

Computing In The Cloud Challenges And Solutions

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1. Introduction

The key word in this context is "here." Although people who work in the domains of computers and information technology may have the impression that the idea that underlying cloud computing is wholly fresh, in reality, it is not an entirely original concept. Accessing web-based services through the Internet is, in a broad sense, a stride (ahead); alternatively, in general terms, cloud computing represents an advance in the field of computer technology where administration of computing services is outsourced to bigger extents and in many dimensions. Cloud computing represents an advance in the area of computer technology where administration of computing services is outsourced to larger extents and in numerous dimensions. To put it another way, cloud computing is an example of an advancement in the area of computer technology.

To be more specific, suppliers of respected products and services are now making available computer resources as part of the services they give. This is happening in recent years. There have been many developments and improvements made in computer technology throughout the course of time. There has been continuous development in the fields of computer hardware, software architecture, web technology, and network communications during the course of the last 10 years. Every every day, the speed of internet networks becomes faster, and the cost of connecting to them gets lower and lower. The revolutionary concept of 'cloud computing' was first presented to the general public after all of these recent findings helped clear the path for its global dissemination.

Cloud computing has brought about a fundamental shift in the traditional methods of carrying out computations. It simplifies life by offering the means for more effective ways to do business, and as a consequence, it makes life simpler. This chapter makes an attempt to call attention to the defects that are inherent in the conventional ways of computing, and it then goes on to detail how the foundation was set for the introduction of the new model of computing. This chapter also makes an effort to draw attention to the flaws that are inherent in the usual methods of computing.

Everywhere you looked, people were using the cloud to do their computing. Discussions on cloud computing are likely to be found in the vast majority of published works, whether they take the form of magazines, websites, or blogs. It is rapidly becoming one of the types of technology that is used by the greatest number of people. It provides opportunities that can subsequently be used to aid the organization in increasing their business. These opportunities may be employed. Cloud computing is used by a huge number of enterprises not only for the purpose of storing data but also for the goal of creating businesses. NIST's reports, it seems, are correct. The term "computing in the cloud" refers to a concept that enables users to access shared computer resources (such as servers, networks, storage devices, applications, and services) from nearly any place at their own leisure and on demand across a network. This kind of computing is also referred to as "utility computing.

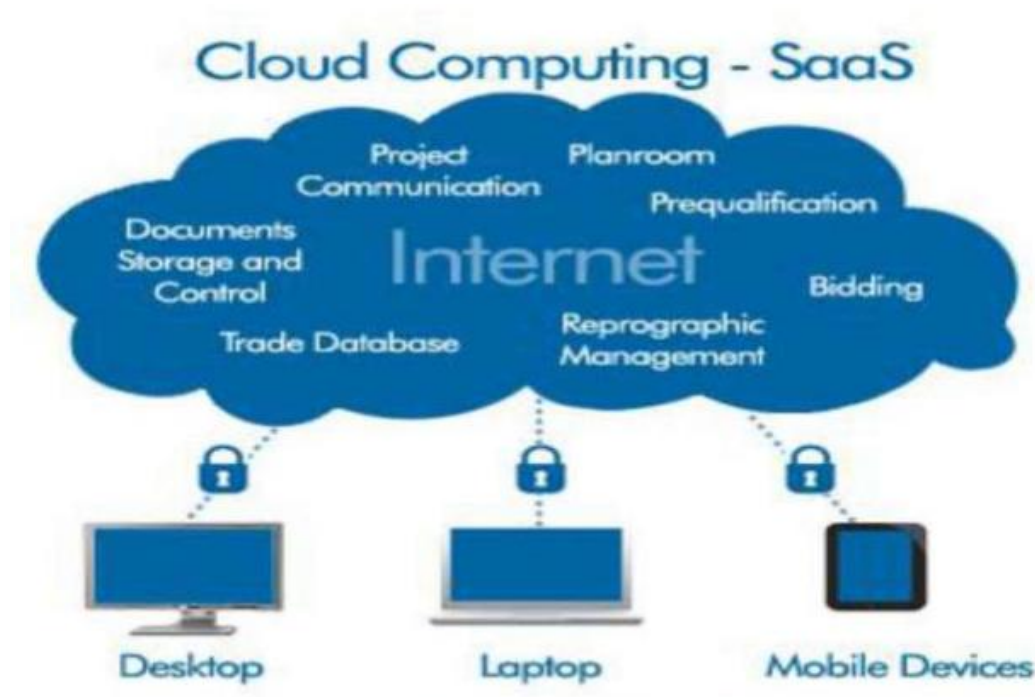


Figure 1.1 cloud computing

"This strategy, which is founded on the concept of virtualization, contributes to a reduction in the expenses connected with the infrastructure of information technology. It offers a solution to the issue of inefficiently priced information technology infrastructure. Cloud computing service providers like Amazon, Microsoft, and Google provide their products and solutions to end customers in an unmediated manner. It was helpful to the expansion of the firm and insured that the process would go in the same manner. The information will be saved in the cloud, where it will be easily available and easy modifiable or deleted. Utilizing it does not provide any challenges. Cloud computing will inevitably result in a sea change not just in the information technology industry but also in every other sector of business. It is a combination of a very diverse variety of services due to the fact that it increases both productivity and uniqueness. The fact that cloud computing offers a diverse range of potential solutions is one of the primary reasons why people are becoming more interested in it. The all-encompassing solution in addition to the many advantages that it offers to the sector or the firm, such as scalability, agility, enhanced flexibility, increased efficiency, and cost savings. These days, an ever-increasing number of companies are moving the applications and services they provide to customers onto the cloud.

2. Review Literature

Anitha(2013) defined cloud computing as a model for the ease of use and on-demand network access to a shared pool of customizable computing resources that can be promptly provided and started with a minimal amount of administrative needs. Cloud computing may also be viewed as a model for the outsourcing of computer tasks. The cloud computing industry was supposed to model itself after this concept. The requirements that needed to be met by AnithaY's model served as the impetus for the creation of this model in order to meet those criteria. The following is an illustration of one definition of cloud computing that may be applicable: The term "cloud" refers to a mode of computing that is parallel and distributed. This mode of computing is made up of a network of virtualized computers that are connected to one another. These computers are dynamically offered and shown as one or more unified computing assets that are centered on carrier-level Agreements (SLA), which are made by agreement between the provider supplier and Buyers. Buyers can choose from a variety of different SLAs. These service level agreements were derived from carrier-level contracts. Because of the Cloud, users are able to make use of the power of computers, which is superior than the physical discipline they have within their own control. Customers may benefit from this. Customers are given the power to better govern their own physical surroundings thanks to this capability. It was the reason for a big number of people's

concerns over the state of the situation's safety. The cloud service provider ensures that the customer does not need to be concerned about any risks associated with making use of their platform, such as the potential for the loss of data or the theft of sensitive information. Moreover, the cloud service provider handles all of the necessary security measures. One of these dangers is the possibility of having one's identity stolen. Because the great majority of the technologies and services that are used in cloud computing infrastructures are still in their infancy, the degree of security that they provide has not been exposed to thorough testing because of this. As a result, cloud computing infrastructures are susceptible to a wide variety of threats. There is also the possibility that a malevolent person may infect the entire cloud by sneaking into it under the guise of a reliable customer and then distributing a virus throughout it once they have gained access. As a result of this, the diseased individual would be able to pass their illness along to others through the cloud.

Dong Yuan and his colleagues (2011) focused their research on logical applications, which usually include mathematical computations and the acquisition of information. This was done as part of their study. Terabytes or even petabytes is a common unit of measurement for the sizes of the information sets that are created as a consequence.

According to Kaur and Verma (2012), cloud computing has progressed to the point that it is currently utilized extensively in a range of industries, such as the commercial sector, educational institutions, governmental organizations, and the entertainment industry. According to these two sources, the utilization of cloud computing should be effective in addition to being trustworthy and protected from potential threats. There has been a great deal of discussion on the ways in which cloud computing is revolutionizing not just the whole area of information technology but also the economy on a global scale. As a consequence of the cutthroat rivalry among Google, Microsoft, Amazon, Intel, EMC, IBM, SGI, and VMware, in addition to using a few public clouds, the use of private clouds has also been increasingly common. Salesforce.com is also one of the companies that has contributed to this trend.

The authors **Pathak and Pal (2015)** explore virtualization, as well as the benefits and downsides of cloud computing, as well as its socio-technical elements. In addition, the writers touch on the socio-technical aspects of cloud computing. In the course of their investigation, they looked at the principles of cloud computing as well. They experimented with concepts such as cloud architecture, virtual machines, and a variety of services for operating systems.

The researchers **Nwogbaga and Nwyibe (2016)** have focused a substantial amount of their work on analyzing the differences and similarities between traditional computing and cloud computing. The many facets of cloud computing, including clients, services, applications, platforms, storage, and infrastructure, were the primary points of emphasis in this study. They offered a clear and straightforward description of the characteristics of cloud computing, in addition to its benefits and drawbacks, and the rationale behind cloud computing.

Sood, Kour and Kumar (2016) explored the computing technologies where the major role has been played by distributed computing technology. They described that Distributed computing technology deals with parallel computing and grid based utility computing. Similar type of technology is Cluster computing that used to manage group computers in a single computer.

In the study paper that he wrote in 2016, **Banker (2016)** throws light on cloud computing and offers an overview of it. He also discusses the history of cloud computing. During this session, he will discuss the most crucial aspects of cloud computing and its many components. Both the potential benefits and cons of utilizing cloud computing have been looked into.

The cloud-based operating systems ZeroPC, Jolicloud, Glide OS, Silve OS, iSpace cloud computer, and ZimDesk were the primary focus of Mishra and Rakesh Kumar's (2016) research. Cloud computing provides a solution that eliminates the danger of customers receiving out-of-date information and enables them to continue receiving uninterrupted service.

This research paper that was authored by **Alam, Pandey, and Rautaray (2015)** focuses an emphasis on the principles of cloud computing, as well as aspects of cloud computing, cloud computing models, cloud management tools, and other issues that are relevant. Cloud computing services that make use of open source software offer a platform that may be used for the exploitation of computers.

It was observed by **Jaber, Aws Naser, Zolkipli, Mohamad Fadli Bin, Majid, MazlinaBinti Abdul,**

Khan, and NusratUlah (2014) that desktop PCs are being phased out in favor of enormous data centers as the principal place for cloud computing. Jaber, Aws Naser, Zolkipli, and Mohamad Fadli Bin, Majid were also contributors to this study. The research focuses solely on the encryption keys that cloud users have requested in certain instances. They get the conclusion that cloud service providers are dropping price, giving improved cloud services, and eliminating functions that are not being used in their analysis. This is the rationale that they use to arrive to the result.

Prasanth and Anupama (2017) provided a variety of cloud computing security models, including the cloud cube model of the Jerico forum, the Multi Clouds Database model, and distributed computing security models such as the NIST Cloud Multiple Tenancy Model and the CSA Cloud Risk Accumulation Model. In this body of research, the authors make the suggestion that the cloud cube model produced by the Jerico forum and the multi cloud database model should be utilized so that sensitive data may be kept private.

Malgey and Chauhan (2016) carried out research to investigate the current issues and worries regarding the security of cloud computing. In addition, they reached the opinion that authentication, confidentiality, the management of data, and data integrity are essential aspects of security. As a consequence of this, taking this issue into mind has shown to be of great importance.

Nisal (2016) conducted research utilizing a case study methodology to analyze the implementation of cloud computing and the system's level of security. The research study that was described before has been brought to more important attention as a consequence of her prior job experience as well as a case study that was carried out at the University of Pune on the building of a cloud-based examination paper.

In order to improve cloud computing security and access management, Darak (2017) looked at a range of authentication techniques and compared the advantages and disadvantages of each one. This study focuses primarily on Kerberos, biometric fingerprint authentication, and iris authentication as its three primary areas of investigation.

3. Model Based Strategy of Cloud Computing

Open Cloud Storage

The public cloud is a kind of cloud computing that makes it possible for members of the general public to utilize computers and have access to various online resources. This is the primary goal of the public cloud concept. The usage of the system or software is not restricted in any way, since there are none of such restrictions in existence. Google, Microsoft, IBM, Amazon, and the like are some examples of such companies. It has a cheaper cost than a private cloud or a hybrid cloud would normally have, due to the fact that it shares the same data or information with a large number of clients. The public cloud provides access to a vast array of resources coming from a variety of locations. In the case that any one of these resources fails, the public cloud may transition to making use of another resource. It is not reliant on its location and has a great degree of adaptability in terms of how it may be used.

Private Cloud

One of the concepts that may be used for cloud computing is referred to as a private cloud. If a company follows this strategy, they will have access to the many different kinds of systems and services that are necessary for them to successfully manage their company. It is possible that one of our staff members or an outside company will be in charge of managing it. Take, for instance, the administration software for the library. It is possible for this department to share data or information with other departments within the company if it has a high degree of security and privacy. When using a private cloud, utilization is severely limited, and the related costs are far higher than those of using a public cloud. Through the use of this service, the cloud service provider makes scalable resources and virtual applications accessible. A private cloud that gives end users in an organization the ability to access the applications that are hosted on that cloud.

Hybird Cloud

A cloud that incorporates both public and private cloud computing resources is referred to as a hybrid cloud. The private cloud is used for the execution of operations that are seen as being mission-critical, whilst the public cloud is utilized for the performance of activities that are regarded as being of a lesser importance. It is able to bring scalability to the cloud in both its public and its private versions. It offers resources that are risk-free while being as inexpensive as is humanly conceivable. Networking is getting more challenging as a result

of both public and private cloud computing. It gives extra control for the security of the application as well as the data, in addition to granting permission to access the system from a range of platforms via the internet. The process of integrating the configurations of a local device with those of a distant cloud might be referred to as "hybrid cloud.

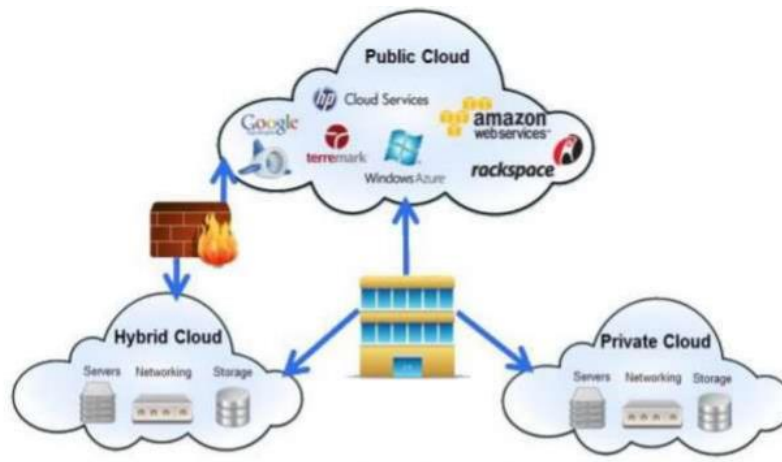


Figure: Deployment Model diagram

Implementations Challenges of Cloud

Computing in the cloud has been used in a wide range of settings [24], including commercial businesses and governmental establishments, all over the world, with the intention of improving both the flow of communication and the provision of services. Cloud computing is becoming more popular among national governments throughout the globe as they seek to modernize their information technology infrastructure in order to stay up with the fast pace of technological advancement. The deployment of cloud computing in e-government has, however, been greeted with a number of challenges. As a result, the subject of whether or not it should be adopted at the national level is one that is fraught with controversy.

Privacy Risk

The use of cloud computing raises a variety of issues for electronic governments, including worries about their citizens' privacy. [25] Cloud computing, in contrast to more conventional approaches to information technology, does not include the storing or processing of data at the actual site of an organization. Instead, this task is delegated to an external company or organization. Cloud computing information is susceptible to access by unauthorized and unwanted users who have the potential to see sensitive information about residents [26]. This is because a third party is involved in the storage of the information. Additionally, the third party has a tendency to maintain information connected to cloud computing in a number of places, which leads consumers to lose trust in the capability of the service to defend the privacy of its users [19]. As a direct result of this, people's rights to the privacy of their sensitive information that is utilized in e-government systems are placed in peril as a direct result of the vulnerabilities that are present in cloud computing. As a direct result of this, people's rights to the privacy of their sensitive information are placed in jeopardy. When cloud computing is linked with e-government systems, this leads in a large rise in the quantity of sensitive information that is held inside the technology [3]. [Clarification needed] Cloud computing is a kind of computing in which data is saved over the internet. It is not acceptable for the information that has been stored since it is often delicate and sensitive, and it would be wrong for it to get into the hands of a party that means to do damage.

Readiness through Utilization of Technology

Cloud computing is widely available and does not cost anything to use, making it an attractive option for use in electronic governments. However, it is needed that governments rent cloud services from a cloud computing company that operates as a third party. If a cloud provider and a government are unable to come to an agreement regarding the adoption of the cloud provider's technology or the usage of the cloud provider's technology in government services, the government may not be able to access and utilize cloud computing services if the cloud provider chooses not to deliver the services of their technology.

When a government is seeking to invest in various service-oriented companies, it is possible for that

government to be concerned about the availability of a trustworthy cloud technology that is based on data from the government. In order for the cloud to perform its functions in an appropriate manner, a high-quality and efficient system in government operations that is reliant on the e-government site and applications is necessary. If a system that employs cloud services has a breakdown, it will result in the suspension of a large number of services that are necessary to the effective operation of government activities in both the public and private sectors. These services are crucial because they allow for the smooth running of government operations. As a consequence of this, it is possible that it will result in a catastrophic loss of the monetary transactions that are made as a direct result of the activities that take place on government websites and applications. Moreover, when a system fails, users of cloud computing that is integrated into e-government acquire an attitude of mistrust against the system.

Worries Regarding the Situation's Safety

When it comes to requiring the installation of cloud-based electronic governance in countries all over the world, security is one of the most critical challenges that has to be addressed. Users of cloud-based e-government systems have a tendency to distrust the system since it does not have enough security, which puts the confidentiality and integrity of sensitive information at risk. Users' lack of faith in the system is another effect of the cloud-based electronic government's inadequate security. As a consequence of this, the government has to give some consideration to selecting a provider of cloud computing services who has developed high-security measures to protect activities that are incorporated inside the technology.

Believe anything you read in the virtual world.

When it comes to the security of confidential and private information that is stored on the internet, governments have a very low degree of trust. Governments have a propensity to take control of everything that has to do with the affairs of their people via the direct safeguarding of sensitive information. On the other hand, the fact that their cloud services are managed by a third party hinders them from having complete control over the personal information they save in the cloud. In addition, the government does not have the required jurisdiction or mandate to monitor activities that take place in the cloud since it does not own such capabilities. As a direct consequence of this, the majority of governments located all over the world have a propensity to have a very low level of confidence in the data storage systems that are offered by the Internet.

4. E-Government Benefits From Cloud Computing

Recent years have seen the introduction of cloud computing into the electronic government systems of nations all over the world. This cutting-edge technology offers a significant number of advantages, which combine to make it an indispensable component in the delivery of information and services to businesses and members of the general public. The implementation of cloud computing may result in several benefits, including increased adaptability, productivity, availability, dependability, and system integration, amongst many others.

Scalability

Computing in the cloud possesses features of great scalability, which allow for its simple incorporation into electronic government systems. Because this technology is considered to be scalable, it may be customized using many types of information technology resources, including servers and hard drives. As a result, the government is in a position to combine cloud-based e-government with a variety of vital functions that take place throughout the country. Because cloud computing can easily be scaled up or down, it is an ideal candidate for incorporation into the electronic government systems of emerging nations [31]. The technology of computing in the cloud is adaptable enough to be utilized in the dynamics that are taking place in the expansion of organizations in emerging nations.

Flexibility

The use of cloud computing into the e-government infrastructure results in increased adaptability throughout the system. As a result, different levels and departments of the government are able to make use of cloud-based e-government solutions. Cloud computing makes use of a number of distinct models, each of which enables information and communications technology (ICT) professionals to arrange it to meet the needs of certain businesses and organizations. A cloud hybrid computing model may be utilized by companies operating in the private sector. This type of model confers major advantages on an organization since it enables companies to achieve the same level of leverage enjoyed by public and private models.

Reduced Expenditures

The implementation of an electronic government in a country calls for a significant financial investment in the relevant infrastructure. It entails the acquisition of information and communications technology (ICT) hardware and software that is necessary for the effective delivery of services to companies and residents. In addition, a government will need to recruit information and communications technology (ICT) specialists in order to manage and maintain its system. The use of cloud technology will present a beneficial opportunity that will arise throughout the process of the construction of the electronic government system.

Pay according to your consumption

The adoption of a pay-as-you-go pricing model, which is supported by cloud computing technology, makes it possible for a government to realize significant cost savings. In addition, the investment in cloud computing gives e-government management the ability to do away with costs associated with power facilities, storage facilities, and operational space. As a result, cloud computing is a technology that helps save money and reduces the amount of money that has to be invested in e-government.

The Integration of Systems

The management of the system is made simpler with the utilization of cloud computing in conjunction with electronic government. Computing in the cloud eliminates the requirement for labor-intensive management inside an e-government site and its apps. Cloud computing enables a self-service demand that may be fostered by the provision of a secure interface that enables anyone to be authorized to access e-government information and services. Cloud service providers offer assistance to governments in the management of cloud security within the context of e-government. The service provider possesses a vast amount of resources, all of which are currently being put to use to strengthen the safety of the e-government systems.

A number of government agencies are looking forward to reaping the benefits that come with integrating cloud computing into their organizational infrastructure. The adoption of cloud computing is supported and influenced by the organizational preparedness levels in terms of IT infrastructures and senior management, as this research demonstrates. As a result, in order to encourage the use of cloud computing by government agencies, top management should emphasize the ways in which the organization's system may profit from the beneficial results that result from the implementation of cloud computing. In addition, senior management may need to pay attention to the readiness levels of technologies inside the organization, such as the availability of the internet, as well as how sociocultural factors affect the adoption of cloud computing.

As a result of its many benefits, cloud computing is quickly becoming more widespread. Cloud computing is intriguing for use in e-government for a number of reasons, including its high scalability, minimal maintenance requirements, great potential for cost savings, and other benefits. Computing in the cloud offers a variety of advantages to different aspects of e-government. Some of the benefits of cloud computing for the public sector were outlined in the opinion of the literature. On the basis of these findings, the following are some of the most significant benefits that cloud computing offers to the public sector: Scalability. Day by day, the number of residents and companies using e-government services, as well as the demands they place on those systems, continue to rise.

The concept of cloud computing is known as a scalable technology since it has the ability to dynamically add additional resources, such as servers and hard drives, to support an increasing number of people as well as enterprises. Availability. Citizens expect the information and services provided by their government to be accessible to them around the clock. Not only may natural disasters, armed conflict, or civil unrest cause electronic government programs to lose data, but they could also prevent services from being provided. Therefore, there is a requirement for distinct backup and recovery systems to be located in different areas. This might cause a significant amount of trouble. Switching from one data center to another should only take a brief amount of time, during which applications and data should still be accessible. The deployment of applications on the cloud might result in increased availability.

Applications have the ability to be deployed in a variety of cloud data centers that are located in various parts of the world. In the event that one of the cloud provider's data centers has an outage, the application may still continue operating in one of the provider's other cloud data centers. Data Scaling. When it comes to e-government, the databases need to be scalable so that they can handle significant amounts of data collected throughout the course of working days, some of which may have greater access rates in a shorter amount of

time. Cloud databases have the ability to be scaled and may be utilized for applications of this nature. Cloud databases now available for deployment offer an incredible amount of scalability while having no negative impact on performance. It is able to readily absorb a huge load of applications for the electronic government.

5. Conclusion

This inquiry is based on the presumption that there is a workable solution to nearly every problem encountered while attempting to efficiently implement the E Governance. The Cloud provides a stable combination with all of the latest advancements that are available today. The introduction of Cloud System has the potential to bring about significant financial gains for E-Government endeavors. Before using Cloud in e-governance, a significant amount of study needs to be carried out. When transitioning to cloud computing at some point in the recent past, one should have made addressing security concerns their main priority. To fully appreciate how data is protected, the security of any and all cloud-based services has to be thoroughly investigated. The next step in the evolution of computers will be cloud computing. It is a pretty recent idea in the realm of computing, and it may be summarized by referring to the three primary components as Software, Hardware, and Network. The Cloud is a common name for referring to the aggregate nature of all of these phenomena. The Cloud creates a sturdy groundwork for the introduction of extensive service supply to a variety of stakeholders, which is made possible by the Cloud. When cloud architectures are used effectively to the process of designing applications for e-government, it will result in the transformation of the country into an information society.

Cloud computing will make it possible to deliver E-governance services in a more timely and cost-effective manner, which will hasten the adoption and use of IT for e-services. The concept of computing in the cloud is still in its very early phases of development, but there is a significant amount of research being carried out in this sector at the moment. In this study, we investigate cloud computing and look at how it might be used in many settings, including governance. In this chapter, the researcher has provided a description of the findings from the study, as well as numerous observations that were made. Additionally, the vital material has been broken down into secondary details. The following is a list of some of the information that you will study about data analysis and testing hypotheses. This chapter's objective is to wrap up the research project titled "Prospects and Challenges of Adopting Cloud Computing in E-commerce Industries" (Prospects and Challenges of Adopting Cloud Computing in E-commerce Industries Study).

An efficient model of electronic governance that could be put into practice inside a cloud environment was the target of this inquiry, and its goal was to find such a model and offer it as a solution. In order to carry out the assessment, we used both the TOE system and the DOI hypothesis in conjunction with one another. This was done in order to ensure that the recommended model would be accepted in the hypothetical scenario. After that, the model was used to conduct an investigation into the primary aspects that contribute to the efficiency of the cloud environment in the e-governance model. The goal of the research was to investigate concepts and intents about the utilization of cloud environments by taking into account many aspects including creative, technological, organizational, environmental, and numerous other benefits of cloud environments in the public sector. In order to investigate these ideas and goals, the research project was carried out. The findings of this research provide the government suggestions for the design of an efficient model of electronic governance that makes use of cloud settings. These suggestions are provided as a consequence of the study.

6. Discussions

The influence of adaptability on the construction of an efficient governance model via cloud environments was shown to have a beneficial effect. Adaptability was essential to the success of the project. The cloud environment is technically feasible given the information technology infrastructure that is already in place. The capacity to adapt indicates that anything can coexist successfully with what is already in operation. Any new technology that makes the old technology completely absolute is not a better choice for any large organization because lots of investment is wasted. Therefore, we can say that cloud environments have proven to be more compatible with the existing resources that are in use in any organization, and as a result, this component has a positive effect on the design of this new model.

Complexity It was found that adding complexity has a beneficial influence on the process of designing

an effective electronic governance model that operates inside a cloud environment. The use of cloud computing is much less complicated than the use of previous technologies. In regard to the unpredictability, in comparison to other kinds of advances, the cloud environment is a lot less complicated. We may also state that in the current situation of global competitiveness, a cloud environment seems to be the greatest alternative for any public sector as it has to pace itself with the present globe.

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