to implement multiple technologies to achieve education security and privacy.

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## AUTHORS BIOGRAPHY

M.N Brohi PhD (Information Technology) Head of SZABIST Dubai United Arab Emirates (UAE). M N Brohi has completed his Ph.D. Research Courses from Northeast University of Technology, Shenyang, China and earned a PhD in Information Technology from Pakistan. He has completed his M.Sc. (Computer Sciences), Quaid-i-Azam University, Islamabad, Pakistan. He has been associated with the teaching profession for the last thirty years. Besides regular class teaching at different universities, his experience is extended to



research, paper publication and text-book writing as well. In 2001 he joined the Preston University Ajman, UAE as Head of Information Technology, Department of IT. In December 2012 he joined SZABIST Dubai as a Head of Campus. Since the last 3 years he has been contributing toward the academic growth of the only off shore Pakistani university in Dubai.

**Atif Ishaq** MS(Information Technolgy) SZABIST,DUBAI United Arab Emirates(UAE)

Atif ishaq is born in Doha Qatar in 1987.He received the BS in Information technology degree from Northern University, Pakistan. Now he doing MS in Information Technology form SZABIST, Dubai UAE. He has keen interest in research and paper publications. He has already papers are published. His main areas of research interest are Cloud Computing, e-learning and information systems.

