

# **AWARENESS AND ADAPTATION OF CLOUD SERVICES BY IT ACADEMICS IN INDIA**

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Dissertation submitted in partial fulfillment of the requirements for the degree of  
MBA in Cloud Computing  
At Dublin Business School

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## **DECLARATION**

‘I declare that this dissertation that I have submitted to Dublin Business School for the award of MBA in Cloud Computing is the result of my own investigations, except where otherwise stated, where it is clearly acknowledged by references. Furthermore, this work has not been submitted for any other degree.’

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## ABSTRACT

The focus of this thesis paper is laid on the awareness and adaptation of cloud services by IT academics in India. In addition, the paper will also highlight the benefits of using cloud computing services in educational institutions. Moreover, the challenges for adopting the cloud computing services Indian universities will also be illustrated in this paper. The researcher will also conduct qualitative and quantitative research methods through which the opinion of students and lecturers of Indian Universities about the adoption of cloud computing. On the other hand, the vendor who provides cloud computing services will also be highlighted in this paper. This research also discuss about utilization of cloud computing technology particularly in the educational institutions where computer technology are progressively used and what should be possible to expand the advantages of normal services for students and staffs. The scope of awareness in the subject of cloud services among the academics of the Indian universities has been clearly reflected through the data obtained from the current research. The results of the study have been somewhat positive in the sense that it shows that academics of the Indian universities are indeed aware of the cloud-based applications as far as serving educational purposes is concerned.

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## 1. INTRODUCTION

### 1.2 Background

Education plays an important role in economic development of a country. India is a developing country and has been providing different plans to make advancement in the educational sector. These different plans make students to go to schools and universities. But the limitation in facilities, trained lecturers, upgraded libraries and laboratories genuinely influences the development. Lack of proper infrastructure and the maintenance of available infrastructure are the major problems faced by the government while implementing the facilities. Also, maintaining the massive software and hardware need sufficient and constant investment to help them.

Cloud computing is one of the latest technologies in recent times which helps to solve these problems. In the education sector, the cloud computing has played a major role in helping students. Cloud computing has not only just made a difference in educational organizations to accomplish their objectives, it is a network of shared resources that every students can access from anywhere at any time. Thus by executing cloud technology in educational institutions, all these issues will be solved and helps to keep a united infrastructure where all the institutions can check the training framework from every single viewpoint. Generally, the cloud computing

stages can be isolated into three significant models, SaaS (Software as a Service), IaaS (Infrastructure as a Service) and PaaS (Platform as a Service). Every one of them have diverse sort of administration direction which manages the foundation of the institution or the product direction which is significantly utilized inside the association (Ghazouani and Slimani, 2017). Adapting cloud computing courses as a different subject in universities has made adjustment and isolated the field of significance for arrangement of cloud computing.

It has been identified that the Google cloud storage and AWS benefits along with IBM cloud are the sections of the major and generally used pointed data providers. The high effect of development has encouraged the universities to grip the zone of critical guidance under information development. The cloud computing courses as an alternate subject within universities has similarly made changes in the overall data storage and IT services of institution. The importance of developing awareness about cloud computing among Indian academics is what's more admirable, adopting cloud computing as another subject, to be learned in an academic level will be discussed in this study.

## **1.2 Rationale of the research**

The development of cloud computing over the globe has been gigantic. Management part, for example, account keeping and changing data have additionally been facilitated because of the expanded competency with data innovation. From the examination of different reports and college coordination and yearly articulations, it has been seen that cloud computing and its components adaptively has affected the management division of instruction as well. It has been identified that in India, the cloud computing services have been initiated in order to help the students with their academic works in different ways (Barona Lopez *et al.* 2017). Now, the students can access different library database for their studies as well and services like video conferencing and online texting paved way for an effective distance education. The study is necessary to examine the effect of different administrations which are given by cloud computing and the general commitment of cloud figuring arrangement with daily academics of the students using these services considers. Effect vastly differs from developed nations to developing nations. The organized arrangement of cloud computing inside the universities in India is far but, not quite the same as adaptively, and utilization of cloud computing for students in the colleges of European countries. This examine, along these lines, will help in upgrading the capacity of distinction inside the versatility and contrast between the level of interest inside India and other countries. The innovation of cloud computing has additionally offered guidance to

those who practices. For example, electronic learning for e-learning frameworks has been created to stay up with innovation and give new bearings to utilize cloud computing (Nooret *al.* 2018). Companies and institutions with both national and global levels have been using cloud computing as one of the most significant models of organization. AWS which give Infrastructure as a Service which has profoundly been grown to offer types of support like transferring records and downloading student data in online interfaces of school and different organizations. Cloud computing as of late has been made open in portable stages and in practically all working frameworks. This subsequently makes the expanded chance of getting lined up with office and establishment level organization. The usage of cloud computing in India colleges, for example, India Institute of Management, Kerala University and different universities at the public and private level equally attempted cloud computing in order to get the work effortlessly done. Their brilliant administration of information and easily available information sources with having legitimate encryptions settled on them the first decisions for establishments in quite a while (Sánchezet *al.* 2016). Study materials in type of online video classes, recordings, computerized books and pictures are perfectly packed inside education uses of cloud computing.

### **1.3 Significance of the study**

The general motivation behind academic research is to take activities which are educated and to give a hypothesis in order to contribute more interest towards the improvement in study of cloud computing in academic level. Subsequently the focused study helps in make utility of research. The future possibility of these studies will likewise be progressively adding to the general significance of the examination. The future possibility of students encouraging e-learning will also be progressively adding to the general significance of the research. This has helped the students to deal with their work in educational field in a viable way (Khedr and Idrees, 2017). The investigation, subsequently, is basic to look at the impact of various organizations which are given by appropriated registering and the general responsibility of cloud figuring plan with the ordinary academics of the students to information development considers. Electronic learning for e-learning systems has been made to keep awake with development and give new course to use dispersed registering. Affiliations and foundations with both National and worldwide levels have been increasing appropriated processing as one of the most huge models of administrations. AWS which gives Infrastructure as a Service has significantly been developed to offer sorts of help like moving records and downloading student information in online interfaces of school and various colleges. Cloud computing starting late has been made open in convenient stages and in basically all working

structures. This, consequently, causes the extended possibility of getting arranged according to office and administration level institutions. The use of circulated figuring in India universities, for instance, India Institute of Management and India Institute of development, various schools at the little and private level are like manner endeavored processing for impressive the limit, so as to complete the work easily. Their organization of data and viably accessible data sources with having genuine encryptions chosen them the main choices for foundations in a long time. Study materials in sort of chronicles presentations automated books and pictures are notable inside the Indian guidance plan of information development.

#### **1.4 Research Aim**

The aim of this research paper is to reveal the change and its consecutive impacts due to integration of cloud computing in education system of Indian universities. It also aims to find out the level of awareness about cloud computing among the students and lecturers, and how we can give the quality training by utilizing the above technology. This can support the colleges in India to analyze the educational system and they can effectively face a future where most of educational administrations will be hosted in cloud which helps to improve the education sector of nation and can find out the role of universities in giving suitable training on the topic cloud computing.

## **1.5 Research Objectives**

The research objectives are mentioned below:

- To find out whether universities in India are effectively using different cloud computing services such as online lecturers, video conferencing, online references etc.
- To analyze the impact of cloud computing in changing the teaching standards and how it helps the education sector in India.
- To find out solutions to solve the issues related to educational applications of cloud computing and to find out what necessary measures are required to give proper awareness to students about the importance of using cloud technologies in education.

## **1.6 Research Questions**

Q1) How cloud computing has become important in educational institutions over the years?

Q2) How the cloud computing has helped the IT academics in India to improve their learning process and how effectively they are using different cloud services?

Q3) What is the level of awareness among students and staffs about cloud computing technology and what are the challenges they are facing in this aspect?

## **1.7 LITERATURE REVIEW**

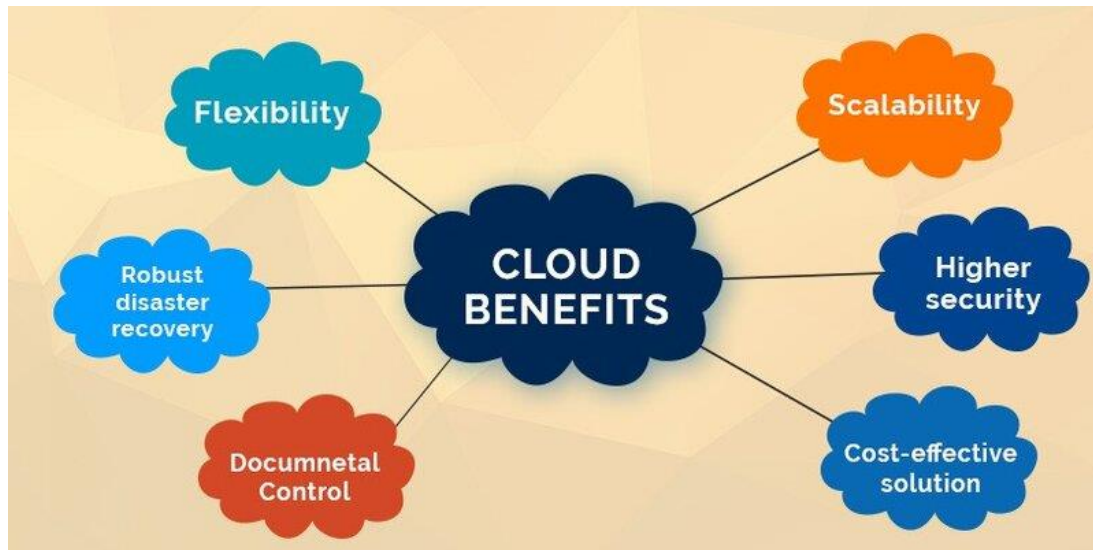
### **1.7.1 Introduction to cloud computing**

Cloud computing is one of the latest technologies that are being used by the business entities to improve the business function, because it provide internet-based registering in which shared assets, software and data are conveyed as service that computer or mobile devices can access on request in a low cost manner. In addition, cloud computing has also helped the business process of an organization to improve the working process for achieving the goals and objectives. It has also been identified that cloud computing is the delivery of computing services such as servers, storage, databases, networking, software and cloud-based services like Google Apps, YouTube, Twitter and Drop box. Most of these are free or low-cost cloud-based services which are utilized on a daily basis. Moreover, the cloud computing also provides an alternative data centre premises through a company can develop its business function. On the other hand, the cloud environment also provides an easily accessible online portal which makes it easier for the user for managing the computing, storing, networking and application of resources (Rittinghouse and Ransome, 2016). Some of the multinational companies like Amazon Web Service, Microsoft Azure, Digital Ocean and Google Cloud Platform are providing cloud platforms to the users through which they can process their works in an effective way. Apart from this, the hybrid cloud, private cloud and public cloud are types of

cloud computing which are being used by the business firms in order to store the database (Stergiouet *al.* 2018). On that note, it can be said that the users will be able to use the cloud platforms in such a manner through which they can enhance their database management system along with their business function.

Moreover, the cloud computing has also helped the business procedure of an association to improve the working procedure for accomplishing the objectives and destinations. It has also been recognized that cloud computing helps for registering managements, for example, servers, storing databases, systems management, programming and others. Besides, the cloud computing additionally gives an option of data center premises through which an organization can build up its own business work. On that note, it can be said that the customers will have the option to utilize the cloud stages in such a way that they can improve their database and board infrastructure together with their business work.

## 1.7.2 Cloud computing benefits



**Figure 2: Cloud computing benefits**

(Source: Marinescu, 2017)

Some of the benefits of cloud computing is:

- **Cost saving-** The usage of cloud computing will mainly help an organization to save the cost of developing products, services and maintenance. In addition, the cost saving procedure will also help an organization to make profit rates thereby attaining a competitive position. On the other hand, the cloud computing will also help a business firm to save the cost of developing the organizational process through which the business function can be enhanced. This will further help the firm to monitor the business process so that low cost services can be developed (Hurwitz and Kirsch, 2020).

- High speed- A business firm will be able to maximize the business function with the help of cloud computing platforms. By using the cloud computing, the speed of the business functions will be improved which will further enhance the productivity of the company. This will also help the firm to develop a strong reputation in the market through which the goals and objectives will be achieved (Bottaet *al.* 2016).
- Backup and restore data- With the help of cloud computing, a company will also be able to take backup of the data as well. In addition, the restoration process of the data can be enabled with the usage of cloud computing process. This will also help the firm to develop its business reputation and can take protection from data loss and data damage. Therefore, it can be said that the cloud computing will provide benefits to the company which is used for data backup and restoration process. Also, the rebuilding procedure of the information can be empowered with the utilization of cloud computing process (Varghese and Buyya, 2018)
- Automatic software integration –The software integration process will be enabled for an organization with the help of cloud computing process. As the cloud computing process provides software integration technique, an organization will be able to integrate the latest software within the database in an effective way. This will also help the firm to provide maximum services to

the customers which will improve its reputation in the market. The product reconciliation procedure will be empowered for an association with the assistance of cloud computing process. As the cloud computing process gives programming resolution method, along these lines, an organization will have the option to coordinate the most recent programming inside the database in a powerful manner (Gaiet *al.* 2016)

- Unlimited storage capacity- With the assistance of cloud computing, an organization will also have the option to accept reinforcement of the information. Moreover, the rebuilding procedure of the information can be empowered with the utilization of cloud computing process. In this way, it is sure that, the cloud computing will give advantages to the organization which is utilizing it for information support and data recovery. Also, the reform method of the data can be enabled with the usage of conveyed registering process

### **1.7.3 Importance of cloud computing in education**

The cloud innovation suggests development in different areas of business, and managements. In the ongoing years, the conventional classroom infrastructure changed definitely to e-learning framework because of the shocking progress in technologies. The time of web and innovative improvement throughout the years boosted open doors for e-learning framework. Cloud computing is the technology

which gives the option to benefit the cloud services on demand at any time. The user has the option to select more than one provider among different cloud providers, instead of a selecting one, thus allow using various edges with different infrastructures (Yang *et al.* 2017). In the recent times, the educational institutions in India are using the cloud computing process through which they have implemented new technologies which has enhanced the learning process of the students. Moreover, the educational institutions are also using the cloud platforms for cutting down the cost of management process. However, some major issues including the security, privacy and performance which are connected while implementing cloud technology in institutions which can be solved by the return provided by vendors of the same technology.

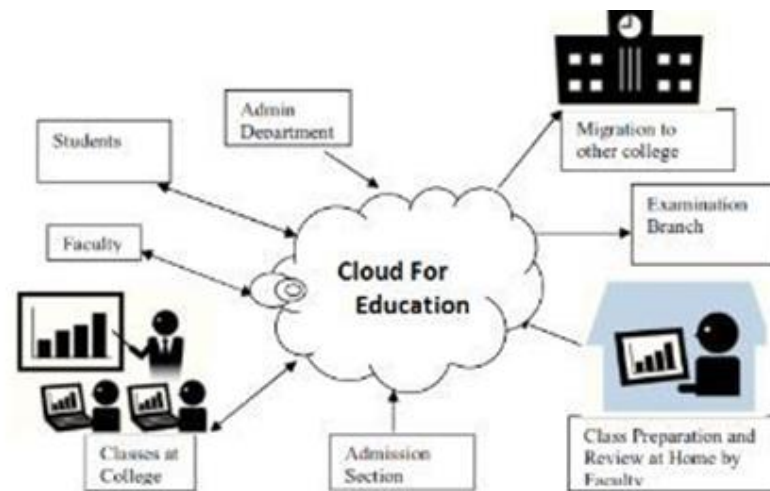
In addition to this, the cloud computing provides e-learning environment to the students so that they can learn and gather knowledge by staying at their homes as well. Students and teachers can access to these services by any mobile devices at any time. Thus it makes the students more flexible to download the study materials. Migrating to cloud technologies helped to reduce the organizational expenses and this permits the attention on educational training rather than the mechanical side (Li *et al.* 2018). This framework could also strengthen independent learning. Therefore, it can be said that the cloud computing is important for the IT academics which will enhance the learning process of the students in an effective way.

The cloud development offers progressions in various territories of business and educational administrations. In these years, the ordinary study structure changed unquestionably to e-learning system due to the dramatic progress in technology. Cloud computing is the innovation which gives the online services on demand. The hour of web and creative progress during the time introduced new developed way for e-learning system. (Elzamly *et al.* 2017). A lot of cloud providers are available and the client has the choice to pick different providers rather than a single provider. The trend setting technology, cloud computing offer SaaS, broadband web and virtualization because of the increased interest of clients. In the partial time, the educational foundations in India are utilizing the cloud computing process through which they have actualized new advancements which has upgraded the learning procedure of the students. Moreover, the educational organizations are additionally utilizing the cloud stages for cutting down the expense of the administartions. However, the security, protection and execution are considered as the main issues related with cloud computing when implementing in educational institutions and it can be solved the point of interest offered by a similar technology (Elzamly *et al.* 2019).

Cloud computing has improved the flexibility of access to the assessment materials. This gives way to focus more on educational purposes as opposed to the practical side (Gangwar and Date, 2016). This structure could similarly encourage

independent learning and distance education. In this way, it tends to be said that the cloud computing is significant for the academics which will improve the learning procedure of the students in a successful manner.

#### 1.7.4 Process through which the Universities will get benefits with the help of cloud computing



**Figure 2: Cloud Computing in Education**

(Source: Wang *et al.* 2017)

As the cloud computing provides e-learning facilities along with online classes for the students, therefore, the educational institute will be able to enhance the profit rate. In addition, the class preparation along with the review of subjects at home by faculty is also possible for the students if the educational institutes use cloud computing process. Moreover, the cloud computing will also help the educational institutes to educate the students in a proper way so that the teachers and students

both can cooperate with each other. It has been evident that cloud computing is the innovation which offers the decision to profit the administration on demand. The forefront technology, for example, PaaS, virtualization, and broadband web are offered by cloud computing because of the developing interest of clients. In the ongoing occasion, the universities in India are utilizing the cloud computing process through which they have executed new innovations which has upgraded the learning procedure of the students (Böse and Rockenbach, 2018). Besides, the educational organizations are additionally utilizing the cloud stages because of the low operational cost.

In addition to this, the cloud computing in education has also played a vital role through which the learning process has been enhanced. With the usage of cloud computing, an educational institute will be able to utilize software along with the other tools for enhancing or improving the learning structure. This will also help the educational institutes to manage their educational services through which maximum number of students can be educated in the institute. There are various invaluable uses for Cloud computing which can use effectively in business. Reduced finance is the primary advantages of cloud computing in educational sector. It utilizes the ideas of virtualization that is the capacity to virtualizes a couple of areas into a solitary wide-region asset system (Battlesonet *al.* 2016). Virtualization makes sure about both the applications just as equipment when contrasted and other most recent

innovations like matrix figuring. Besides, the idea of pay as you go helps the administration to expand the adaptability and versatility of information to the customers. Along these lines, the customer will also not experience any software or equipment maintenance issues (Li *et al.* 2018).

As the cloud computing furnishes e-learning workplace along with online classes for the students, in this way, the colleges will have the option to upgrade the benefit rate. Also, the class arrangement beside the survey of subjects at home by staff is additionally workable for the students if the colleges use cloud services. Additionally, the cloud computing will likewise assist the universities with educating the students in a genuine manner so that the lecturers and students both can help out one another (Battlesonet *al.* 2016). In the progressing events, the informational establishments in India are using the dispersed figuring process through which they have executed new developments which has fixed the learning strategy of the students. Also, the educational institutions are furthermore using the cloud stages for reducing the cost of operations. In educational foundations, the security assurance and execution are the major concerns related with the choice of appropriated registering, which can be solved by the central focuses offers updating by the providers.

The class plan close by the review of subjects at home by staff is furthermore useful for the students if the informative foundations utilize conveyed figuring process.

Moreover, the disseminated figuring will similarly help the educational establishments with instructing the students in a real way so the teachers and students both can assist each other. The cloud transporters are open in compensation and the client can choose multiple providers instead of a single provider, as such captivating to utilize different interfaces with organized structures (Al-Ruitheet *al.* 2017).

### **1.7.5 Vendors of cloud computing services**

Electronic learning for e-learning frameworks has been made to keep conscious with development and give new course to utilize scattered enrolling. Affiliations and establishments with both National and overall levels have been expanding, appropriated handling as one of the most tremendous models of affiliation. AWS which gives Infrastructure as a Service has essentially been created to offer sorts of help like moving records and downloading Student data in online interfaces of school and different affiliations. Therefore, this makes all the inclusive chance of getting organized by office and establishment level affiliation (Oredoet *al.* 2017).

The utilization of coursed figuring in India colleges, for example, India Institute of Management and India Institute of advancement, different schools at the public and private level attempted scattered preparing for amazing breaking point the board in order to finish the work without any problem. Virtualization ensures about both the applications similarly as gear when differentiated and other latest technology like

network figuring. Appropriated figuring reinforces limit with respect to huge proportion of employments and data (Jalaliet *al.* 2016).

Study materials in kind of records introductions robotized books and pictures are prominent inside the Indian direction plan of data advancement. SaaS, PaaS, IaaS, web organizations and utility handling are the classification of cloud services used by clients. The thought behind the utilization of these sorts of organizations from web programs through web has made them ‘cloud’ organizations (Kalaiprasathet *al.* 2017).

#### **1.7.6 Security issues in cloud computing**

Cloud computing has different security issues because of its incorporation with numerous advances, for example, virtualization, activity framework, asset booking, activity Cloud figuring contains applications, stages and foundation. Cloud computing includes applications, stages and foundation. Business utilizations incorporate SaaS, Web Services, PaaS, Managed Service Providers (MSP), Service Commerce and Internet Integration. Thus, security issues of these technologies are material to cloud computing. The educational applications related to cloud computing technologies are not enough reliable to maintain data security and integrity. Apart from reviewing and monitoring, to retain security, it is important to find and analyze safety and security issues in the field of a cloud computing environment, so as to identify and solving the possible risks and issues. The service

provides will not be able to managing of all of these when they hosted web applications, services and data in cloud environment. Therefore, there will be some issues such as availability risk, lateral expansion of malicious attack has risen about the loss of managing data which are protected (Satyanarayanan, 2017).

For the advancement of SaaS, some main factors of security should be considered. These factors are security of the network, the confidentiality of data, data security data integrity, availability of data locality and access control (Li *et al.* 2018). For improving the progress of the company, SaaS provides a suitable infrastructure for the business entrepreneurs. There will be some security issues, for example, host and system interruption which should be thought of also, controlled, will remain to the customers. The capacity to supply power while no accessibility of another help, specialist co-ops need to guarantee conceivable moderation plans of the issue. Because of the major issues such as absence of data security and information coordination capacity, cloud norms are not dependable enough as new incorporation of host can upgrade. Customers can access cloud services on request and also empowering to utilize different interfaces with various structures.

Cloud computing incorporates applications, stages and establishment. Each section does various activities and gives various things to associations and people far and wide. The applications identified with cloud computing are insufficient solid to keep information security and reliability. At the point when diverse specialist

organizations have facilitated web applications, administrations and information in the cloud condition, they can't control the administration of these (Mokhtaret *al.* 2016).

Cloud standards are not dependable enough as new joining of host can update a notable issue such lack of proper data security and data coordination limit (Gholami and Laure, 2016). When there is no availability of another support, the primary communities need to ensure possible control plans of an issue that is the ability to flexibly control. The cloud dealers are available in abundance and the customer has the decision to pick various vendors as opposed to a singular shipper, thus enabling to use various interfaces with different structures.

### **1.7.7 Security problem in SaaS and PaaS**

As opined by Li *et al.* (2018), in SaaS, the consumers mainly dependent on the service providers of the cloud. Cloud SLA is valuable for the clients as it can portray the presentation qualities of the administrations. The specialist organization may duplicate information in a few spots for effective and information accessibility. Information security, the security of the system, the privacy of information, information honesty and accessibility and information region and access control are the main points of security considered during the advancement. SaaS gives the business people a fitting framework for improving the development of the organization. SaaS model of cloud computing has concentrated on keeping up the

classification of the data. The model gives information security to the clients, and it keeps up information accessibility among the purchasers. The authority association may copy data in a couple of spots for adequacy and data availability. Thus, sort of safety and security has been suited, data storing and data control are some issue that brought when data is being taken care.

In this model, for programme development and operating system, specialist organization gives conceivable order of checking on the administration stage. Protection and administration progression helps to identify the security issues of PaaS, get to control and insurance of both specialist co-op and client. Cloud measures are not dependable enough as new consideration of host can improve a significant issue such absence of information security and information coordination ability. Specialist operations need to guarantee conceivable moderation plans of a difficult that is the capacity to control while no accessibility of assistance. Other than another kind of security issues required to be viewed as that is adjusting of burden all through stages. Cloud SLA is valuable for the clients as it can depict the presentation qualities of the administrations. The specialist co-op may duplicate information in a few spots for proficiency and information accessibility. Thus, some issue has been raised like the manner in which information is being changed, kind of safety and security has been put up, information stockpiling and information control. It is required to consider some key factor of security during the improvement

of SaaS. These variables are information security, the security of the system, the privacy of information, information honesty, accessibility, and information territory and access control. SaaS furnishes the business people with a proper framework for upgrading the development of the organization. The model gives information security to the clients, and it keeps up information accessibility among the purchasers. SaaS model of cloud computing has concentrated on keeping up the privacy of the changed data.

### **1.7.8 Security problem in IaaS**

Cloud computing is an incorporated virtualization advances which offer better types of Information Technology services to the clients. Data security and protection, administrative consistence and mis-configurations are the main problems related to IaaS model. Among them, data security has become a significant concern of the organizations to actualize cloud IaaS administrations. Security issues to control the information have been expanding with time as virtualization technology has been expanding. Various issues ruin the IaaS model. Open cloud security has more security features than private. Open cloud has more hazard prospects as all the shoppers are aggregated largely, and they utilize similar cloud administrations to store and assemble information. The utilization of open cloud administrations doesn't give appropriate safety efforts to the clients. It very well may be said that framework is not the main alternative for the assets of equipment where information

live or prepared, however the manner in which information has been transmitted over the media from cause to goal in the unbound system. With that, there are conceivable outcomes that information may be analysed in the cloud platform.

Cloud IaaS administration neglects to give free promotion to dispatch quality data and to achieve cloud endorser want. Conveyed processing has diverse security issues due to its fuse with various advances, for instance, virtualization, action structure, resource booking, action Cloud figuring contains applications, stages and establishment. Hence, security issues of these developments are material to appropriated processing. To check and solve the security issues, it is necessary to distinguish and dissect security issues separated from testing and observing in the field of a cloud computing environment. The programmes identified with cloud computing are not responsible to keep all information's safe and secure. At the point when distinctive specialist organizations have facilitated web applications, administrations and information in the cloud condition, they can't control the administration of these. Cloud computing is a shared framework which has been utilized to expand potential vulnerabilities in unapproved information get to which works with character the board, information protection, privacy, confirmation, encryption, accessibility, physical security and system security.

In addition, Cloud SLA is gainful for the clients as it can depict the presentation qualities of the administrations. The specialist co-op may replicate information in a

few spots for effectiveness and information accessibility. Cloud innovation permits portable access to relate information by utilizing the devices. Also, advanced mobile phones and the chance of cloud innovation have guaranteed that nobody is kept separate from this circle. Students who live in a significant distance can utilize this capacity to get to the information and data with respect to a specific point. Individuals can attend classes even at their home using a browser and finish their chapters. Different cloud services offer easy access to their study materials and online classes for students and even lecturers. The expert center may duplicate data in a couple of spots for adequacy and data availability. As such, some issue has been brought like the way up in which data is being taken care. The fundamental issues that have been experienced by the IaaS model are data security, responsiveness and managerial consistence (Satyanarayanan, 2017). Some key factors such as data security, the security of the framework, the protection of data, data dependability; data region and access control are considered during the development of SaaS. The major issue faced by organizations to complete cloud IaaS is data security. Security issues to control and secure data has been updated regularly as with the development of virtualization extending with time. In public cloud, all the customers are accumulated all around and they use the similar cloud organizations to store and collect data. Thus nature of public cloud has more security risk than private cloud.

### 1.7.9 Measures to reduce the security risks in cloud computing



**Figure 3: Measures to reduce the security issues in cloud**

(Source: Li *et al.* 2018)

The specialist organization should be progressively productive to secure, recognize and respond in a likely manner. Administration board and administration logs are performed normally in SaaS. The application is dependable enough to update subtleties of the clients, and it requires operational and hierarchical changes. SaaS utilizations of cloud computing need to consolidate secure item designing administrations, organization of security, encoded information for giving security to the changed information. Additionally, for avoiding security, there are some authenticity tests, which are necessary for the organizations (Wang *et al.* 2017). These included shaky designs, execution of laws. The providers use few tools such

as session management and packet analysis to examine and thus they had made numerous steps, for example, passwords, physical safety measures, establishment of the most recent variant of programming to guarantee data security. Among them, session management is the important tool which offers scalability, data storage and services. Therefore, it can be said that the network security should be implemented in the cloud platform in order to protect it from cyber threats.

Apart from this, during application and data communication through the system, the Internet connectivity and bandwidth need to be considered. Confirmation and authorization system can be used for protecting unlawful disclose and alteration of data. On the other hand, to provide verification of the restore process of data virtualization, backup policy and duplication of data should also be standardized (Wang *et al.* 2017).

Meeting the executives is a basic factor to give information supply to administrations and adaptability towards their customers. In expansion to this, cloud SLA is valuable for the clients as it can depict the presentation qualities of the administrations. The specialist organization may duplicate information in a few spots for productivity and information accessibility. SaaS furnishes the business visionaries with a suitable infrastructure for improving the development of the organization. Due to the lack of data security and data integration, reliability is considered as a major problem for

cloud technology. When there is an unavailability of assistance, the cloud should ensure proper control plan for that issues.

Network availability and transfer speed should be considered during application and information transmission over the system. The system specialist organization should have the option to appropriately screen a heap of system or traffic to adjust the heap. This assign is the limit to which an innovation is examined in a specific time. Developments that can be attempted before it is totally actualized are all the more promptly embraced as new advancement need additional season of venture, vitality and assets. Cloud computing is drawing in a huge worldwide venture with its bit of scope of expanding the limit and capacities of the current and most recent programming. The eventual fate of cloud specialists in a nation can be progressed by improving the attention to the lecturers just as the students. That is, cloud innovation is a course to be educated and learned in the school level. This study is about to check the level of awareness among academics and how they effectively make use of cloud computing technologies in Indian Universities.

The power affiliation may duplicate the information in two or three spots for productivity and data accessibility. Some issue has been brought like the path up in which information is being dealt with. During the movement of SaaS, some key factors of security are required to consider. SaaS outfits the business visionaries with a sensible structure for improving the technology.

## 2. RESEARCH METHODOLOGY

### 2.1 Introduction

In the process of examining the problem in the research, various methods and processes are applied and considered as the research methodology. The information and data are presented in a way that will make it easier for the reader to understand the research and can use it to increase their knowledge and skills (Paul, Solanki and Kumar, 2020). The overall research is based on the correct process of methodology. So it can be said that, it is considered as a framework of the research. In the field of collecting information researchers used various methods and methodology in the research. The research methodology is used to gather the information about the data collected for the research and how the whole process is done which helps in completing the research. The importance of the research methodology is that they give information about the project with the help of survey and interview conducted in the research methodology. Based on the literature review the information given is related to the research questions that help in the research methodology (Akinuwesi, Odumabo and Aribisala, 2020).

Exploratory, descriptive, and explanatory research are three types of research used in the research methodology.

**Exploratory Research:** Under the exploratory research, the topic of the research has no definite explanation and present as a broad sentence. This research helps in exploring and even the research questions are also analyzed. The roots of the issues are found with the help of this method and collect the information based on the evidence to get a better understanding. The hypothesis is formed and data which are not required are deleted by this method. The information is collected from case studies, surveys, interviews and group's discussion. Based on the title of the project, the research is conducted and collects the information (Arunkumar and Kannan, 2020).

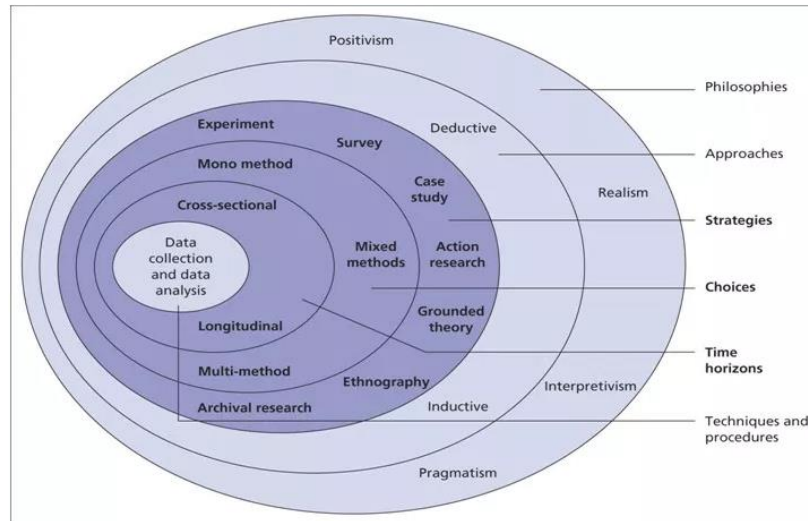
**Descriptive Research:** In this research, the method is used based on the particular circumstances and population and studied according to the topic. In this, the subject of research focuses more on 'what' actually happened, rather than focusing on 'why' it occurs. This is the most accurate method used in this research to explain the result to the reader (Ali, Wood-Harper and Ramlogan, 2020).

**Explanatory Research:** For the studies, the explanatory design is ideal and it is not accurately researched before, and priorities are required to give so that a better model is generated with the definition of operation. This method is based on theories with the help of which it explains the questions in an accurate answer (Sharma, 2020).

The main motive of this research is to find out the level of awareness and how they effectively using cloud services which are adopted by academics in Indian universities. The educational applications of cloud services are taught in universities to the students. The process of conducting the research the approach is explained with the help of research onion so that the reader can understand accurately.

## **2.2 Research Onion**

In the research methodology, the improvement is required which can be done by the research onion and it also helps in designing the methodology. For the study, the data and information collected which are developed by this method gets a logical explanation (Shehu, 2020). Besides, the collected data and information are handled in a systematic way with the help of the research onion. Saunders developed the model of research onion which is also used in this research. In this model the different methods are given which help in conducting the research and explain the process accurately (Munshi and Faizan, 2020). Before designing the research, the decision is made by the researchers with the help of each layer consisting of this model. In the below section the different layers of research onion are explained.



***Image 1: Research onion***

Source: (Saunders, et al., 2016)

### **2.3 Research Philosophy**

In the research onion, the research philosophy is the first layer that explains the subject of nature and provides knowledge related to the subject. Based on the ideas provided by this layer are further investigated. The researcher analyzed the information collected by this layer as the information taken from a philosophical point of view which is not considered completely true. The strategy of research is developed with the help of a research philosophy (Hoskins, 2020). The information is considered as a practical explanation. In selecting the research philosophy, a great influence is involved due to the relationship of the researcher with the subject and process of collecting the knowledge. The research can make it strong by raising the

question in the research. The research question is raised in this layer which helps in completing the research in a more efficient way.

### **2.3.1 Positivism versus Interpretivism**

In the process of continuing the research, hypotheses are developed by the researcher. This hypothesis is passed through various tests and then confirmed. In this process, while collecting information and data, sometimes the rebutting is done. For developing the hypothesis, the real theory is used to bring out the valuable outcomes. In the process of collecting data in philosophy, the external factors are not affected because any changes in the data will not arise (Singh and Tyagi, 2019).

From the history, positivism is considered as a successful technique, since if the information seems illogical; it is ignored and deleted from the data. In the research philosophy it is essential to have the positive information which gives the roots cause to the approach or else it has no use (Hernandez, 2019).

Any old tradition is not used in the context of interpretivism. Thus the interpretivism approach can be considered in various forms. For example, the information should be effective, right, revisionist and analytical. In the world it is considered as a biased concept. To construct the theory, this approach can understand and redevelop the information.

### **2.3.2 Pragmatism**

As the actions and development are two features that contribute to the pragmatism research. The ideas are utilized by the researcher and the purposes of action are understood so that in a systematic way the research can be taken forward. The world is changed with the actions of humans and their contribution (Kujur *et al.* 2019).

### **2.3.3 Realism**

This term means that, the human mind understand the situations based on reality. With the help of a scientific approach, knowledge is developed and it is the main focus. Direct and Critical are two types of realism. Based on the concept that ‘what we see’ comes under the Direct realism. It means through the senses of humans were the world is constructed. In the case of Critical realism, humans experienced the real world sensations and pictures. While developing this research, the philosophy of research follows positivism because quantitative method is used for collecting data. The data is collected in the research with the help of a survey where survey monkey is used to find out the required information among 40 IT students and an interview with professor in Indian University. From the literature review, the hypothesis is generated after analyzing the results obtained from the structure of questionnaires (Islam, 2019).

## **2.4 Research Approach**

The research approach means the involvement of the plan and procedure in which data are collected, analyzed and research is discussed. The selection of the research approach depends on the problems arising from the subject, the researcher's personal experience and the experience of the audience. The data collection method and data analysis method are two types of research approaches (Inyang and Josiah, 2019).

### **2.4.1 Research approach for data collection**

In the research, the actual values are taken out from the collection of data and the findings are considered as valid points. The research theory is tested and variables related to the questions are described. These are considered as the reliability of standard in the research. In the qualitative and quantitative research, the collection of data is again divided into the research approach. The data collected by this method are accurate and help in solving the research till the end (Kampa and Kaushik, 2019).

#### **2.4.1.1 Qualitative versus Quantitative**

The main focus of qualitative data is to collect the data. So they are not giving much importance to the analytical techniques for analyzing the data. In the process of qualitative data, the data are collected and analyzed based on the theories and the conclusions are made. The conclusions of the research can be changed during the process of collecting data. On the other hand, quantitative data follows the statistical method where they made a connection between the information they already have

and an experience gained by the researcher. In the study both the methods are giving the same elements but their analyzing process is different (Srivastava, 2019). In this research, the quantitative methods are used to understand the research question and are able to create the best questions for the research which also help in conducting the survey. In the survey if the research question is not formed accurately and logically, then the point of conducting the survey will be useless. So it is very essential to choose the best analysis method to analyze the data and develop the research questions. If the research questions will be interesting it will help the participants to understand them and answer them accurately. In case the questions formed are meaningless and boring the participants will not attempt it properly and the whole point of conducting the survey will go waste. Even the time and cost of conducting a survey will also be wasted (Paul and Chatterjee, 2019).

In both the studies, the role of literature is different. Literature plays an important role in quantitative analysis and with the help of the theory is identified and justified and serves the meaning of the research. According to the hypothesis, the ideas of the questions are formed with the help of the literature. The literature review of quantitative research is broader than qualitative research (Muthuvennila and Thanuskodi, 2019). While collecting the information, the questions does not create any disorder in the qualitative research since, it is based on the information provided

by participants without considering any numerical values. In the case of quantitative research the numerical value and calculation are involved.

### **2.4.2 Research approach for data analysis**

The deductive and inductive approach is used in the data analysis for research approach so that results can come out directly.

#### **2.4.2.1 Deductive Versus Inductive Approach**

Either the deductive approach or inductive approaches are applied by the researcher to test and analyze the particular hypothesis. The research data are collected with the help of an inductive approach and theories are developed. According to the philosophy of the research, deductive research is based on positivism and inductive research is based on interpretivism.

The storyline is followed in the research to analyze the data by the researcher in the process of the inductive approach. The reason for using this method is that they are based on interpretivism and help the researcher to understand the data step by step (Bashorun, Omopupa and Dahiru, 2020). Due to this, the hypothesis is formulated and calculated by the research and finally the result will be out. In the case of deductive research, the hypothesis is formulated by the researcher when the relationship between the variables is set. Later on, with the help of a quantitative approach the collected data are used to test the hypothesis. Besides, in the deductive

approach, the collected samples are in the appropriate number so that it will be adequate to establish the data. The method used in the deductive approach is definite so that the single explanation produced is enough for the research to understand the hypothesis. While, the occurrence of the event is considered in the inductive approach. For the process of the inductive approach, a large number of samples are not required. So it can be said that inductive approach is better (Chukwusa, 2020).

But in this research, the researcher follows the deductive approach because they consider the positivism of research philosophy and they use the important features that develop from the variables. Also, the researcher finds it more accurate to find out the outcomes from the research. The collected data from this approach will help the researcher to understand the survey more efficiently.

## **2.5 Research Strategy**

The research strategy includes various ways to find out the answer like surveys, experiments, literature reviews and interviews. In this study, the researcher used the survey and interviews in the research strategy.



**Image 3: Research stages**

Source: (Senet *al.* 2020)

### 2.5.1 The Survey

The survey is the process where the data is collected through various information and samples for the research. The strategy is planned and according to the subject of the research the survey is planned. The variables that come in the research can be dependent and independent and there isn't control of the researcher in this part. In the survey various samples are collected to gather more data and even demographic data can be collected so that more accurate research can be carried forward (Senet *al.* 2020). Although in the survey the collected should be taken from the history and background of the subject or else there is no value of collecting data and pursuing for research. The population, cost, number of people involved, reaction of people

and effects are involved while pursuing for the survey. Sometimes the lifestyle and employment income are also considered in the survey depending on the topic of the research.

### **2.5.2 Interview**

An interview session will also be conducted by the researcher with the professor in the University in order to analyse the depth of the study. In addition, the interview session will also the researcher to analyse the impact of cloud computing within the education. Furthermore, the students from business management use mostly the interview method to do the research. It is the most common and best strategy to conduct the research. In collecting the data, the quantitative approach is used as per the deductive approach and analyzes the data while using the variables and build relationships between the variables.

## **2.6 Research Choices**

Mono method, Mixed method and Multi method are the three types of method used in the choice of the research. This is also given in the onion diagram of the research. For the research one approach is required in the mono methods. In mixed methods, more than one method is used for the research. In the case of multi methods, the selection of methods is based on the long process. Also, it can be mentioned in the mixed method and all the methods are combined and used as one set of data to

understand the research. In multi method, each method is drawn in each separate segment so that each part of the research can be understood efficiently (Waral, 2020). This is the major difference between the mixed method and multi method. With the help of qualitative techniques and quantitative techniques, each set of data are analyzed in the section of the multi method. This helps to understand the data more accurately and easily for the researcher to implement it in the research. The chance of developing the mistakes is also reduced during the process of research. Even the reader understands the whole research efficiently and it will help them to conduct other research (Asadi, Abdekhoda and Nadrian, 2020).

In this study, the researcher used the mono method to conduct the research in which only methods are used to gather information. Online survey used as a tool to collect data and conduct the survey by developing the questions for the participants. Professors from university are selected for the interview to collect data. In the universities of India, there are various academics in the IT sector who gives training in cloud computing. So with the help of quantitative method, surveys are done in the research to understand, how effectively they are using cloud computing technology, the level of awareness about cloud computing among the IT students and the importance of adopting cloud computing (Kumar and Ogunmola, 2020). Even it can also be observed in the survey that universities are developing cloud computing as a subject to provide knowledge to their students. With the help of the mono method,

the information gathered in this research helps to bring out the best outcomes and it will meet with the expectations of the researchers.

## **2.7 Time Horizon**

A framework of time is made by the researcher for the completion of the project which indicates as a time horizon. It is also mentioned in the research union. Longitudinal time horizon and cross-sectional time horizon are two types of time horizon seen in the research union. It is very essential to complete the project within the mentioned time or as per the plan set by the researcher (Tripathi, Thakran and Sharma, 2020). If the research will take more time as per the mentioned time in the plan, then the point of conducting research is of no value.

### **2.7.1 Longitudinal versus Cross-sectional**

In the specific time period, the single circumstances are considered by the cross-sectional time horizon. In this case the time has a limit and set a specific time to complete the research and this is the reason many researchers used this time horizon. In the research strategy while doing the survey, this is the most common method used by the researcher. Among the variables the connection is found during the survey so that the hypothesis is done accurately. While conducting the research the researcher may also use the qualitative method in the case of a cross-sectional time horizon (Kishore Kumar, 2020). The limits are set in the time so that the researcher

is always active and try to complete the research within the allotted time. But the chance of arising mistakes is high in this case. To complete the task within the time frame the researcher can sometimes forget to collect some information which affects the results of the research.

On the other hand, in case of longitudinal study the changes in the data occur and develop on the repetition due to the time which will also change to complete the research. In the process of collecting and examining data, the researcher feels that changes are important while collecting the information and so they used the longitudinal time horizon. Although, the changes will not affect the process of research and provide the more accurate and perfect data which help in the research. But it will consume more time to complete the project because there is no guarantee that the data of the research can meet the expectations of the researcher (Singla, B. S., and Aggarwal, 2020).

In this case it depends on the research to choose the time horizon for the research methodology and approach. So the researcher selected the cross-sectional time horizon to complete the project. Besides, the researcher should be careful while collecting the data because of the time limit. They should ensure that they will not miss any important information (Siwach and Malik, 2019).

## **2.8 Population and Sampling**

The samples for the research are collected by the population of research, which means the sets of objects or people that help in the survey. In collecting the sampling here not in a normal form the term population is used. People in institutions, universities or organizations are used as a population. The researcher studies about the particular object from the whole group which helps in conducting the sample. By collecting information from one particular person is not enough to conduct research. Before conducting the survey and interview, the researcher targets their objects and group of people from that object, so that problems will not arise during the process (Singh and Mansotra, 2019). For example, in this research, the survey is done on the students and interview is conducting with lecturers of Indian universities. Here the object is the educational sector in Indian Universities and groups of people are employees and students. The sample will be collected while conducting the survey and ask the questions about the awareness of cloud computing in the academic in educational sector. Based on the research questions, the survey and interview is done among the population and samples will be collected.

It should be taken care of by the researcher to manage the population while conducting the survey because it will be very difficult for the researcher to manage the size of the population. So in this case, the researcher chose the population size as a sample. It happens due to the limitation of the cost and time in the research

which limited the size of the population while conducting the survey. Due to this, the population chosen from the entire population is considered as a sample and the whole research will be conducted based on this. It is a very important part of the research to select the correct sample of the research. If the size of the population will be high, it affects the time and cost of the research. In the research, study to maintain the reliability, the selection of size and samples are difficult in case of quantitative research (Monisha and Gurusamy, 2019). But in the case of qualitative research, the size of the sample should be small which helps to give the result accurately. If the size of the sample is taken in a small number it will in completing the survey in the given time and cost of conducting the survey will also not be crossed. Also, it will be easier for the researcher to calculate the data and information. The chance of raising the mistakes is also reduced. The sampling can be done in the research with the help of two techniques: Probability sampling and Non-probability sampling. They are explained below:

### **2.8.1 Probability Sampling versus Non-probability Sampling**

In the case of probability sampling, for conducting the research the whole population needs to be selected. With the surveys this is closely related to. In four stages this sampling method is divided. In the first stage, a frame of the sample is needed to be developed to carry out the research. In the second stage, it is very essential to determine or decide the size of the sample. In the third stage, a sampling technique

is selected to choose the samples (Nunda and Elia, 2019). In the last stage, the sampling is done perfectly and the accurate sample is selected with the help of analysis which gives the perfect results. The samples selected by this method are accurate and helps in conducting the research step by step. This also helps the reader to understand the research and while reading the research they feel like they are reading a story.

In the case of probability sampling, the work is done step by step and each step has its own features and process which help the researcher to select the best sample for the research. With the help of a frame of samples from the population the various samples are selected. In the research updated and accurate sample is very important or else there is a chance of the mistakes in the research because of the wrong and unimportant information which the sample has no meaning for the research (Mani, Hameed and Thirumagal, 2019). In probability sampling the level of sampling is represented and is called the sample frame. Besides, in the research there is less chance of developing the errors, if the frame of sample is large in number. Even it is to be ensured by the researcher that the frame of sample is representative of the survey. So if the response is not high, then the survey will not conduct properly. Their sample frame should take the survey seriously and understand the objectives behind the research which help them to complete the survey accurately and seriously. So it can be said that if the frame of the sample is not selected properly

then the whole survey will be without results. In this first step, the researcher should take time and do the best selection of the sample frame which helps to pursue further steps to complete the survey (Thomas and Paul, 2019).

In the research, the non-probability sampling technique used the theory, instead of the sample. The researcher gets various ways while selecting the sample with the help of this technique. This type of sampling is based on the subjective agreement. In the non-probability methods there are various types of sampling involve and they are explained below:

**Quota sampling:** This type of sampling is used in the interviews as a non-random sampling. In this case, a particular frame of sampling is used. While in the selection of size of the sampling, the entire population is divided into different parts. Based on this divided group, the quota will be calculated. This is the easiest process and will consume less time. The rate of conducting this sampling is also cheap. So it means if this technique is used, the time and cost of conducting the research will be done in a budget. Even the process is also simple, so the chance of facing difficulties is also less (Naveed and Ahmad, 2019).

**Purposive sampling:** The answer of the research questions are developed by the judgment on the solution as per the survey and it will help the researcher. The

purposive sampling is based on the assumptions of the researcher that they observed from the solutions.

**Snowball sampling:** In some cases the selection of sample decision making is difficult, so in that cases, this type of sampling is used. It helps in eliminating the problems that arise at the time of selecting the samples.

**Self-selection sampling:** In the research, self-selection sampling is used when the samples get the options to take part in that case. The research objective is announced by the researcher and the research significance and importance are explained to the population. This helps the population to understand the research and will attempt the survey properly. Also, if the population will get the chance to select, the more excitedly attempt the survey.

In this research, the academic staffs and students of universities in India are considered as samples. In the survey, the main focus is on the students and for the interview, lecturers who provide knowledge and skills about cloud computing in the universities are selected.

## **2.9 Ethical Considerations**

In the process of study, the ethics of research are followed by the researcher and conduct the research under the rules and guidelines of the code of ethics of

researchers. While conducting the research, they ensure that no one will get harmed like issues will not arise in the financial sector; plagiarism and stress will not arise on a psychological level. Even the researcher should ensure that the research is based on the information and data that follow the rights and policies and it gives the right knowledge to the reader. The researcher should ensure that they are not forcing them to participate in any manner directly or indirectly (Ali, Paris and Gunasekaran, 2019). Although, during the survey the data is collected in the secured way and ensure that no illegal methods are used to collect the data and information. In spite of this to maintain the consistency in the research, the researcher should take advice from the supervisor so they can guide them in every stage. This also reduced the chance of issues. Moreover, the authors used in the literature review from previous study are ensured that properly applied or referred, so that it will not affect the current research. The data used in the research should be deleted permanently after completing the research. The researchers are liable to store the data in their system or anywhere is completely against the law. In case of this research the survey is done based on the Google tool so they ensure that the collected information is from the correct source. Also, they should understand that the participant will not get harmed and hurt during the survey. Even while conducting the survey the researcher should make sure if the reader will not get hurt and disappointed at the end of the research.

### 3. DATA ANALYSIS AND FINDINGS

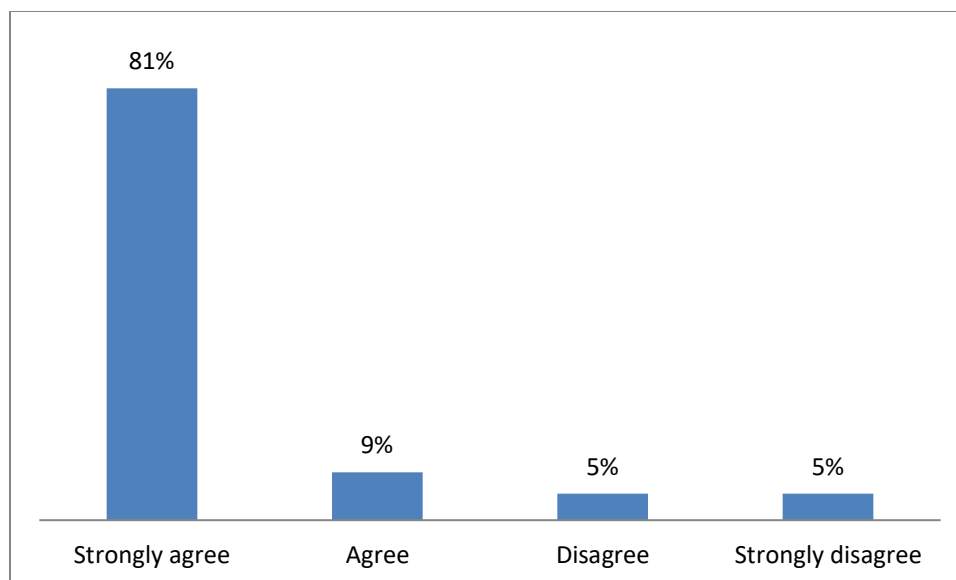
#### 3.1 Data analysis for Survey

For the survey process, a set of 10 questions have been sent to the students and staffs who are involved in different Universities of in India. In addition, survey has been created with the help of Survey Monkey and the link has been sent to 40 respondents. By analyzing the responses, an analysis will be developed by the researcher in order to get the appropriate results of the survey.

#### 3.2 Survey Questions

Q1) How far do you agree with the fact that cloud services such as shared access, data storage are important to students and lecturers in a university?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	81%	30	40
Agree	9%	4	40
Disagree	5%	3	40
Strongly disagree	5%	3	40

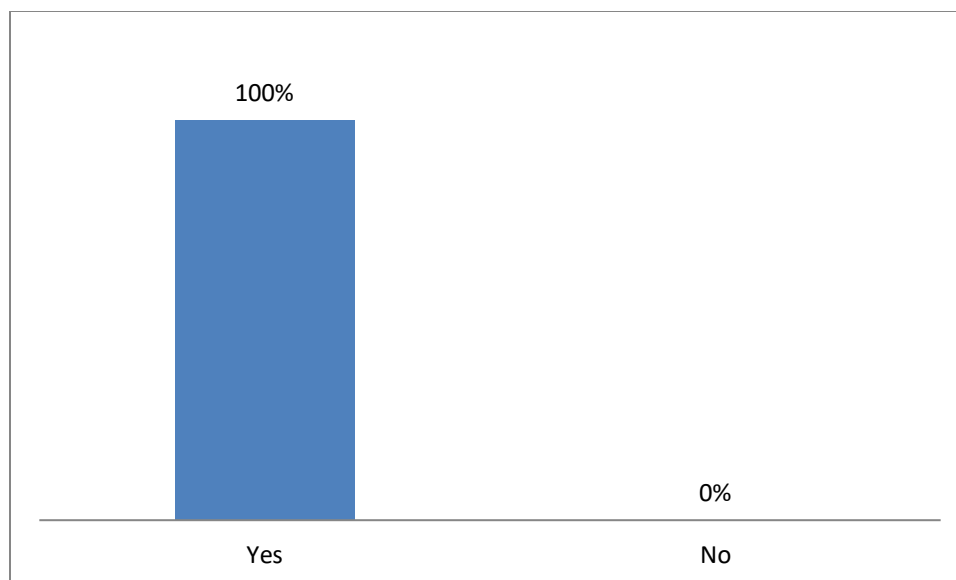


### Trend analysis

From the above graph, it can be said that most of the responses have agreed with the fact that cloud services such as shared access, data storage are important to students and lecturers in a university for their educational purposes. With the help of this, the Universities of India will be able to share study materials with other universities and colleges.

Q2) Are you using the cloud services such as online texting, video conferencing, online referencing for academic purposes?

Options	Response percentage	Number of responses	Total number of respondents
Yes	100%	40	40
No	0%	0	40

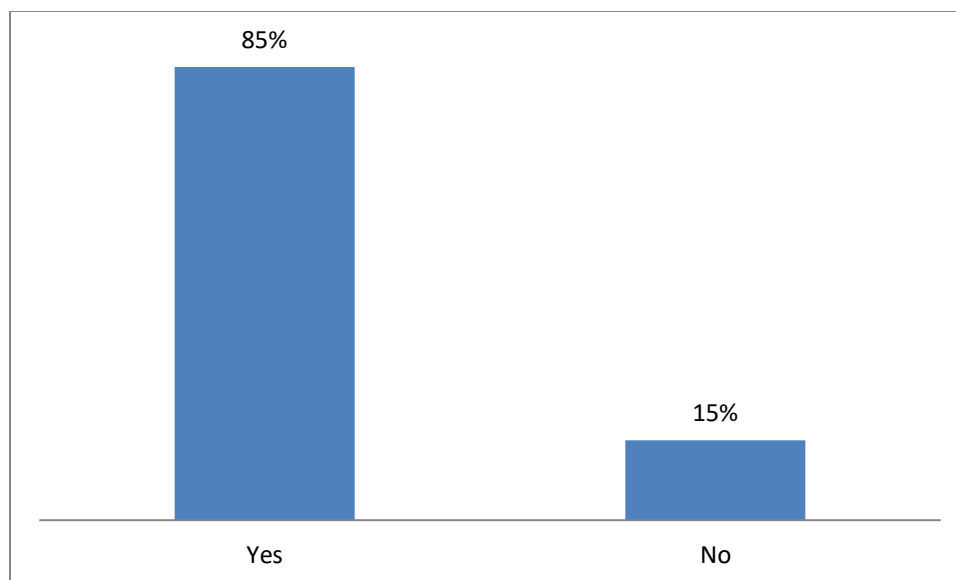


### **Trend analysis**

The above graph mainly highlights that all the participants have agreed that they are using the cloud services such as online texting, video conferencing, online referencing for academic purposes.

Q3) Cloud services like video conferencing and online reference helps students in training and research related needs for their education. Do you agree?

<b>Options</b>	<b>Response percentage</b>	<b>Number of responses</b>	<b>Total number of respondents</b>
Yes	85%	33	40
No	15%	7	40



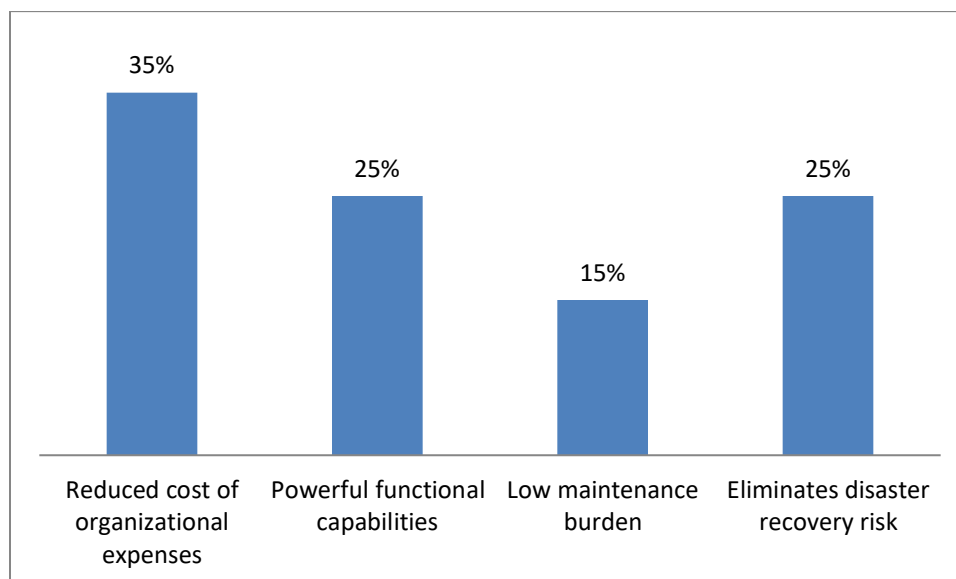
### **Trend analysis**

From the above graph, it has been seen that Cloud services like video conferencing and online referencing helps students in training and research related needs for their education. With the help of cloud services, the students can effectively focus on their studies.

Q4) Apart from online texting and video conferencing, which cloud application, will be more beneficial to educational institutions?

<b>Options</b>	<b>Response percentage</b>	<b>Number of responses</b>	<b>Total number of respondents</b>
Reduced cost of organizational expenses	35%	14	40

Powerful functional capabilities	25%	10	40
Low maintenance burden	15%	6	40
Eliminates disaster recovery risk	25%	10	40

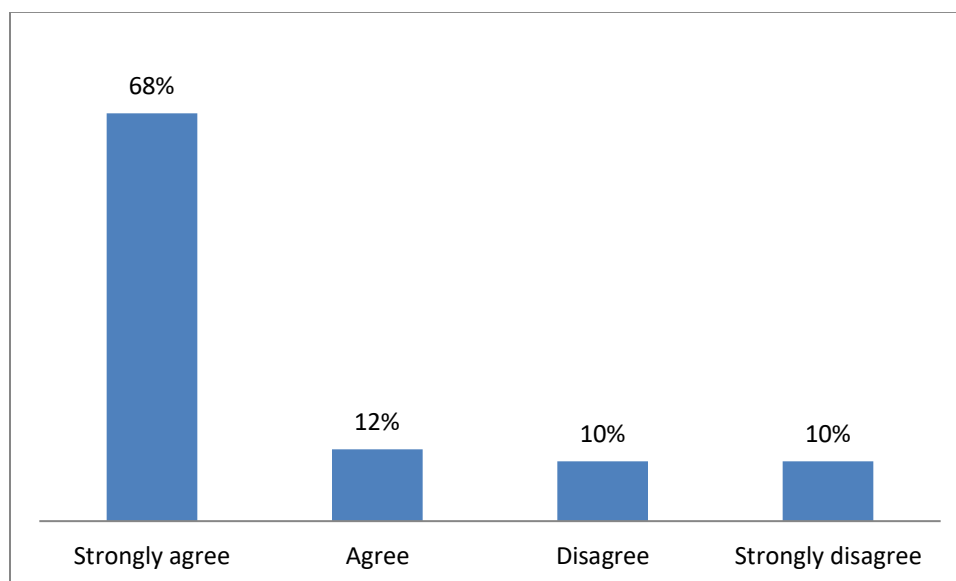


### **Analysis**

The above figure mainly shows that most of the people have agreed that cloud service mainly reduce the cost of organizational expenses through which the profit rate can be maintained high. It will also help the organization to provide more services to the students at low cost in an effective way.

Q5) How far do you agree that universities in India has gained benefits with the implementation of cloud services?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	68%	18	40
Agree	12%	15	40
Disagree	10%	5	40
Strongly disagree	10%	2	40



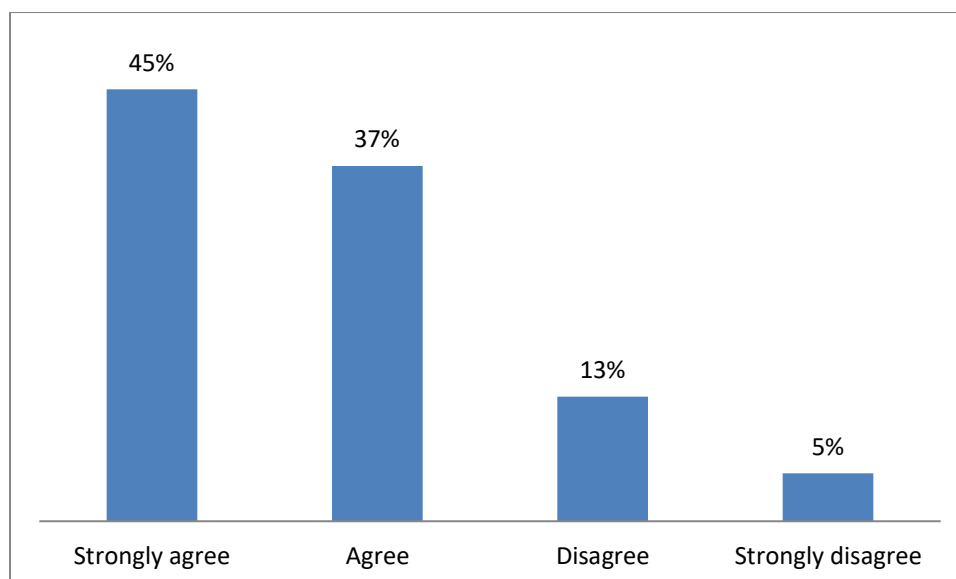
### Analysis

The above graph mainly highlights that, most of the respondents have agreed with the fact that universities in India, has gained benefits with the implementation of

cloud services. Most of the Universities in India have implemented the cloud services within their operational process in an effective way.

Q6) What are the changes that happened in India universities after the implementation of cloud computing?

Options	Response percentage	Number of responses	Total number of respondents
Improvement in data storage	42%	17	40
Enhanced security	25%	10	40
Cost effective	8%	3	40
Improved learning options	25%	10	40

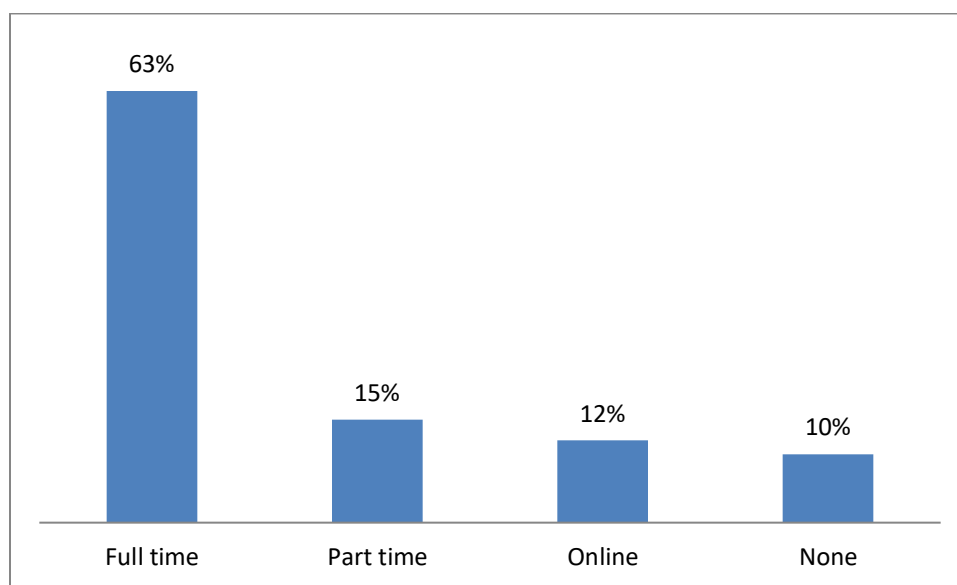


**Trend analysis**

The above graph mainly highlights that most of the respondents have agreed that a lot of changes have happened in IT academics of India after the implementation of cloud computing and among them, effective data storage is seem to be the most important above all. By using the cloud services, the Indian Universities will be able to enhance the academic system.

Q7) What type of cloud computing courses are given by University to students?

Options	Response percentage	Number of responses	Total number of respondents
Full time	63%	25	40
Part time	15%	6	40
Online	12%	5	40
None	10%	4	40

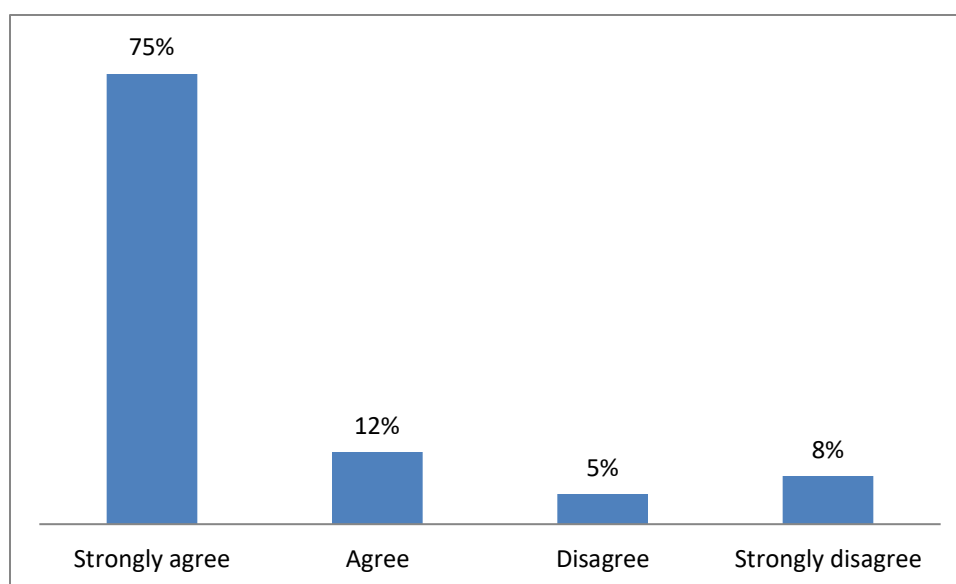


**Trend analysis**

The above graph mainly highlights that most of the participants have agreed that full time cloud computing courses are given by University to students. With the help of full time cloud services, the students have received effective knowledge about their educational services in an effective way.

Q8) Linking University data in a cloud network will be more secure. What is your opinion?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	75%	30	40
Agree	12%	5	40
Disagree	5%	2	40
Strongly disagree	8%	3	40

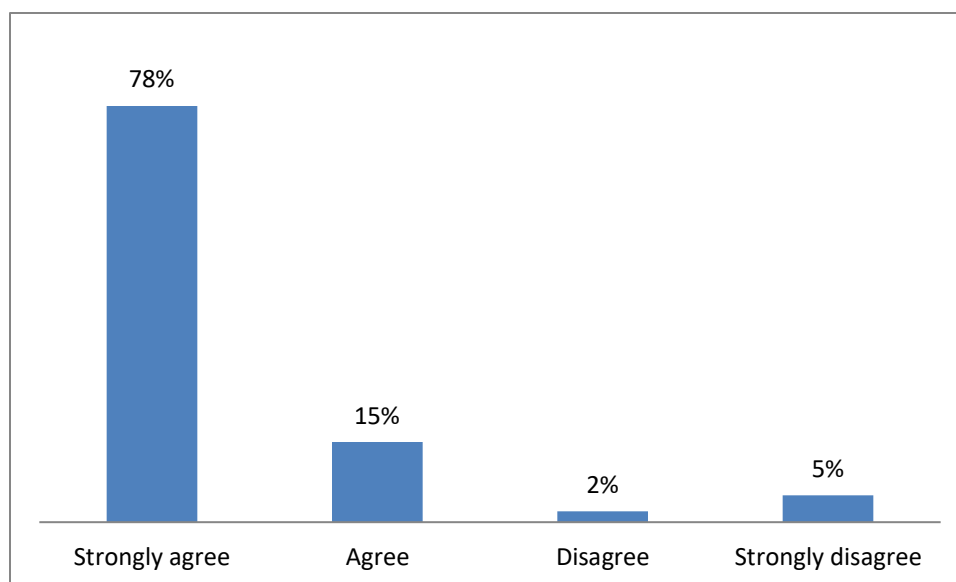


**Trend analysis**

Most of the participants have agreed that Linking University data in a cloud network will be more secure because the data security is one of the most effective benefits of cloud computing. But, a few people have in a doubt about the security in cloud computing.

Q9) To what extent do you think that an awareness is required among students and lecturers in the universities about the importance of Cloud training?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	78%	20	40
Agree	15%	5	40
Disagree	2%	10	40
Strongly disagree	5%	5	40

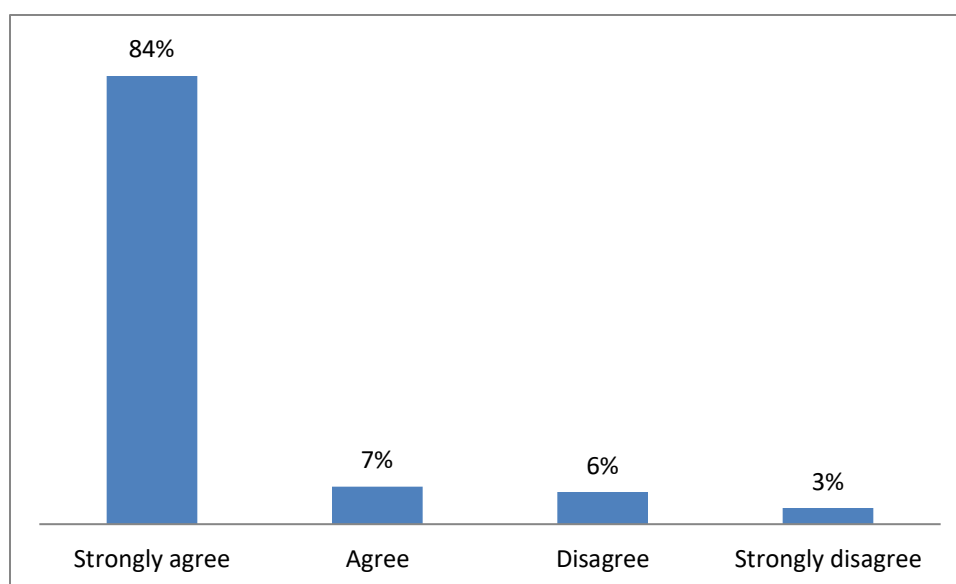


### Trend analysis

The above graph mainly highlights that most of the participants have agreed that an awareness is required among students and lecturers in the universities about the importance of Cloud training. Among them, a small group are not aware about the effective use of cloud services.

Q10) How far do you agree that all the Universities switching to a cloud community network can make huge changes in IT structure of Indian education?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	84%	15	40
Agree	7%	10	40
Disagree	6%	10	40
Strongly disagree	3%	5	40



### Trend Analysis

From the above graph, it has been seen that maximum numbers of respondents have agreed that the Universities switching to a cloud community network can make huge changes in educational sector of India. It is because of the fact that cloud computing can change the educational structure of the country and can provide effective knowledge to the students.

### **3.3 Interview Questions**

An interview session with Professor, Head of Department (Electronics and Communication Engineering) from Kerala University in India has been conducted.

Q1) How you have used cloud services in academic studies?

“We have used the cloud services in academic studies in an effective way. The online and e-learning systems achieved a rapid growth with the help of Cloud Computing. Lecturers upload their study materials, assignments and exams in the cloud server and students can get access to these servers via internet through computers or mobile devices. Through this, lecturers can examine students, keep records and they can upload their teaching materials and methods. Also students can seek help of all lecturers from anywhere at any time. Migration to cloud environment helped the university to minimize the cost of operation, since the study materials and servers are shared with other universities. Thus there will be a link between other

universities and students can share or access the best study materials from this shared study materials.”

Q2) What are the benefits you have received by using cloud services in the Institute?

“Most of the private and public educational institutions make uses of cloud technology to support their necessities. These administrations are progressively given utilizing internet technologies to students and all employees through internet browsers. In our college, the remarkable progress due to cloud computing is the effective distance education. But most of the schools and universities in India, IT have a limited role. Majority of the work like attendance, lecturers and examination is done physically. But, everything is changing nowadays. In the present scenario, cloud computing plays a vital role. We are using services like Skype and Zoom for online classes and examinations. In addition, I believe that the educational institutions in India will completely make use of cloud technology in the future.”

Q3) What are the challenges you have faced while implementing the cloud services in the college?

“At the initial stage, we have faced many challenges like data security and data handling technique in cloud while implementing the cloud computing in the college. Data protection is a major security issue faced and a proper service source in Cloud

Computing is also an important issue. Deploying servers in a private cloud from an institutional level is not possible because of the lack of proper funding and support from the government and thus we used public cloud. Private cloud deployment is needed for conducting a secure exam system. It is not possible to install cloud computing in all types of educational course and the absence in availability of education related cloud computing packages, which is seemed to be other challenges we faced.”

Q4) Do you think that the students and the lecturers will gets benefits with the use of cloud services such as video conferencing and online references in their education?

“Thanks to cloud computing as it gives the services like online education, corporate education, E-learning and mobile based education which helped to make remarkable changes in the educational field of country. In the present situation, online video lectures are going on and this helped to keep students and the syllabus in the same track within a limited period of time. Modules are uploading directly by each lecturer and students can access to the data even they are at home using internet. All the universities in our country are currently using these services for online classes and even examinations are conducted using video conference. The current scenario will help all the universities and colleges to realize the importance of migrating to a cloud environment.”

Q5) Do you agree awareness is required among students and lecturers in the universities about the importance of Cloud Computing and its services?

“In India there are more than 20000+ colleges, 600+ universities and around 300+ central institutions which offer Degree, Diploma and other Master Degree courses. Among them, only limited colleges and universities are effectively using cloud computing. This is because of the lack of awareness among students and lecturers about cloud technology. Suitable and sufficient training programme on cloud services should be introduced in these institutions and the academics should aware about the importance of online lecturers and e-learning. Also the government should encourage educational institutions with proper financial support and arrangements which are necessary for effective Cloud Computing packages.”

### **3.4 Discussion and Findings**

From the overall survey and interview analysis of this research, the importance of cloud computing and the contribution of these universities in providing better training in this technology has been analyzed. The cloud computing has helped the Indian Universities to enhance their learning methods in an effective way. Lecturers in India make use of cloud technologies in different methods for e-learning and other educational purposes for the students in the universities. In this way by executing

cloud computing technology, we can defeat all these short comes and keep up a brought together framework where all the specialists can check the educational framework from every single viewpoints and proceed with screen and guide the framework. They check the requirements of the universities as well as guarantee that quality training is give to each student and his participation, and so on can be adequately kept up without stressing the framework issue.

The survey was conducted on student's doing their bachelors and masters degree programmes. When a few part of them worried about the security issues of cloud technology, major part of the students believes in the fact that cloud computing has made a huge change in their learning system through its easy accessibility to study materials and e-learning systems. Also the lecturers support that cloud services enhanced for effective distance education. Also, giving proper awareness and an efficient training in cloud technology will make changes to the entire educational sector of India. This will make students more focus on their studies.

In addition, the study fundamentally centres on distinguishing the attention to cloud administrations among the academics of the Information Technology division in Indian colleges. The data accessible from past researches have helped to detail the structure of the study and plan the different research approaches to such an extent that the decisions enhance the odds of getting a persuading and exceptionally significant answer for the exploration questions. The previous research concluded

that new tools and technology encourage the progress of universities; implementing and solving the short issues of cloud computing can make huge evolution in the educational sector of country (Ercan, 2010). Moreover, the speculations, clarifications, discoveries and different information sources are validated with flowcharts and graphs to offer the expressions and contentions progressively vulnerable to the students. In this research, the review was done on the staffs and students in Indian colleges. The conclusion of research depends on the idea of inquiries posed during the study and the member's reaction to it.

## 4. CONCLUSION AND RECOMMENDATIONS

### **Conclusion**

Cloud computing is an increasing adoptable technology in the present educational sector. Students and staffs have the option to quickly and economically get to different application stages and resources through the website pages as per the request. This is reason for the reduced cost of expenses and, present more practical techniques. The research mostly focused on identifying the awareness of cloud services among the academics in Indian universities. Adhering to the research objectives, the researcher have thoroughly study several relevant case studies in order to eliminate the chances of possible overlap in research methodology and research questions. An in-depth knowledge of various case studies and other related literatures has also helped to obtain valuable information in relation to the subject of the current study. The information available from past studies have also helped to formulate the structure of the study and design the various research approaches such that the choices optimize the chances of getting a convincing and highly impactful solution to the research questions. A unique feature of the current research has been reflected through the researchers' effort to draw extensive comparisons between the different approaches available to identify a particular variable of the study. For

instance, an elaborate discussion on ‘Probability Sampling versus Non-probability Sampling’ has been presented which will help the readers to clearly understand how different approaches can be conducted for the same study to arrive at a logical conclusion. However, it is important to mention here that, every single discussion or comparison presented in the study, however elaborate or simple, is ultimately an effort on the part to clearly outline and explain the readers, the heart of the matter that is being explored. Additionally, the theories, explanations, findings and other inputs are substantiated with flowcharts and diagrams so as to make the statements and arguments more penetrable to the readers. This effort on the part of the researchers is valid as more often than not, a research work is consulted by a large number of readers who are partially or sometimes completely unrelated to the topic in discussion. The conclusion of the current study has been obtained through a particular multilayered analysis of both qualitative and quantitative data. These data were obtained by surveying and interviewing the participants chosen for the research. In the current study, the survey was done on the students and staffs and interview was with lecturers of universities in India. The conclusion of the study is based on the nature of questions asked during the survey and the participant’s response to it.

**Linking with objective 1: To find out whether universities in India are effectively using different cloud computing services such as online lecturers, video conferencing, online references etc.**

Extensive and elaborate research approaches have been undertaken to search the length and breadth of the sample population and arrive at a logical conclusion that will successfully answer the first objective of the study, that is, whether the IT academics of Indian universities are aware about the available cloud-based services and whether they are effectively using the cloud services that are capable of revolutionizing the way education is imparted in India. The extent of awareness in the subject of cloud services among the academics of the Indian universities has been clearly reflected through the data obtained from the current research. The results of the study have been somewhat positive in the sense that it shows that academics of the Indian universities are indeed aware of the cloud-based applications as far as serving educational purposes is concerned. The outcomes show that there is a general understanding of the basic concepts of cloud computing among all the employees as well as students of the universities which have been selected as objects of the current study. Particularly, the responses received from the participants who are involved in this survey and interview confirm the theory that cloud-based applications can have a game-changing impact when it comes to optimization of ease of learning. Besides that, they are effectively using the online lecturers, online

reference etc these days using applications like Zoom, Skype and WebEx. On the other hand, in case of academics of the universities who are less proficient in the field of Information Technology, there were some doubts and confusions regarding the benefits as well as security issues pertaining to the use of cloud computing applications in delivery of easy learning access. This is because of the lack of awareness about how effectively cloud computing technology can be used.

**Linking with objective 2: To analyze the impact of cloud computing in changing the teaching standards and how it helps the education sector of India.**

The answers to the first objective of the research inevitably leads to the second and obvious question, that is, how the teaching standards changed in Indian Universities in providing education to the students with the help of cloud computing. It has been already established through various background studies that cloud computing has immense potential to change the way education is imparted in India. Thus, whenever the study speaks of awareness among the academics of Indian universities, it does not imply only the knowledge that something called ‘cloud computing’ exists or the knowledge that cloud computing can be used to make education more accessible to the larger mass of India. These services helped to make a giant impact on distance education. Cloud services like video conference and online referencing, students and

lecturers can keep a direct link with each other and it helps to increase the training standards of lecturers. The lecturer can monitor and keep record of all students via online. It, in fact, refers to the actual knowledge of the technicalities, the benefits or advantages, the limitations or disadvantages, the applications as well as the implementations of cloud computing, specifically, to the benefit of imparting education. Although the research is only based on the responses of a selected group of people from only selected universities, it can still shed a general perspective as the results are backed by data. The results of the current study reveal that there are several levels of understanding on the topic of cloud computing ranging from expert levels to as little as novice level. But, irrespective of the degree of expertise among the academics of the universities, there is a common agreement when it comes to the question of benefits of using cloud services in the educational sector. And the answer is a resounding yes. This means that whether a person is an expert in the domain of cloud computing or not, the advantages of the technology is clearly resonating among the academics who continuously dedicate their time and hard work to the cause of knowledge sharing. Beside this, the analysis of various data obtained through the study show that many of the Indian universities have started cloud computing courses for their students. The data analysis also shows that most of the universities have chosen to start full time courses on this subject, rather than a part time course for its students. This tendency can be an evidence to the fact that more

and more educational organizations in India are quickly realizing that cloud computing is going to be the next big thing in terms of transforming the education sector and will help to change the teaching standards to a better developed mode.

**Linking with objective 3: To find out solutions to solve the issues related to educational applications of cloud computing and to find out what necessary measures are required to give proper awareness to students about the importance of cloud technologies.**

This is the era of rapid technological development and innovative applications of those developments in all spheres of life starting from education up to governance. As countries around the globe are preparing themselves to move to a futuristic world where every day to day activity and essential pursuit will either directly or indirectly be guided by a technical instruction, it is only a matter of time that those who are unaware for this technological race will face major disadvantages. And since education is the root of everything we do, an effort for the technological advancement in this sector is only obvious. Data from the current study show that the respondents of the research have opined that education needs a technological breakthrough and that technological breakthrough can be achieved through successful implementation of cloud computing and to overcome the issues related to it. Data protection, deploying issues, non availability of cloud educational packages and constant financial support are some of main issues of cloud computing in

educational sector noted after the research. However, it is important to point out here that the academics have some degree of concerns over the security issues that may arise due to cloud computing. Like every other technological tool, there are indeed security issues pertaining to the matter of cloud services. Yet, there is no denying that the technology will bring massive changes to the way educational activities are carried out in India. Therefore, in order to make the universities more acquainted with cloud computing, it becomes necessary to address their issues over security concerns. All educational institutions should take necessary steps to aware students and staffs about the effective use of the cloud technology. With the financial support and short skill training initiatives or full time curriculum based courses on cloud computing is going to be the primary approach to increase the awareness about the technology among academics.

### **Recommendation:**

In recent years, with more and more countries moving towards a tech-based approach on everything starting from the simple day to day life matters like the home delivery of a box of pizza to serious issues like government security or cross-border trading, it was only a matter of time that someone would realize the immense potential of technology in the education sector. Thereafter, a revolutionizing technology called ‘Cloud Computing’ was quickly applied in the education sector to deliver faster, borderless and more easy ways of knowledge sharing. The technology

not only allows an easy access to education through e-learning, it has the potential to break barriers and help the education sector to take a leap in the direction of a more global and comprehensive approach to knowledge sharing. Educational institutions in countries like Ireland and UK are completely migrated to cloud computing servers. Basic application from attendance to online classes have already implemented in these developed countries. But for India, to move in that direction, the role of educational institutions has to overcome different concerns. But, institutions can deliver quality knowledge and real time practical skill training to its students only if the faculty is itself trained well enough. Being trained does not necessarily imply only theoretical or bookish knowledge. Cloud computing is a purely cutting-edge technological work and hence along with theoretical knowledge, the practical knowledge also becomes fundamentally important as a skill. Without the proper understanding of the practical fundamentals of cloud computing, it is absolutely meaningless to say that a nation or a society or even an individual for that matter is progressively advancing towards a cloud-based technological revolution in the education sector. One of the many ways universities can adopt cloud services is by pulling up the standards relevant infrastructure. While the suggestion may sound a direction towards more expense on the part of the university management, it may not always be so. Universities can influence many available cost-effective emerging technologies to provide equitable learning access to its students. A decent

infrastructure model needs to have only a few components like user devices, network resource, memory resource, CPU resource, data resource, storage resource and Firewall or security perimeter. For starters, the universities can start by providing its students only a few tools like a cheap access device, a high speed internet connection, probably a wireless hotspot and a web browser. For a user-friendly experience, the universities can provide a customized learning access tailored to satisfy the needs of a specific student. This will attract more attention from students towards cloud computing and will spread awareness about the extra benefits of using this particular technology in the field of education. From a job perspective too, there is going to be a host of advantages of cloud computing knowledge. All in all, this appears to be the best time for universities to jump into a technology spirit as the near future is undoubtedly going to be a fast paced, rapidly evolving and highly competitive world. It is sure that the use of the cloud computing technology increased rapidly in the present condition and hope that it will make changes in the educational sector of India. The educational sector being at the center of all activities will probably be the first in line to reap the benefits of such a technological wave and quite thankfully, the current study can conclude that if the Indian universities make a little more effort to introduce this emerging technology services, they will be at the forefront of this futuristic world.

## REFERENCES

Akinuwesi, B. A., Odumabo, A., and Aribisala, B. S. 2020. Knowledge Grid: An Intelligent System for Collaboration and Knowledge Management in Nigerian Universities. *Data Science Journal*, 19(1).

Ali, A. A., Paris, L., and Gunasekaran, A. 2019. Key factors influencing knowledge sharing practices and its relationship with organizational performance within the oil and gas industry. *Journal of Knowledge Management*.

Ali, M. B., Wood-Harper, T., and Ramlogan, R. 2020. A Framework Strategy to Overcome Trust Issues on Cloud Computing Adoption in Higher Education. In *Modern Principles, Practices, and Algorithms for Cloud Security* (pp. 162-183). IGI Global

Al-Ruithe, M., Benkhelifa, E. and Hameed, K., 2017. Current state of cloud computing adoption—an empirical study in major public sector organizations of Saudi Arabia (ksa). *Procedia Computer Science*, 110, pp.378-385.

Arunkumar, K. R., and Kannan, P. 2020. Awareness and Use of Open Education Resources (OER) Among PG Students: A Study of Alagappa University. In *Handbook of Research on Digital Content Management and Development in Modern Libraries* (pp. 21-35). IGI Global.

Asadi, Z., Abdekhoda, M., and Nadrian, H. 2020. Cloud computing services adoption among higher education faculties: development of a standardized questionnaire. *Education and Information Technologies*, 25(1), 175-191.

Barona Lopez, L.I., Valdivieso Caraguay, A.L., Maestre Vidal, J., Sotelo Monge, M.A. and Garcia Villalba, L.J., 2017. Towards incidence management in 5G based on situational awareness. *Future Internet*, 9(1), p.3.

Bashorun, M. T., Omopupa, K. T., and Dahiru, G. 2020. Cloud Computing and Academic Libraries in Nigeria. In *Handbook of Research on Digital Devices for Inclusivity and Engagement in Libraries* (pp. 113-134). IGI Global.

Battleson, D.A., West, B.C., Kim, J., Ramesh, B. and Robinson, P.S., 2016. Achieving dynamic capabilities with cloud computing: An empirical investigation. *European Journal of Information Systems*, 25(3), pp.209-230.

Böse, M. and Rockenbach, F., 2018. Internetrecht: Vertragliche und datenschutzrechtliche Besonderheiten beim Cloud Computing. *Monatsschrift für Deutsches Recht*, 72(2), pp.70-74.

Botta, A., De Donato, W., Persico, V. and Pescapé, A., 2016. Integration of cloud computing and internet of things: a survey. *Future generation computer systems*, 56, pp.684-700.

Chukwusa, J. 2020. Blog Technology: Constraints to Implementation in Public University Libraries in Nigeria. *Science & Technology Libraries*, 39(1), 83-95.

Elzamly, A., Hussin, B., Abu-Naser, S.S., Shibutani, T. and Doheir, M., 2017. Predicting critical cloud computing security issues using Artificial Neural Network (ANNs) algorithms in banking organizations.

Elzamly, A., Messabia, N., Doheir, M., Abu Naser, S. and Elbaz, H.A., 2019. Critical Cloud Computing Risks for Banking Organizations: Issues and Challenges. *Religación. Revista de Ciencias Sociales y Humanidades*, 4(18), pp.673-682.

Ercan, T., 2010. Effective use of cloud computing in educational institutions. *Procedia-Social and Behavioral Sciences*, 2(2), pp. 938-942

Gai, K., Qiu, M., Zhao, H., Tao, L. and Zong, Z., 2016. Dynamic energy-aware cloudlet-based mobile cloud computing model for green computing. *Journal of Network and Computer Applications*, 59, pp.46-54.

Gangwar, H. and Date, H., 2016. Critical factors of cloud computing adoption in organizations: An empirical study. *Global Business Review*, 17(4), pp.886-904.

Ghazouani, S. and Slimani, Y., 2017. A survey on cloud service description. *Journal of Network and Computer Applications*, 91, pp.61-74.

Gholami, A. and Laure, E., 2016. Security and privacy of sensitive data in cloud computing: a survey of recent developments. *arXiv preprint arXiv:1601.01498*.

Gireesha, O., Somu, N., Raman, M. G., Reddy, M. S., Kirthivasan, K., and Sriram, V. S. 2020. WNN-EDAS: A Wavelet Neural Network Based Multi-criteria Decision-Making Approach for Cloud Service Selection. In *Computational Intelligence in Pattern Recognition* (pp. 853-865). Springer, Singapore.

Guruprasada, G. M., and Kumbar, M. 2019. Use of Technology to Enhance Innovative Services in Academic Libraries. *Pearl: A Journal of Library and Information Science*, 13(4), 351-355.

Hernandez, A. A. 2019. An Empirical Investigation on the Awareness and Practices of Higher Education Students in Green Information Technology: Implications for Sustainable Computing Practice, Education, and Policy. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, 10(2), 1-13.

Hoskins, R. 2020. Visibility and accessibility of indigenous knowledge on open access institutional repositories at universities in Africa. In *Digital Libraries and Institutional Repositories: Breakthroughs in Research and Practice* (pp. 454-472). IGI Global.

Hurwitz, J.S. and Kirsch, D., 2020. *Cloud computing for dummies*. John Wiley & Sons.

Inyang, O. G., and Josiah, S. O. 2019. KNOWLEDGE AND USERS' PREFERENCES OF CONTEMPORARY MARKETING STRATEGIES USED IN ACADEMIC LIBRARIES. *Library Philosophy and Practice*, 1-18.

Islam, M. A. 2019. Perceptions and use of cloud in academic activities: a study of a public university in Bangladesh. *Digital Library Perspectives*.

Jalali, F., Hinton, K., Ayre, R., Alpcan, T. and Tucker, R.S., 2016. Fog computing may help to save energy in cloud computing. *IEEE Journal on Selected Areas in Communications*, 34(5), pp.1728-1739.

Kalaiprasath, R., Elankavi, R. and Udayakumar, R., 2017. CLOUD COMPUTING SECURITY TOWARDS END TO END TERMINOLOGY. *International Journal of Pure and Applied Mathematics*, 115(8), pp.637-641.

Kampa, R. K., and Kaushik, P. 2019. Economics of open source library software: evidences from Indian libraries. *Global Knowledge, Memory and Communication*.

Khedr, A.E. and Idrees, A.M., 2017. Enhanced e-Learning System for e-Courses Based on Cloud Computing. *JCP*, 12(1), pp.10-19.

Kishore Kumar, S. 2020. Use and Access of E-Resources in College Libraries: A Case Study of Selected First Grade Colleges in Bengaluru in India. In *Handbook of Research on Digital Content Management and Development in Modern Libraries* (pp. 60-75).IGI Global.

Kujur, S., Vinayagam, S. S., Awasthi, H. K., and Murthy, G. R. R. 2019. Study of factors influencing adoption of educational technology in teaching-learning process in agricultural universities in India. *International Journal of Education and Management Studies*, 9(3), 164-168.

Kumar, V., and Ogunmola, G. A. 2020. Web Analytics for Knowledge Creation: A Systematic Review of Tools, Techniques, and Practices. *International Journal of Cyber Behavior, Psychology and Learning (IJCPL)*, 10(1), 1-14.

Li, J., Zhang, Y., Chen, X. and Xiang, Y., 2018. Secure attribute-based data sharing for resource-limited users in cloud computing. *Computers & Security*, 72, pp.1-12.

Li, P., Li, J., Huang, Z., Gao, C.Z., Chen, W.B. and Chen, K., 2018. Privacy-preserving outsourced classification in cloud computing. *Cluster Computing*, 21(1), pp.277-286.

Mani, M., Hameed, S. S., and Thirumagal, A. 2019. IMPACT OF ICT KNOWLEDGE, LIBRARY INFRASTRUCTURE FACILITIES ON STUDENTS' USAGE OF E-RESOURCES-AN EMPIRICAL STUDY. *Library Philosophy and Practice (e-journal)*.

Marinescu, D.C., 2017. *Cloud computing: theory and practice*. Morgan Kaufmann.

Mokhtar, S.A., Al-Sharafi, A., Ali, S.H.S. and Al-Othmani, A.Z., 2016, May. Identifying the determinants of cloud computing adoption in higher education institutions. In *2016 International Conference on Information and Communication Technology (ICICTM)* (pp. 115-119).IEEE.

Monisha, D., and Gurusamy, S. 2019. Awareness of College Students in the Adoption of Social Networking Sites in Creating a New Learning Environment. *ANVESHAK-International Journal of Management*, 8(1), 71-83.

Munshi, S. A., and Faizan, M. 2020. User Perception Towards ICT Services and Facilities in Maulana Azad Library, Aligarh Muslim University. In *Innovations in the Designing and Marketing of Information Services* (pp. 120-134). IGI Global

Muthuvennila, S., and Thanuskodi, S. 2019. User Perception on Open Access Resources among College Students in India: A Survey. *Library Philosophy & Practice*.

Naveed, Q. N., & Ahmad, N. (2019). Critical success factors (CSFs) for cloud-based e-learning. *International Journal of Emerging Technologies in Learning (iJET)*, 14(01), 140-149

Noor, T.H., Zeadally, S., Alfazi, A. and Sheng, Q.Z., 2018. Mobile cloud computing: Challenges and future research directions. *Journal of Network and Computer Applications*, 115, pp.70-85.

Nunda, I., and Elia, E. 2019. Institutional repositories adoption and use in selected Tanzanian higher learning institutions. *International Journal of Education and Development using ICT*, 15(1).

Oredo, J., Njihia, J. and Iraki, X., 2017. The Role of Organizing Vision in Cloud Computing Adoption by Organizations in Kenya. *Am. J. Inf. Syst.*, 5(1), p.38.

Paul, P. K., and Chatterjee, D. 2019. iSchools Promoting “Information Science and Technology”(IST) Domain Towards Community, Business, and Society With Contemporary Worldwide Trend and Emerging Potentialities in India. In *Advanced Methodologies and Technologies in Artificial Intelligence, Computer Simulation, and Human-Computer Interaction* (pp. 864-878). IGI Global.

Paul, P. K., Solanki, V. K., and Kumar, R. 2020. An Analytical Approach from Cloud Computing Data Intensive Environment to Internet of Things in Academic Potentialities. In *Principles of Internet of Things (IoT) Ecosystem: Insight Paradigm* (pp. 363-381). Springer, Cham.

Rittinghouse, J.W. and Ransome, J.F., 2016. *Cloud computing: implementation, management, and security*. CRC press.

Sánchez, M., Aguilar, J., Cordero, J., Valdiviezo-Díaz, P., Barba-Guamán, L. and Chamba-Eras, L., 2016. Cloud computing in smart educational environments: application in learning analytics as service. In *New advances in information systems and technologies* (pp. 993-1002). Springer, Cham.

Satyanarayanan, M., 2017. The emergence of edge computing. *Computer*, 50(1), pp.30-39.

Saunders, M., Lewis, P. & Thornhill, A., 2016. Research methods for business students. 5th ed. Harlow: Pearson Education Limited.

Sen, S., Roy, S., Biswas, S., and Chowdhury, C. 2020. Security-and Privacy-Aware Computing in Cloud With User Mobility: An Extensive Review. In *Modern Principles, Practices, and Algorithms for Cloud Security* (pp. 1-20). IGI Global.

Sharma, E. 2020. Developing ICT adoption model based on the perceived awareness and perceived usefulness of technology among telecom users. *International Journal of Technology Enhanced Learning*, 12(1), 99-114.

Sharma, M., Gupta, R., and Acharya, P. 2020. Factors influencing cloud computing adoption for higher educational institutes in India: a fuzzy AHP approach. *International Journal of Information Technology and Management*, 19(2-3), 126-150.

Shehu, A. B. 2020. APPLICATION OF WEB 2.0 IN PRIVATE UNIVERSITY LIBRARIES OF NORTHERN NIGERIA USING THE THEORY OF MANNES LIBRARY 2.0.

Singh, J., and Mansotra, V. 2019. Factors affecting cloud computing adoption in the Indian school education system. *Education and Information Technologies*, 24(4), 2453-2475.

Singh, R., and Tyagi, S. 2019. Integrating Knowledge Management Applications for Library Automation: A Study of Amity University, Greater Noida Campus.

Singla, B. S., and Aggarwal, H. 2020. Effect of Information Architecture on the Usability of a University Website: A Comparative Study of Selected Websites of Punjab (India). *International Journal of Cloud Systems and Technologies (IJDSST)*, 11(1), 38-52.

Siwach, A. K., and Malik, S. K. 2019. Use of electronic resources by science faculty and researchers in selected North Indian universities. *Library Philosophy and Practice*, 1-25.

Srivastava, A. 2019. The construction of knowledge on “quality” in higher education: A study of universities’ websites in India. *education policy analysis archives*, 27, 99.

Stergiou, C., Psannis, K.E., Kim, B.G. and Gupta, B., 2018. Secure integration of IoT and cloud computing. *Future Generation Computer Systems*, 78, pp.964-975.

Thomas, A., and Paul, J. 2019. Knowledge transfer and innovation through university-industry partnership: an integrated theoretical view. *Knowledge Management Research & Practice*, 17(4), 436-448.

Tripathi, S., Thakran, A., and Sharma, M. 2020. Enhancing the Sustainability of OER Through Context-Aware and Intelligent E-Learning Systems Specific to India. In *Technological Innovations for Sustainability and Business Growth* (pp. 18-29).IGI Global.

Varghese, B. and Buyya, R., 2018. Next generation cloud computing: New trends and research directions. *Future Generation Computer Systems*, 79, pp.849-861.

Wang, L., Ranjan, R., Chen, J. and Benatallah, B. eds., 2017. *Cloud computing: methodology, systems, and applications*.CRC Press.

Waral, N. L. 2020. Innovative Marketing Strategies in Academic Libraries: An Overview. In *Innovations in the Designing and Marketing of Information Services* (pp. 1-15).IGI Global.

Yang, A.M., Li, S.S., Ren, C.H., Liu, H.X., Han, Y. and Liu, L., 2018. Situational awareness system in the smart campus. *Ieee Access*, 6, pp.63976-63986.

Yang, C., Huang, Q., Li, Z., Liu, K. and Hu, F., 2017. Big Data and cloud computing: innovation opportunities and challenges. *International Journal of Digital Earth*, 10(1), pp.13-53.

## APPENDIX 1 : Screenshot of Online Survey Form

**AWARENESS AND ADAPTATION OF CLOUD SERVICES BY IT ACADEMICS IN INDIA**

1. How far do you agree with the fact that cloud services such as shared access, data storage are important to students and lecturers in a university?

Strongly agree  Disagree

Agree  Strongly disagree

Neither agree nor disagree

2. Are you using the cloud services such as online texting, video conferencing, online referencing for academic purposes?

1 of 10 answered

Activate Windows  
Go to Settings to activate Windows.

## APPENDIX 2

### INFORMATION SHEET FOR PARTICIPANTS

PROJECT TITLE: AWARENESS AND ADAPTATION OF CLOUD SERVICES BY IT ACADEMICS IN INDIA

I am Sijo Salu, an ongoing student at Dublin Business School. I am currently pursuing my MBA in Cloud computing.

You are being asked to take part in final year research study which is supervised by Mr. Tom Wall. The aim of the research is to reveal the change and its consecutive impacts due to integration of cloud computing in education system of Indian universities.

**WHAT WILL HAPPEN** : In this study, you will be asked questions regarding the effective use of different cloud computing services and the issues related to them.

The ethical guidelines followed in this research are as follows:

1. No sensitive information will be asked to be disclosed
2. Privacy of the participants will be respected.

#### TIME COMMITMENT

The interview typically takes nothing more than 10- 15 minutes.

#### PARTICIPANTS' RIGHTS

You may decide to stop being a part of the research study at any time without explanation required from you. You have the right to ask that any data you have supplied to that point be withdrawn / destroyed. You have the right to omit or refuse to answer or respond to any question that is asked of you. You have the right to have your questions about the procedures answered (unless answering these questions would interfere with the study's outcome. A full de-briefing will be given after the study). If you have any questions as a result of reading this information sheet, you should ask the researcher before the study begins.

#### CONFIDENTIALITY/ANONYMITY

The data I collect does not contain any personal information about you except age, gender. The data collected won't be disclosed with any third party.

**FOR FURTHER INFORMATION**

I Sijo Salu will be glad to answer your questions about this study at any time. You may contact me at 10393782@mydbs.ie

**INFORMED CONSENT FORM**

**PROJECT TITLE: AWARENESS AND ADAPTATION OF CLOUD SERVICES BY IT ACADEMICS IN INDIA**

**PROJECT SUMMARY:** This thesis paper focus on the awareness and adaptation of cloud services by IT academics in India. In addition, the paper will also highlight the cloud computing services which are useful in education, check whether it is effectively using in the educational sector and how it is applicable for students and staffs . The challenges for adopting the cloud computing services Indian universities will also be illustrated in this paper

By signing below, you are agreeing that: (1) you have read and understood the Participant Information Sheet, (2) questions about your participation in this study have been answered satisfactorily, (3) you are aware of the potential risks (if any), and (4) you are taking part in this research study voluntarily (without coercion).

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Participant's signature

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Student Name (Printed)

SIJO SALU

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Date 15/05/2020

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Participant's Name (Printed)

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Student Name signature