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**AUDITING, MONITORING, AND ASSURANCE MEASURES
FOR THE CONTROLS OF CLOUD COMPUTING**

Abstract

This research would keep focus on the strategic implementation regarding the auditing and monitoring process considering the application of cloud computing. On the other hand, the risk identification process has been done regarding the cloud security process. In addition to that the cloud computing monitoring process and reviewing the operational glow would also be arrested for the better organizational output generation. In this research, interpretivism philosophy and inductive research approach have been utilized to frame out the research value identification. The secondary data collection would also deliver the subjective data for the matter of risk minimization. Incorporation of cloud computing and auditing techniques have been applied as an effective strategy in terms of improving the overall work process of an organisation.⁴⁶ The findings section of the study includes development of different themes relevant to aims and objectives of the research process. Analysis of the developed themes has reflected the impact of cloud computing and auditing techniques across the work process. It also includes a brief discussion reflecting about the overall sturdy process

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1.1 Introduction

Because of the enormous use of technology our all day to day tasks are being regulated through online and so there is a requirement of storage in order to store the huge amount of data and to solve this problem the concept of Cloud Computing has been invented. There must be some regulating factors to control cloud computing. Auditing, monitoring, and assurance gives proper measurements that would help to make around the most important facts to be taken and granted for the cloud computing methods. It might be used for relating to the utility that is required for cloud computing. The research starts with the introduction chapter which covers mainly the background of the research. The problem statement and rationale help to determine the facts and cause of the research. The aims and objectives of the research are identified with the methodological overview and significance of the research to be understood.

1.2 Research Background

The research provides an in-depth understanding of the measures for auditing, monitoring, and assurance that helps the security controls in child computing. It has various measures through which auditing and monitoring can be done. The importance and uses of various tools can be discussed through organizations and maintained through security information used in cloud computing (Chandra *et al.*, 2019). Various risks are there in using cloud computing such as data breaching and privacy of data leaks through cloud computing processes that can be mitigated. The information system can be used for measuring cloud computing derivatives by the information system that is used for organizations in safeguarding privacy in a more improved way. Cloud computing has taken a significant place in modern businesses, irrespective of the size of the organisation. A number of renowned companies including Apple, Google, Amazon and Microsoft are providing cloud computing processes for both personal use and industrial use. Instead of using stacks of physical storage devices, most organisations are using the process of cloud computing to store data and retrieve them whenever needed from almost anywhere in the

world with the help of smart devices and an active internet connection. However, on the other hand, these practices are increasing the incidents of hacking, personal data breach and other such malpractices. Therefore, auditing the benefits and limitations of cloud computing has become an absolute necessity.

1.3 Problem Statement

The problem statement for the research is about cloud computing methods of auditing, monitoring, and assurance control for the measurement of the study. In using **cloud computing** the risks that are associated with it are mainly from data breaching and the leaking of confidential data.

48 1.4 Research Rationale

What is the issue?

The issues that arise due to cloud computing technologies are formed by adjusting the measurement to take place. Strategic challenges, technology security, and adjusting of the auditing standards thus help in the effectiveness to be made in the auditing process (Wang *et al.*, 2022). The auditing and monitoring process thus has cyber-security-related issues that may prove fatal for many IT auditors. It might be useful for the strategies that are used for highlighting the problems associated with strategic development under different forms. Alike every single technological innovation, cloud computing has become the trend in the modern computing processes ²⁶ with the help of artificial intelligence (AI), machine learning (ML), big data environment and smart devices. It diminished the chances of data loss, however increased the number of ways a hacker can reach the server and manipulate the information stored.

Why is the issue?

The issue is there due to the format used in cloud computing processes and technology. There are many IT auditing of financial data and other software patent-related data that need to be monitored (Kumar and Goyal, 2019). Thus various security measures must be kept to prevent hackers from getting access to the data. Thus it needs to be mitigated to get proper assurance from the security assurance system. As learning of networking has become quite popular nowadays, people who are either deprived in the current socio-political scenario or the ones

trying to exploit the lack of knowledge of other people are using their knowledge to breach data and using that database for cyber-crimes.

Why does the issue exist in the present time?

The issue exists in the present time as the data breaching facility has been generated very much in the IT sector. It exists due to data management and the governance that thus has for the emerging technology used and the change of the infrastructure (Suganya and Sujatha, 2020). In the present time, the issue exists as hackers have increased their hacking styles and techniques to intercept the system of IT professionals to get information from their systems. Often, people are aware of the ways to use cloud computing, however, do not pay much attention to the loopholes that are present in the networking system that may lead to exploitation of the system by skilled hackers who are continuously updating themselves with the latest innovations in the technological sectors.

1.5 Research Aim

The research aims to focus on the auditing, monitoring, and assurance measures to control the process of security controls used for the measuring of cloud computing.

1.6 Research Objective

- To identify the strategies used in auditing, monitoring, and assurance measures for the data of security control that can be sued for cloud computing
- To determine the importance of auditing, monitoring, and assurance measures of cloud computing security
- To evaluate the process of doing and getting a clear idea about cloud auditing and monitoring
- To identify the risks of cloud security to measure the controls of cloud computing

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1.7 Research Question

- What strategies need to be used in auditing, monitoring, and assurance measures for the data of security control used for cloud computing?
- How the importance of auditing, monitoring, and assurance measures of cloud computing security can be determined?

- Why does the process of doing and getting a clear idea about cloud auditing and monitoring needs to be evaluated?
- What risks of cloud security are to be used in measuring the control of cloud computing?

1.8 Methodological Overview

Methodological Overview of the study helps to gather proper information about the methods used in the research.³⁵ Secondary data collection and qualitative data analysis for the study have been used. The research includes interpretivism philosophy, where the researcher might get relevant information while collecting secondary data from various secondary²⁸ yet authentic information sources such as journals, articles, books and reliable reports (Pape and Stankovic, 2020). An explanatory research design will be followed, to give proper information and explanation of various sources like magazines, websites, books, and journals. The inductive approach of the research will be followed as it is a secondary data collection research.

1.9 Research Significance

The significance of the research helps to provide in-depth knowledge about the security control measures taken and granted for the research. Cloud computing is thus taken to be a major crucial thing that helps every organization in completing organizational activities. The research will help the readers to identify and understand the security cloud computing system of cloud computing. This will be identified while auditing, and monitoring the required data of various data that are used in ensuring business decisions and ethical controls (Tissir *et al.*, 2021). The research will also help to use the viewers' advantages and disadvantages taken and granted for auditing, monitoring, and assurance measures taken and granted that would help to control security control for cloud computing. As the usage of cloud computing is not only limited to IT sector anymore but also is being used in various sectors such as manufacturing, consultation, banking, and service providing; hackers have started targeting these sectors as well. Given the fact that the IT sector is highly aware of the loopholes in the networking process, the other sectors are not that knowledgeable regarding these vulnerabilities. Therefore, these sectors are often becoming the target of ransomware, data breach, and malware. Identifying the ways that a hacker may use to break into a networking system is highly recommended as well as appreciated nowadays. Thus

both the subject and object of this research are significant in the current scenario of cloud computing.

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1.10 Research Structure



Figure 1: Research Structure

(Source: Self-Created)

1.11 Conclusion

It can be concluded from the research that auditing, monitoring, and assurance controls can be measured by cloud computing. Every data is equipped with a security process control format where cloud computing helps them and protects such confidential data. The research background is covered with problem statements and the rationale of the research to be understood with the reason for doing the research. The aim of the research is used to determine the process while conducting the research and the motive for doing so. The aims and objectives of the research are given with methodological, overview, and research significance to complete this chapter successfully.

Chapter 2: Literature Review

2.1 Overview

Cloud computing helps in configuring, accessing, and manipulating software and hardware resources remotely. It offers data storage online, applications, and infrastructure(Bello, *et al*, 2021).Cloud computing offers independency of the platform as the cloud software is not needed to be locally installed on the personal computer.In the year 1950, the idea of cloud computing came into actuality with the implementation of computers as the mainframe.since then from static clients cloud computing has been developing into a dynamic one(Zulifqur, *et al*,2021)Cloud computing monitoring is a process of observing, managing, and reviewing the operational flow of work in a cloud-based infrastructure of IT. The clouds have various moving components and it is important to safeguard that each and everything comes seamlessly.

Cloud auditing is a recurring examination and enterprise does to document and assess the performance of cloud vendors. The cloud service provider helps to store some accessed rarely data by using a method of offline. Thus cloud users use an effective way to carry out data integrity auditing on frequently outsourced data(Garg, *et al*, 2020).Numerous researchers have proposed various protocols for data integrity auditing.Cloud computing is a very complex system. The metric system which is existing needs to improve to meet the requirement of the business. (Li, *et al*, 2021)

2.2 Previous literature

In the words of Achar,(2022), auditing in the security of cloud computing is the procedure for monitoring and evaluating the cloud-based system service and safety. audition helps in ensuring that the applications and data are compliant and secure with policies of security and regulations of the industry. Auditing in cloud computing can be performed through an automated device or manually and through auditors of a third party. Enterprise should daily engage a team of compliance to perform control and system audits on the infrastructure of clouds to make sure the validated network and host the sensitivity scans and perform consistently. In addition, auditing helps to verify the system of cloud-based services that are following the policies of security and regulations of the IT industry.

According to Orue-Echevarria, *et al*, (2021), auditing helps in the security of cloud-based services. MEDINA approaches for consistent certification of cloud service against the certification cloud scheme of the EU. It describes the lifecycle of constant certification of security. Internal audit helps management to identify risks connected to cloud computing. A checklist for cloud compliance comprises an effective and easy way for the enterprise to start the important task and ensure that all the activities of cloud computing are safe from a survey by the regulator those who want clarity of ownership of data and access. aloud audit checklist helps to assure that the requisites of data, storage, and processing are documented properly.

In the words of Dhingra, *et al*, (2021), a cloud-based traffic monitoring congestion system obtains data traffic from nodes of sensors and addresses the data to a remote server of the cloud for processing, diagnosing, and visualization. In the platform of cloud computing design users get proper notifications for the high density of traffic from the cloud. Cloud computing helps to tackle the issues of configuration in the short run as well as in the long run scenario. Additionally, the framework of Cloud computing has been introduced to solve the complex monitoring system. Cloud monitoring helps to find the applications of cloud-hosted perform within the agreement of their service level. The clouds have various components of moving and performing well it is important to take precautions that everything assembles seamlessly.

According to Liu, *et al*, (2019), a Cloud computing-based system of monitoring contemporary IOT of agriculture is looking forward to promoting modern agriculture development through the formation of a complete system of information.¹² Cloud computing is mainly concerned with the centers of data which is available to the huge number of user of the internet. IoT (internet of things) system of monitoring which runs on the browser evolved and the status of the device has been analyzed in real-time. Sensor data has been exhibited by chart through the technology of¹² visualization. For the platform of cloud computing in the layers of support the safe and stable operation of the monitoring system of IOT requires a decent software and hardware foundation. By the research of platform of cloud computing the Web service of Amazon has been chosen as⁶⁶ the hardware and software platform of the system of IOT monitoring.

In the Words of Shukla, *et al*, (2022), cloud computing is the most enticing technology that offers technological and economic benefits in the separate provisioning service domains. However, the expanding popularity of services of cloud approaches with concerns about the assurance of security of its divergent services. Enforcement of properties of security is a tough task in a cloud. The business organization desires to be confident that the platform of the cloud on which the infrastructure of the business will be installed is secure and must remain secure. Moreover, cloud service customers need to believe in the cloud service provider with integrity,

confidentiality, auditing, and availability (shams et al., 2020). Cloud ecosystems recruit a diversity of security controls to make sure privacy and security. However, it is a task that is challenging to measure the usefulness of the operation.

According to Javed, *et al*, (2021), an assurance provides proof to support the claims of safety such as behavior system and threat addressed and manifests why the evidence which is included is adequate. Cloud computing security is a vital concern as it is stored in an encrypted form.

2.3. Current literatures

2.3.1 Cloud Auditing

According to Shen *et al*,(2019), the informational technology outsourcing life cycle are made up of various parts each containing various kind of unforecastable factors and risk. Thus it is very much necessary to control the risk factors and recognize various IT outsourcing. Therefore the IT outsourcing also needs to audit in its whole life process. Traditional outsourcing is an advanced version of infrastructure outsourcing. Apart from that, the cloud computing is the novel version of information technology.

As per the Taha *et al*, (2021), Cloud computing includes several advantages. Apart from that, cloud auditing is defined as verifying following a particular set of rules and safety measures. In this context it can be said that the auditors are the persons who ensure that the work must be accomplished systematically and authentically related to IT infrastructure. It also takes into consideration the application of audit and then chooses the best and appropriate infrastructure for IT function.

According to Wu and ding, (2019), Cloud auditing is completely different from infrastructure auditing as there are some issues related with the interest and freedom of the auditor. In addition, cloud auditing also has issues with professional auditing practices and appropriate technical knowledge and proficiency of the auditor.

2.3.2 Cloud monitoring

In the words of Krzyszton and Niewiadomska,(2021), cloud monitoring is defined as the process of investigating and handling series which are responsible for controlling the total workflow. On the other hand, cloud monitoring is a kind of manual or automatic investigating technique or

instrument which can examine whether the cloud is working or not. Apart from that, those businesses which depend upon cloud technology must require management and service-based processes. Cloud monitoring can perform various kinds of functions such as verifying data from different locations. On the other hand, it also follows up files and applications to protect from any kind of cyber breaches.

According to Gao *et al*, (2022), cloud based monitoring is referred to as the strategies and techniques in order to manage and control cloud based applications and services. The business measures their infrastructure and digital footprint. Apart from that the IT administration and development teams are able to make their presence visible through the performance of the digital assets. On the other hand cloud monitoring is also develop a effective way in order to maintain the visibility of the Enterprise enhance experience of the users

In the words of Min, (2022), cloud monitoring is a particular case which helps to analyze and evaluate the condition of IT infrastructure. With the help of the cloud monitoring instruments, businesses can be able to maintain the performance and security of the environment of the cloud and to solve the problems which are faced by the end users. Normally the cloud monitoring works within the premises and remaining part of the hybrid. As a result it helps to increase the presence in the whole environment. The major function of cloud monitoring is to maintain the record of the consumption of cloud hosted resources.

According to the views opined by Birje and Bulla, (2020), the cloud monitoring give the complete overview of the hybrid and multi cloud infrastructure and the number of applications introduced on this infrastructure. The cloud monitoring process detects any kind of issue and resolves it quickly before it affects the end users. A critical cloud monitoring tool will be able to measure the layers of network between hybrid private and public cloud. This kind of instrument is very useful in case of huge quantities of data across a number of distributive channels. With the help of cloud monitoring it is able to find the cloud introducing application with their respective service level agreement. Apart from that it also measures capacity issues and determines the amount of cost.

In the words of Yang, (2023), a hybrid cloud monitoring face various kind of obstacles accessing data. It is also seen that cloud monitoring aids to the administration of data which is collected in different types of clouds. On the other hand the cloud monitoring data also manages to store data into manageable pieces.

2.3.3 Cloud assurance

According to Rios, (2019), cloud assurance is a technique which is used in order to protect customers by measuring the capacity of the cloud service providers. Cloud assurance is to be provided as per the standard and regulatory laws. The major advantage of IT infrastructure and cloud assurance is that it reduces the operating cost by reducing the infrastructure losses. Cloud insurance also provides data handling process in a very easy and convenient method. Apart from that it also facilitates transportation of data and transformation steps at business level. Data assurance is defined as the process in which data are protected in an appropriate manner.

In the words of Town and Wang, (2022), management of security assurance helps to visualize the internal affairs of the business such as goals, plans strategies and many more. Therefore, the organisation can securely protect the vital information of the company from any kind of Cyber threat. Apart from that security assurance also influence the efficiency and give strength to the business in order to complete with the business.

According to patio *et al.*,(2020), cloud assurance request strong password in order to ensure a strong protection of important data. It is created by mixing alphabets, numerical, special characters and symbols. Apart from that there is multi factor authentication which provides the business organisation a multi-layer protection of data. It also enable that there must be fewer number of access to the users. Therefore the system and accounts will be more productive. Cloud assurance also showed a feature of disable inactive accounts which is referred as if the employee leave the organisation, the login credentials of the employees will be invalid from the time of the termination. The cloud technologies also measure any kind of suspicious activity and restrict the account at the time when it is detected. In addition with that it also removes the files which are not required or create any kind of unnecessary storage consumption. There is also set of rules and regulations regarding accessing data. Cloud assurance also secures the computer layer in order to protect the entire system and data.

2.4 Theoretical framework

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In the field of information and technology Cloud computing has a significant importance.
17 According to Bello *et al.*, (2021), the meaning of cloud computing can be better understandable when it is described in two parts. The first part portrayed in this case is a kind of web browser which distributes the permission of the usage of remote control resources. Secondly it refers to a payment for the actual use of resources.
18 The cloud computing basically provided three kinds of services such as software accessories, platform as a service and infrastructure service. The SAS

customers are those kinds of customers which provide customers software applications on rent from the cloud service providers through the internet. The PAS is platform as a service virtualized scenario over the cloud with the help of the internet. Apart from that the infrastructure service provides a important facilities to the customer in order to become more efficient and effective in preparing strategies and proposing new technology.

There are different kinds of theories and models which have been proposed in order to propose new technology. Apart from that it is also observed that there are various studies on information technology. At the IT levels there are various kinds of studies taken such as technology

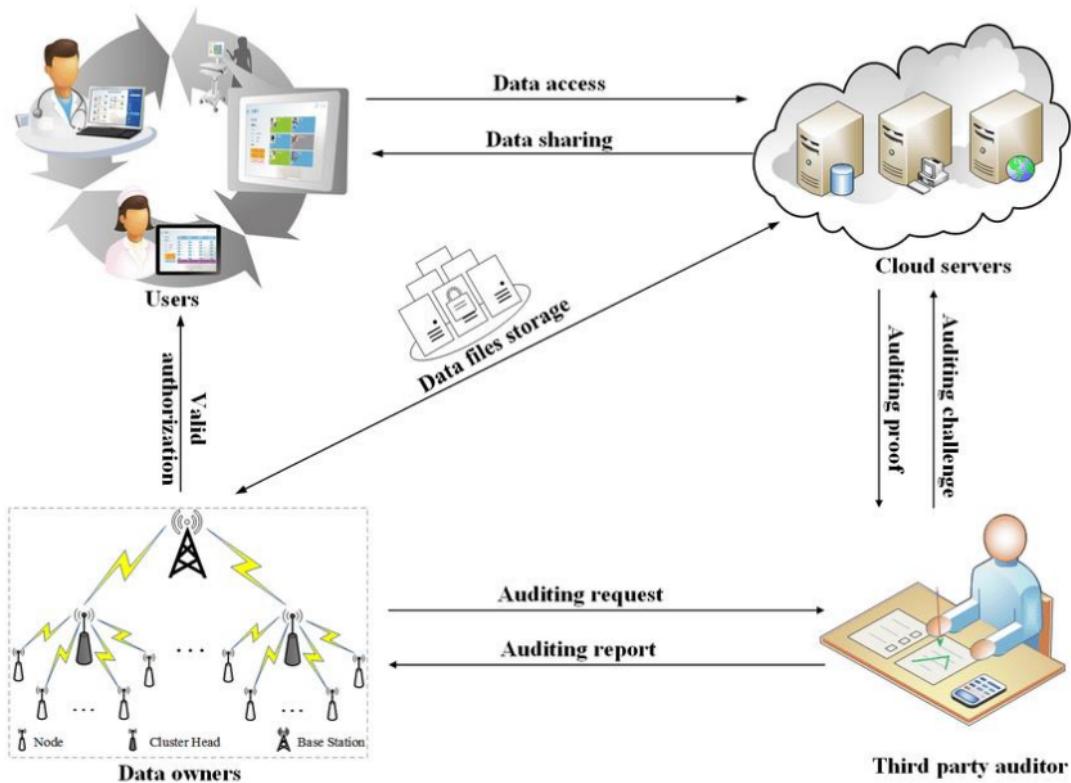


Figure 1: Cloud computing and cloud auditing

(Source: researchgate.net, 2023)

Moreover, the Acceptance model, theory of plant behavior, theory of acceptance and use of technology are the different forms of cloud computing aspects. On the other hand, this section of the study mostly focuses on the appropriate studies of diffusion of innovations and the technology organization environment.

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Diffusion of innovation

The theory diffusion of innovation measures how cultures influenced new ideas and technology in order to spread all over the world.

Diffusion of innovation is related with the features of the innovations. In the words of Sunyaev and Sunyaev,(2020), it is defined as the method in which the innovations are spread with the help of several distributive channels over a period of time. There are certain benefits of the innovation such as compatibility, complicity and observability. Compatibility defines the level to which the innovation is non-variable. Complexity defines difficulties which occurred in the use of the innovation. Observability is the level to which the innovation will be visible to the individual.²⁷ There are different kinds of attributes which need to be considered in order to take decisions regarding accepting or rejecting innovations. This attribute affects both individual and organizational adoption of technology.

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Technology organization environment framework

Technology organization environment framework is formulated in order to analyze how innovative technology is being undertaken by the business organizations. It defines the features of the organization such as the size of the firm, level of centralization, formulation and complexity. This framework also it wasn't there adoption of innovation depend on various factors such as the feature of the technology. Apart from that the features of the technology is not the only point of concern there are other factors also involved such as environmental and organised factors. However, the technology organization environment framework has lots of limitations. These frameworks consider both technological and non-technological factors in the diffusion process.

2.5 Conceptual framework

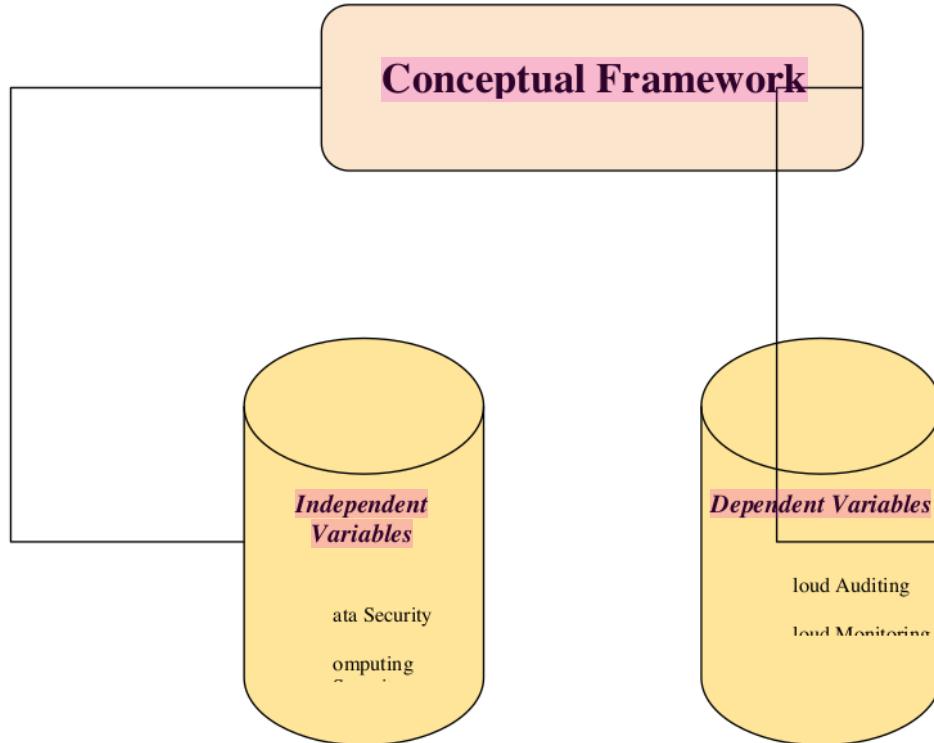


Figure 2: Conceptual Framework

(Source: Self-Created)

In order to frame the conceptual framework there two major parameters are taken into consideration and are dependent variables and independent variables. The independent variables are data security, Computing security, Data privacy framework, cloud security, and risk factors associated with the cloud computing framework. The dependent variables are cloud auditing, cloud monitoring, cloud assurance, cloud computing, and diffusive innovation. The impact of the dependent variables depends on the independent variables in order to construct the conceptual framework (Yang *et al.*, 2020). Cloud computing is one of the reliable platforms where people can perform various tasks about auditing, monitoring, and different innovation management. Sometimes, the bulkiness of purchasing software licensing may be cumbersome for the company and time-consuming and hence, in this case, the company may adopt the very plans of the cloud computing facilities with the relative subscription (Shen *et al.*, 2019) with the respective company. It saves a good amount of time for the company and the project. Moreover, it is quite

challenging for the company to maintain the data security of highly confidential data associated with the project and managing the data privacy for the given project is quite crucial in this case. Depending on the very facts of data security many organizations do not prefer to take subscriptions to cloud computing facilities and they prefer to buy the software material by consuming time. The matter associated with cloud computing always encourages creativity and innovation for organizations to achieve its goal by saving time and money. Cloud auditing, monitoring and control are all the relative tools that are used for the project (Garg *et al.*, 2020).²³

The main aim of the research is to evaluate the impact of data security, data breaches, and risk on cloud computing services and what are the relative mitigation plans to minimise the major risks and facilitates the flexibility of cloud computing.

2.6 Gap in the literature

In the words of Qasem, *et al.* (2019) a gap in literature exists in the adoption phase in both organizational and individual levels. Cloud computing is considered computing of the next generation. Cloud computing has been adopted in the public and private sectors given its collaboration, flexibility, scalability, cost-effectiveness, and collaboration. Cloud computing stems from the idea of traditional hosting internet has been used to reserve applications of software data. The study aims to view the current gap in of adoption of cloud computing in higher education institutions. Security concerns may be the barriers to the adoption of cloud computing in the higher education sectors. Software producers of the cloud must provide integrity and confidentiality.

According to Shafiq *et al.* (2022), the literature shows that there is a research gap open in the metric as algorithms did not give priority to the request of the user and still result in the issues of latency. Cloud computing software should improve the algorithms to provide user security and safety. In a typical environment of cloud computing, there are two modules, the backside, and the front side. The front side is on the side of the user where it can be accessed through internet connections. Whereas the backside deals with the models of cloud computing. Assurance must be needed to increase the security of cloud computing and enhance safeguards.

2.7 Summary

From the above study it can be noted that cloud computing important technology which offers services to business organizations like programs, and accessing data, files, and programs across the internet. Pay-per-use model technology has been adopted by ⁵⁸ cloud computing. Thus it also can be noted that cloud computing offers scalability, cost savings, and performance of scale. However, it also noted that an audit of cloud computing is helpful to the risk related to it.

Chapter 3: Methodology

3.1 Introduction

The methodology is engaged with the philosophy of the research work, the approaches and its design which is discussed below. The primary role of the chapter is to deal with various method which is necessary at the time of conducting research work and making an appropriate decision which is necessary for inputting strategic choices. ⁶² The primary objective of the research methodology is to provide enlightenment on the approaches according to the need of the researcher to incorporate in every stage during the task performance relevant to the study of Auditing, monitoring and assurance measures for controlling cloud computing. Acknowledgement of the methodology necessary to engage with proper design which provides an appropriate blend towards the crucial element which is associated with the primary objectives of the study through which essential destination can enrich.

3.2 Research Onion

The methodology is going to be detailed through the help of research Onion which follows to complete the various access of the research methodology. the methodology discusses detailed information regarding the research approaches and design which creates an impact on the overall research work. It goes into detail regarding the collection of data method which is represented by maintaining a code of conduct and the searches associated with the collection of data represent authentic and analysed manner. Data collection is one of the important parts through which proper analysis of the data helps to provide proper information to the research work and it provides its destination. Furthermore, under ethical consideration and respecting limitations, the research is conducted which provides a fruitful destination for the research work. ⁸

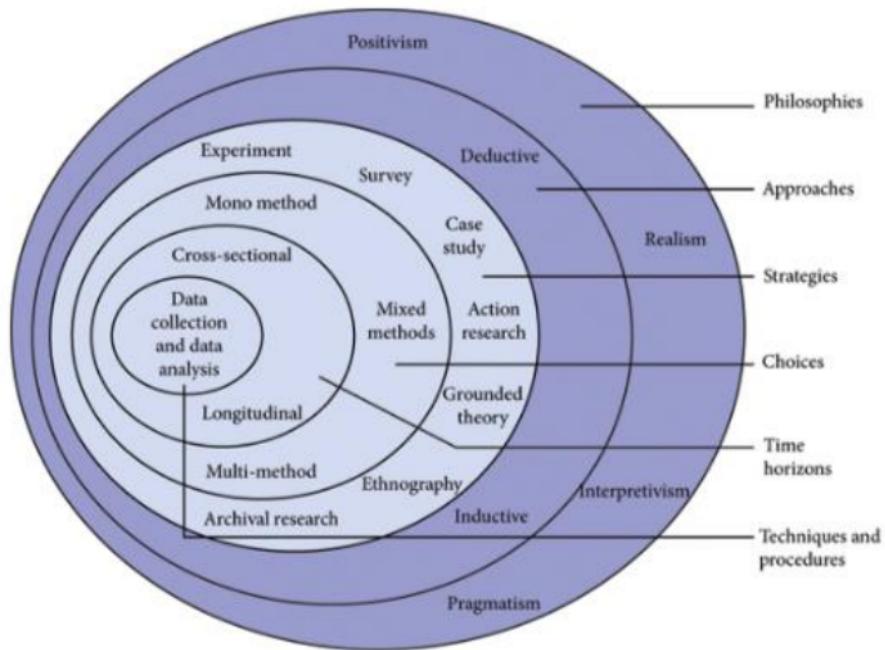


Figure 3: Research Onion

(Source: Saunders *et al.*, 2007)

3.3 Research Philosophy

Research philosophy provides a significant journey to the research study which involves beliefs and assumption that is required for conducting the research work. The research philosophy is also helpful for the research to provide accurate knowledge through which proper decision-making and action-taking approaches lead to representing the findings of the research. It also leads to determining the mentality of the research at the initial stage which respects the study and provides the entire research with proper direction. Approaching the research philosophy help the research method to understand the nature of the research work and it is categorised into 3 basic research philosophy which deals with the origin and nature of the concerned fact and provide light to the merging of human knowledge. Research philosophy is been distinguished into three kinds they are, positivism, realism and interpretivism. Positivism philosophy provides a map to contemporary philosophy with includes logical discussion (Marsonet, 2019). Interpretivism is another form of research philosophy which help to emphasize the reality of the subjective and

also creates a social connection. This type of approach helps people to understand reality by providing proper experiences.

However, the research work is going to complete through the incorporation of a *positivism* research philosophy which will provide accurate data for the research work. In an extension of gathering logistical and factual pieces of information for the research work, this approach helps to choose a proper destination. The current research on monitoring and auditing measures for the control of cloud computing provides information which encourages gathering facts regarding the various context to understand the approaches of necessary measures required for controlling cloud computing.

3.4 Research Approach

Research approach would provide the certain shape regarding the research regarding valuation generation which can be effective for the better risk reduction concern and delivering the certain level of output. Based on the characteristics, the segmentation of the research approach can be done such as inductive, abductive and deductive. In this research, an inductive research approach has been applied which through the probability of risk mitigation concern can be ensured. Support of the inductive research approach would provide a certain direction regarding the research value output generation (Alnaggar and Pitt, 2019). Herein, the support of the inductive research design would be effective which through the probability of the data collection process security can be maintained. On the other hand, the inductive research approach can be effective regarding the issue of making proper data scalability process (Varpio *et al.* 2020).

3.5 Research Design

Considering the development of the research process, research design would be identified as per the process which through the evidence based information can be structured. Herein, the application of the research design would provide a certain type of background which through the operational risk can be reduced. There are certain two types of research design which can be effective for the research process such as descriptive and explanatory research design (Sileyew, 2019). Herein, the application of the explanatory research design has been applied which through the possible development of the subjective data collection has been done. With the help of the explanatory research design, the subjective frame of the research output can be determined. This

would provide a certain range of research regarding feasibility development process and heightening the quality concern.

3.6 Data Collection

Data collection can be specified as per the most important criterion for the research process regarding the applied functional process. In this research data collection plays an important role for the procedure of developing the research. Herein, the application of the data collection would provide the certain evidence based information for the research process development. There are two types of data collection which can provide the evidence regarding the development of the research process such as primary and secondary. Primary data collection denotes the process of making collection of the data from the direct source. This would be effective for the process of making development of the research based on the quantitative and qualitative data. On the other hand, the secondary research is also connected to the process of making a collection of the data from the documented source such as a journal, newspaper article and magazines. In this research, a secondary collection process has been applied for the process of deriving the research regarding information collection process (Ruggiano and Perry, 2019). Support of the secondary data collection would be effective for the procedure of making detailed information collection regarding the topic auditing, monitoring and assurance measure process which through the controlling process of cloud computing can be ascertained. In addition, the different dimensions can be assessed for the development of the strategic planning which through the secondary data analysis process can be smoothly done.

3.7 Data Analysis

With the help of the research regarding value assessment, the probability of making identification of the information can be ascertained. Herein, the differentiation of the different research regarding initiatives are to be assessed by focusing on the proper auditing, monitoring and assurance measuring process considering the cloud computing security development. In addition, the process of making assessment of the cloud auditing has been applied which through the probability of reducing the risk can be identified. In addition, the possibilities of identification of the risks can be assessed regarding the cloud security concern and determining the controlling process of cloud computing (Sadeeq *et al.* 2021). The monitoring process would

be effective which through the cloud computing operational problems can be handled properly. With the help of the proper monitoring process, risk regarding the hacking of the data can be denied. This would provide the probable understanding regarding the matter of keeping the operational confidentiality. In addition to that the risk identification factors have been assessed considering the development of the auditing and monitoring process which can hamper the sustainability concern as well. In addition, the possible auditing of the cloud computing can be done while undertaking the risk assessment regarding the data finding and assurance measurement process as well.

3.8 Sampling and sampling process

With the help of the sampling process, probability of making identification of the information can be marked. Herein, the utilisation of the sampling process would provide the situational research development by focusing on the proper application of the information as well. The procedure of sampling is beneficial regarding the matter of developing the authenticity of the article selection and also making application of the proper input of the data which through the probable quality development of the research proceedings can be marked. In this research, inclusion and exclusion sampling research processes have been applied which through the probability of making identification of the relevant articles can be finalised. Regarding the inclusion of the research regarding articles, this would be required to specify the year from 2017 from which relevant information can be collected. Apart from that the google database such as google scholar has been identified which through the collection of the relevant articles can be confirmed. Therefore, the feasibility of the information can be standardised which through the relevant and important information can be provided based on which the feasible research regarding output can be derived. This can be interlinked to the substantial process of the research regarding value assessment. The process of making a global comparison of the cloud security is also assessed in this section while providing the proper scope of the output deriving process. Herein, the development of the infrastructure regarding procedure would also be assessed which through the possible framing of the risk reduction can be done. In addition, the innovation perspective is also assessed here considering the better cloud computing process application.

3.9 Ethical Consideration

² Regarding the development of the research quality development process, this would require to keep focus on the ethical issues based on which the possible research regarding risk can be properly handled. The ethical presence can ensure the authenticity ² of the research process and ² making application of the information by focusing on the risk assessment concern. Herein, the application of the Data Protection Act 2010 would help to keep providing support of the protection of the data. Herein, the collected data can be protected undertaking the application of the law. Based on which the supportive feasibility regarding the research development and keep ensuring data can be ensured. Secondly, the application of the manipulation of the collected data would hamper the research process development. In addition, the risk regarding the manipulation of the data can be handled by mentioning the articles with the help of the database identification. On the other hand, the commercialisation of the data cannot be occurred which can hamper the research regarding value assessment. In addition, this can be involved regarding the legal issue and litigation cases as well. Therefore, the researcher would keep focus on the development of the ethical concern by maintaining the rules and regulation and denying the manipulation and commercialisation of the data.

3.10 Limitation

In terms of making development of the research process, different types of issues can occur which can hamper the quality of the secondary data collection quality as well. Herein, the issues regarding not selecting the proper title based article would be the problem of this research. In addition, the research regarding limitation can be marked regarding the quality of the data as well. Therefore, the possibility of developing the quality of the data can be ensured.

3.11 Gantt Chart

Tasks	1st May-15th May	16th May-28th June	29th June - 28th July	29th July- 25th August	26th August- 30th September
Research topic					
Literature review					
Methodological overview					
Process of data analysis					
Finding and discussion					
Recommendations <small>31</small> and Conclusion					

Final submission					
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Table 1: Gantt chart

(Source: As created by researcher)

3.12 Summary

From this research, differentiation of the research regarding development and data collection process can be done which through the risk regarding the data collection can be reduced. In this research, the interpretivism philosophy has been selected which through the probability of detecting the research value assessment can be done. Herein, the set of values has been indicated for the process of better research output regarding the delivery process.³ In addition, the application of the inductive approach would provide a certain identification of the research value assessment. The selection of the secondary data collection has been done which can reduce the research regarding risk by taking collection of the data from the articles and journals. In support of the application of the Data Protection Act 2018 has been identified to keep protection of the information.²⁵

Chapter 4: Data analysis

4.1 Introduction

This section of the study conducts an analysis of different information collected for the research process. Audit monitoring accounts as a period piece of examination of different activities of an organisation. It also includes documentation of different performances delivered by cloud vendors. Key areas of auditing across the cloud computing process focus on security as well as privacy concerns. The process of audit and “compliance” in cloud computing processes covers different internal and external processes the organisation implements to meet the objectives of the organisation. The section also includes a brief discussion using different literature sources and also analysis of different findings of the study.

4.2 Theme 1: The strategies used in auditing, monitoring, and assurance measures for the data of security control that can be used for cloud computing

Findings

In the present time, most of the organization prefer to use cloud computing to improve business operations and reduce the cost of operations. Especially, in the case of startup companies, they will prefer to use cloud computing to centralize data security and provide higher security. As an example, it has been seen that Amazon prefers to use cloud computing systems for processing power, networking, storage and other purposes.

Amazon web service is a subsidiary of Amazon and it will help this organization by providing on-demand cloud computing platforms. In this way, various organizations prefer to use specific strategies to monitor their cloud services such as website monitoring processes, monitoring virtual networks, monitoring cloud storage and other ways. With the help of a website monitoring process, most of the organization can track various aspects of cloud-based websites that will help to identify their traffic, resources usages and data availability. Therefore, after using this strategy, Amazon expands its market share in the global market for cloud infrastructure market amounting to 34% and also recent times there have been some competitors such as Microsoft Azure and Google Cloud.

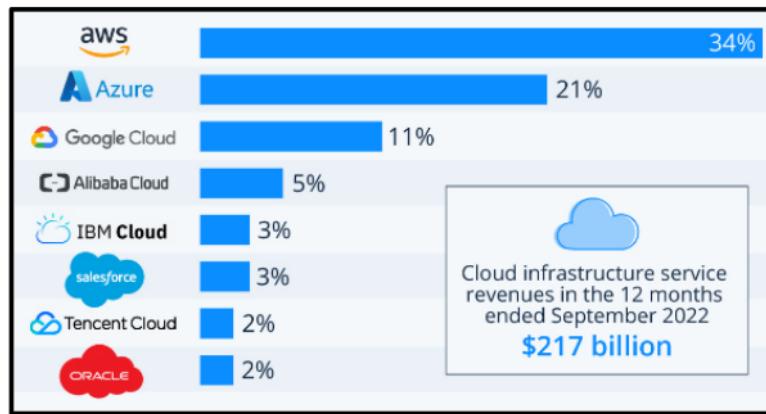


Figure 4: Amazon, Microsoft & Google Dominate Cloud Market
(Source:

On the other hand, most of the organization prefer to follow their virtual networks, where these organization will monitor their network performance, connection and other information. In this way this organization will evaluate their security-related issues for cloud communicating. Database monitoring is another important strategy which most of the organization use to identify any bottlenecks that could hinder efficient data transmission. Nowadays, Netflix also focuses on their security process of cloud computing. In the year 2016, this organization migrated all of their databases to the cloud. Therefore this organization gains some positive benefits such as, Netflix now increasing their amount of content and consumers easily using this application in the global market. For storing, and securing data cloud computing is the best option for every organization and any sector.

Analysis

From the above findings it has been seen that, for monitoring and auditing cloud computing, most organisations prefer to use specific strategies such as the need to monitor cloud security reports that will help an organstaion identify suspicious activity before the security attack.¹² Therefore to solve the security problem of cloud computing, this organstaion uses IAM techniques. This process included password management and multi-factor authentication that will help to fulfil the goal of cloud computing service. Apart from this, it has been seen that most organstaion should focus on cloud costs to fulfil the common goals of every organisation. In the global market, the main aim to use cloud computing is to reduce the cost of their management process, therefore, this organisation hires technicians and finance teams that will help to avoid overspending on their cloud infrastructure project. Especially startup companies append huge amounts to improve their infrastructures of cloud commuting therefore, technicians and financial teams provided proper budgets to reduce the cost of their cloud computing process. In this way, this organstaion can improve the COGS and understand the cost per customer.

Apart from this, the organstaion needs to set up a robust APM tool that will help to monitor and understand the matrix, and logs. Therefore, the organstaion will use DevOps monitoring metrics which assist to track the performance of the cloud.

4.3 Theme 2: The importance of auditing, monitoring, and assurance measures of cloud computing security

Findings

54

In order to ensure the security of its cloud system and document the compliance with all the regulatory system, auditing of cloud system is much necessary for every organisation. Moreover, auditing can be beneficial in terms of assessing and documenting cloud vendor's performance. It examines the variety of controls in terms of operations, administrative, security and performance. In addition to it, continuous monitoring and taking constant action for developing the cloud system will be beneficial for the organisations for gaining more trust of the customer and sustain their business in the long run.
33

In order to get insights on the importance of auditing, monitoring, and assurance measures of cloud computing security, various market data has been presented in the below section.

From the first figure, it can be found the growth rate of 5 economies in terms of cyber security.

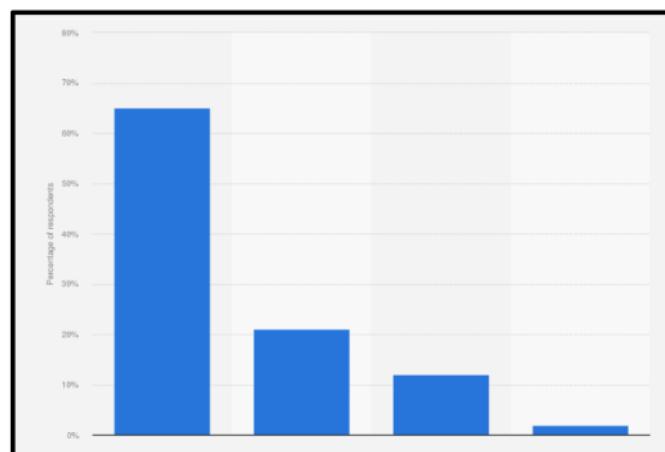
In terms of global cyber security, China is leading in the chart.



Figure: Global Comparison of Cloud Security

(Source: Sava, 2019)

It can also be found from a survey conducted by Statista research department that in the globalisation aspect, most of the respondents participated in the survey strongly agreed with the statement that they are conscious about their personal data.



Analysis

In the aspect of globalisation, it has been found that most organisations shifted their business operations from a physical to a cloud-based system. However, it raises issues related to data breaching and data theft. Therefore, every country in the world has taken some measures in the area of IT governance for reducing data theft and ensuring data privacy such as the implementation of various laws and regulations. Periodic auditing of the cloud system is part of the regulations that companies have to maintain. According to various IT audit leaders, the most technical risks related to ⁶⁵ cloud computing are cyber breaches, privacy access and regulatory compliance (wirc-icai.org, 2019).

In order to get insights into the market data related to cloud computing, various graphs have been presented in the findings sections.

From the first figure, it can be derived that China is in the top spot in terms of cyber security measures. It can also be found that in terms of security, the global cloud-based software market size is 29 Billion US dollars. In addition to it, the share of the global security market in terms of service is now 10.2 billion US dollars. It has been assumed that by 2030, the market size will grow to 80 billion US dollars.

The second figure represents the result of a survey conducted by the Statista research department. It can be found that more than 65% of the respondent strongly agreed that they are conscious of their personal data. However, it can also be found that 12% of people disagree with the statement.

In the findings sections, a graph related to challenges faced by organisations using public clouds has also been presented. From the figure, it can be found that 66% of the company faces barriers in terms of security measures for using public cloud domains. It can also be found that 60% of them face challenges in terms of regulatory compliance. These companies also faced challenges in terms of lack of knowledge in cloud experience. This factor ⁶⁴ can pose a challenge for consumers in terms of data piracy.

In addition to it, another survey was conducted to find the importance of data security and auditing of the cloud system. From the result, it can be found that 20% of the respondent companies agree with the fact that the most important security preference for their cloud system is preventing cloud misconfiguration. In addition to it, 19% of the respondents also informed that

another security preference is regulatory compliance according to the IT governance of the respective country.

4.4 Theme 3: The process of doing and getting a clear idea about cloud auditing and monitoring

Findings

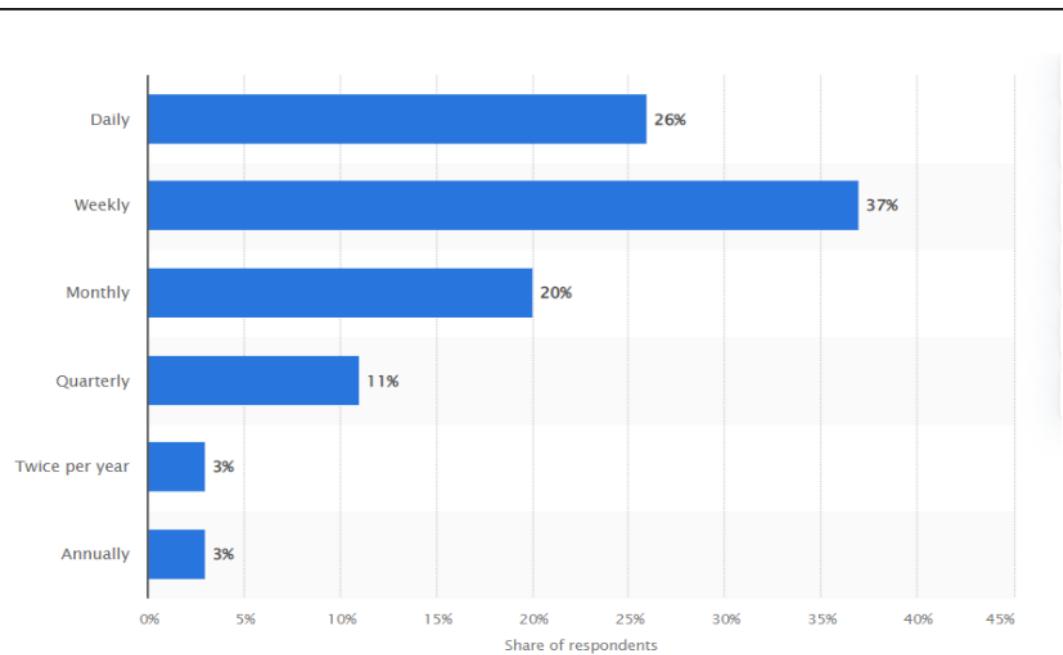


Figure 4: Frequency of cloud audit in organisation

(Source: Statista, 2023)

The process of “cloud auditing” mainly focuses on the security control process of the organisation. During the end of 2021, around 26% of respondents highlighted daily requirements of audit clouds in the execution of organisation work processes (Statista, 2023). This process of “cloud auditing” mainly includes focusing on the security controls of the organisation. Different security control measures of an organisation are procedures, technical protection as well as operational protection. One of the important aspects of cloud security audits is checking of “access control” of the organisation. Employees leave organisations after a certain working, ¹¹ as well as new employees, join. The important aspect of this cloud computing technique is that security audits must manage accessibility control effectively. It is important for the management to ensure that after leaving employees, access is revoked. This is an effective security maintaining strategy which also helps in ensuring the safety of different data stored in the cloud system of the organisation.

The process of “cloud auditing” starts with planning. In the opinion of Barati *et al.* (2021), the basic process of auditing includes providing notification to different departments of business in order to ensure the distribution of information. Conduction of meetings on a scheduled basis is an effective step that includes the administration of the performance of different departments. Adjustment of the auditing program is based on the basis of different inputs collected during meetings. Completion of fieldwork is followed by the drafting of a report. It includes different areas such as the identification of the scope of the audit. And also conducting an analysis of the

Analysis

It can be analysed that cloud auditing accounts as an important principle in terms of ensuring the security process of the organisation. According to the opinion of Wu *et al.* (2019), cloud security audit accounts as an important aspect that highlights the importance of verification of employee identity. Cloud environments are an important aspect which also includes the use of different third-party tools which can result in security risks. The incorporation of auditing helps in the identification of different types of security-related issues and thus improves the overall work process. It can be analysed that the incorporation of different tools such as “APIs” help organisations to correct any form of security-related issues within the organisation. Cloud compliance auditing is an important strategy that ensures consistent growth and development of the organisation. Auditing in cloud compliance images in process of obtaining evidence of service process through different analytics procedures.

Cloud auditing and monitoring help in improving the quality of security of different information stored across the database of organisations. According to the opinion of Yang *et al.* (2020), cloud auditing techniques include the evaluation of different information stored. Hence, an important process in this regard is a selection of an auditor, otherwise, the security of data is not ensured. This process is an inspection technique that further involves the incorporation of different tests. One of the important processes of cloud auditing is developing an understanding of the internal environment of the business. This includes the separation of customer data and applications. The next important step is the protection of the different assets of the customer. It is important to ensure that no “unsanctioned access” is granted to the staff of the business. In the process of auditioning for a cloud service environment, the biggest step is ensuring the secure storing of information. It is important to validate different security measures adopted by companies such as Amazon.

In the process of website monitoring, one important aspect is an analysis of different data stored in the cloud system. In view of Gao *et al.* (2021), cloud service providers need to provide facilities such as “subscription setting”, or “usage rate” as different services offered to potential customers. It can be analysed that a complete audit of a cloud environment is a necessary step in terms of ensuring issues such as the safety of data. Organisations often provide access to customers in terms of gaining an understanding of relevant audit processes. Hence, the process of

cloud auditing and monitoring helps in maintaining “contractual obligations” for the management as well.

4.5 Theme 4: The key risks of cloud security to measure the controls of cloud computing

Findings

Findings

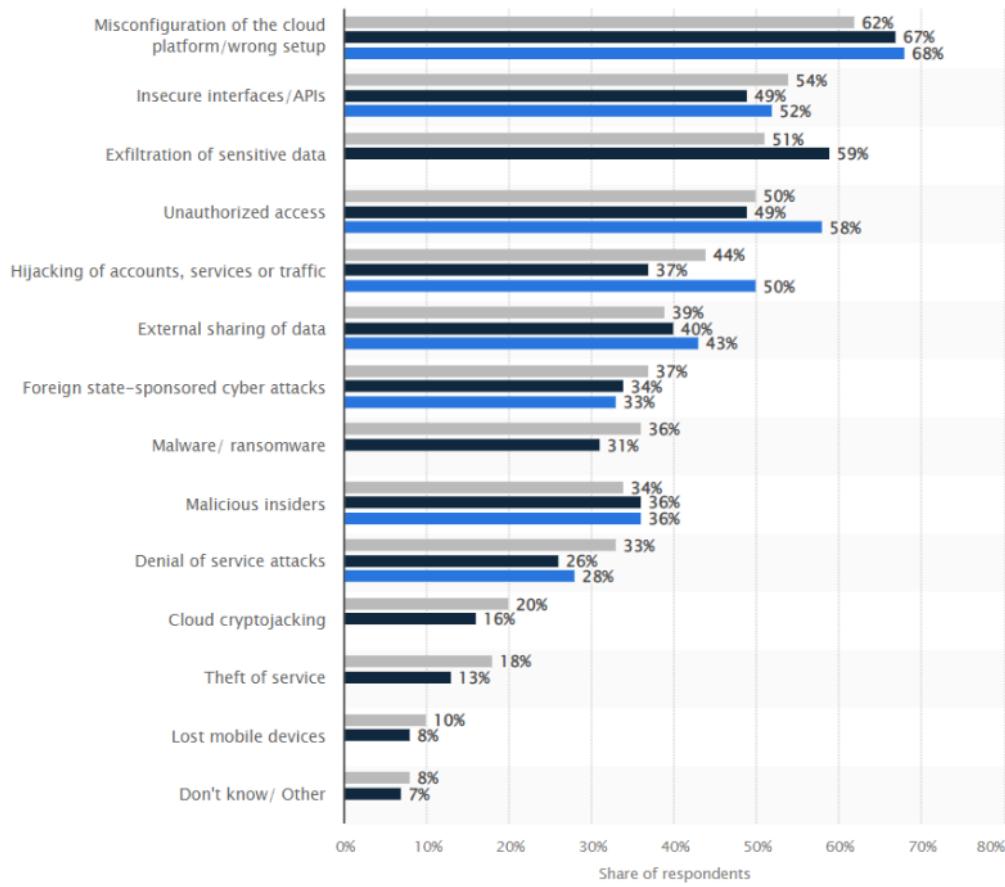


Figure 5: Security threats in cloud computing

(Source: Statista, 2023)

Cloud computing technology is an important aspect that helps in fainting different benefits such as “storage capability”, and “mobility” of information stored in the cloud. However, there are different risks associated with this cloud computing technique which is losing information or data. A different significant threat posed by cloud computing techniques is “exfiltration” of sensitive data (Statista, 2023). The process of “cloud computing” relies highly on the internet. Herein, the biggest risk is the accessibility of different services by APIs which can result in losing information to hackers. As identified in the graph above, 31% of risk reports from “malware” account as an important factor of concern in this regard. In this regard, one of the important aspects is an analysis of different security factors responsible for posing risks. One important security risk is a denial of the occurrence of “**service attacks**”. In many situations, such as emergency delivery of data, organisations face risk in terms of transferring services from one “vendor” to another “vendor”.

Analysis

It can be analysed that cloud computing techniques face different security-related issues that directly hamper the functioning of “cloud-based” infrastructure. According to the opinion of Al-Issa *et al.* (2019), emerging “multi-cloud” auditing systems give a chance of sharing different networking resources. However, “misconfiguration” in the security setting of the cloud leads to a “data breach”. “Misconfiguration” of the cloud is a major issue because it results in losing of essential data such as “financial information” or “password” of the organisation. Hence, this type of “misconfiguration” can result in the exploitation of a valuable set of data. Cloud computing techniques' dependency on the internet results in exposing data and information across different online platforms. As a result of this, it often results in unnecessary movement of data. It can be analysed that losing data to different corporate devices during the process of transmission from personal devices to corporate devices such as computers can result in losing vital information to hackers.

It can be analysed that the “hijacking” of accounts results in losing of the necessary information. Incorporation of weak passwords or using one password across multiple accounts results in the “hijacking” of accounts. It is a potential threat hampering the core business functions as well as cloud infrastructure. In the opinion of Awaysheh *et al.* (2021), the availability of employee credentials can provide a chance for different internet hijackers to access sensitive information stored in the cloud. One of the important risk factors, in this case, is storing company resources on a private network. This type of situation also poses a risk in terms of accessibility of the cloud storage. As corporate networks run on a completely different infrastructure and are also not owned by the company, it results in lacking proper security tools incorporation necessary for data security. The use of traditional tools for increasing data visibility for organisations is a risky step in this regard.

Insecure “Application Programming Interface” use can threaten the confidentiality as well as the integrity of different information in use. As per the opinion of Tabrizchi *et al.* (2020), increasing reliance on cloud-based technology is creating a need for the protection of confidential data. Different cloud service providers using “APIs” can result in threatening the confidentiality of information. It can be analysed that a lack of understanding about the security of “cloud storage”

can pose risk for the management of different data stored in the system. It is important for businesses to improve the efficiency of the cloud computing process.

4.6 Discussion

Cloud computing techniques account for an effective principle in terms of remote storing of different essential information of the organisation.²⁹ According to the opinion of Papadopoulos *et al.* (2019), the incorporation of cloud computing techniques offers a “computing paradigm” in terms of improving communication processes. One of the crucial tasks of cloud computing techniques includes monitoring of flow of the work process within the organisation. In order to ensure that proper rules and regulations are followed, it is the task of management to develop a dynamic cloud storage system for the operating business. Increased advancement of technology is playing a crucial role in terms of recognising different IT outsourcing. Advancement technological tools such as IoT are playing an important part in terms of reducing errors in communication processes as well as in data management. However, the use of these tools and techniques is also posing risk in terms of the “hijacking” of different accounts.

The immense benefits of cloud computing techniques account for an effective means in terms of easy delivery of data or other files of an organisation. As per the opinion of De Donno *et al.*³⁶ (2019), increased use of cloud computing techniques helps in the development of a new perspective of data storage systems. *Cloud auditing* technique helps in improving the infrastructure of traditional auditing processes. However, one important concern in this regard is the lack of awareness regarding the use of service-based processes. Hence in order to implement cloud-based monitoring techniques, one important principle is the effective management of different applications and services associated. The “Cloud Auditing” technique also assesses different issues in relation to the traditional audit approach and thus includes technology accordingly. The cloud monitoring process provides a chance for flexible integration of third-party applications such as the “Google Cloud platform” which further helps in a better collaboration approach. Effective use of cloud services helps in controlling the overall workflow. IT administration is helping in increasing the visibility of different business activities and thus increasing transparency of business activities. As per the view of Mehraj and Banday (2020), cloud-based monitoring helps in managing different cloud-based control applications. Increased use of “cloud-based monitoring” helps in overviewing different multi-cloud infrastructures in

use. It also includes measuring layers of different networks which operate between the “public cloud” as well as the “private” cloud. The incorporation of hybrid cloud monitoring helps in the administration of different datasets which are stored in different clouds. It also helps in data management by storing data in different manageable pieces.

Cloud assurance is a platform that helps in reducing the operational cost of business. According to the opinion of Alam (2020), one of the important benefits of the “cloud assurance” technique is it uses a strong password. The benefit of using a strong password is that it protects data from “hijackers”. Effective management of “cloud assurance” helps in viewing different internal affairs of business ranging from business plans to objectives developed for the business. This ensures transparent business operations. Herein, it is convenient to regard that cloud assurance as well as cloud computing technique accounts as an effective measure that helps in the protection of vital information of companies.

4.7 Summary

From the above discussion it can be seen about the specific strategies which organisation prefer to use to increasing their performance goals. Apart from this the monitoring process of cloud computing also discussed.

Chapter 5: Conclusion

5.1 Conclusion

²⁴ Increased use of technology is playing an important part in changing the overall orientation of the business. The biggest benefit of technology is improving the process of data storage. The study concludes that the incorporation of “cloud computing” techniques helps in improving the process of data storing. Increased incorporation of cloud computing and auditing techniques results in the occurrence of different risks such as “data breaching” or leaking of data during the transportation process. Adoption of the right and appropriate strategy plays an important role in preventing hackers from getting access to the data. The study concludes that cloud computing and auditing are responsible for the easy and quick management of different information in organisations.

¹⁶ **5.2 Linking to the objective**

5.2.1 Linking to the objective 1

The first objective of the study is to identify different strategies which are incorporated in the process of auditing, monitoring, and also adopting assurance measures for controlling data security. Different measures adopted to protect the cloud range from “secure deletion” to integrity checking to even “masking” of data. In-depth knowledge about different “cloud computing techniques” helps the management of organisations to successfully complete different business activities. Auditing and monitoring different datasets helps in devising ways and strategies to use the information. It also accounts for an effective technique to adopt effective security control measures for business. As assessed from the study process, cloud computing is playing a significant role in different areas of business such as “consultation”, “banking” and also “service providing” sectors. Data breaching and “malware” are posing threats to the use of ⁶⁷ cloud computing techniques. Hence, the adoption of effective solutions such as increasing awareness of these tools and techniques can help in improving the overall aspect.

⁶⁸ The study has also identified that cloud computing techniques are playing an important role in terms of assessing performance delivered by different employees. The incorporation of cloud auditing and computing techniques across the business is helping management to evaluate

different performances delivered by employees and also making the overall process transparent. As elaborated in the study process, one important condition is to amend the policies and values followed by the organisation to date. The inclusion of cloud computing techniques is responsible for the revolution of business processes. This monitoring technique is helping to gain access to data and also offers different “backup” storage of the information.

5.2.2 Linking to the objective 2

To determine the importance of auditing, monitoring, and assurance measures of cloud computing security

Focusing on the cloud computing security based concern, importance of auditing and monitoring process can be done. Herein, the security threats of ⁷ cloud computing can be marked in the form of ethical hacking. Therefore, the importance of auditing and monitoring would be applied which can be beneficial for the proper application of the cloud computing process. In addition, the security controlling process would be done by focusing on the proper password management process. In addition, a robust APM tool would also secure the feasibility of cloud computing security. In addition, the process of data transmission would also be effectively handled. Therefore, this would connect to the importance of auditing, monitoring and assurance measurement processes to ensure cloud computing security.

5.2.3 Linking to the objective 3

To evaluate the process of doing and getting a clear idea about cloud auditing and monitoring ³ In terms of getting a more clear idea about cloud computing process, this needs to keep focus on the procedure of the application of the cloud commuting and development. Therefore, the supportive infrastructure is needed which through the support of the cloud computing can be effectively undertaken. In addition to that the application of the storage capability and making assessment of the information would be beneficial for the risk management factor based development. In addition to that the possibility of affecting the system by malware can also occur which can mitigate the issue regarding service attack. In addition to that the issue of misconfiguration can be marked as a security threat regarding the cloud platform based operation and feasibility. On the other hand, the utilisation of the computing paradigm would help to keep development of the computing paradigm based development and upgrading the business values. In addition, the application of IOT plays an important role for the proper data management process.

5.2.4 Linking to the objective 4

To identify the risks of cloud security to measure the controls of cloud computing

With the help of the frequency based assessment, the possible development of the cloud audit can be done which can help to keep development of the technological protection process. In addition to that the application of the security maintenance strategy would be effective which through the possible development of the cloud computing pattern can be ensured. On the other hand, the process of distribution of the information can be done which can upgrade the auditing performance as well. Thus, the possibility of aligning to the objective 4 can be ensured which through the probable security concern regarding the risk measurement process can be done and the application of this for the organisational overview can be secured.

5.3 Recomendation

In the present time every organisation needs to be improving their cloud computing process therefore, this organisation needs to follow some specific steps to improve their cloud computing system.

- The organisation needs to use the right instances. Most of the cloud service providers offer instance types of design that will help in workloads. This strategy will also assist to increase the memory intensive and also help for high speed graphics calculations.
- For cloud computing security, organisations should put data in the right place, therefore organisations should focus their decision about where data should reside.
- Organisation need to focus on monitoring performance that helps to maintain the load balance for an organisation. This load balance is the main key point to collect proper statistics that will help to increase the performance growth of an organisation. Therefore, organisations should use cloud provides tools, database monitor tools and other tools.
- In order to improve the cloud computing organisation need to use caches that will help to improve the speed of accessing files. Therefore, an organisation can use multiple caches to improve their performance and in this way all users can access files from the location nearest to them.
- Apart from this, to improve the cloud performance, organisations need to focus on the automation process where it will help to identify any risk and problem regarding cloud computing. With the help of automation tools, organisations can detect changes across the environment and also detect anomalous behaviour.

- DDoS is the biggest threat for cloud computing therefore organisations should focus on the proper security protection that will help to solve this attack. Therefore, by managing data access and classifying the proper data an organisation can defend them by this risk. Apart from this, organisations need to use the longest password or use a complex password which includes a mix of letters and symbols. In addition organisations need to create multiple layers of protection for their cloud computing. Therefore, the management team of an organisation needs to use a second validation and authentication method which will help to save the cloud Services from this type of attack.
- This is the most important thing that every organisation should implement specific inbound and outbound firewalls rules to reduce the attack. These types of rules need to be created at the application layers.

5.4 Limitation

The main purpose of this research was auditing, monitoring, and assurance measures for the controls of cloud computing therefore, the major challenge for this research was to select this type of research topic. That is why it was time consuming and required research. Apart from this, it was too difficult to collect the proper information regarding this specific topic and identify real life examples regarding cloud computing. However, with the help of authentic articles the data was collected for this research that was difficult work because of limited free access articles in the Google scholar and websites. In addition to that, the issue of not executing the primary data collection such as survey and interview would be addressed as the problem regarding the matter of making the data collection process more dynamic. The support of the direct source based data can make the research more effective and fruitful.

5.5 Future scope

The influence of cloud computing and auditing techniques is quite significant in new business processes. Effective knowledge in terms of the use of this application is an effective way of managing huge volumes of data for business processes. The future scope of cloud computing and auditing techniques is wide owing to improving the “data storing” process. It also can help organisations to effectively take advantage of different features of these providers and thus gain a competitive advantage in the business. The future scope of this application is that it can help in the effective management of data and information and also change the infrastructure of cloud operating systems.

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