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A Study on Cloud Computing Applications-Its Advantages, Challenges and Risks to the Indian Service Sector

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Abstract

Cloud computing represents a transformative technology that delivers IT services and resources through the internet. It provides a cost-effective solution for the development of computerized services, with industry leaders such as Microsoft, Google, Amazon, and IBM leading this innovation. This technology encompasses a diverse array of services, including infrastructure, software, hardware, training, and client support. As an emerging field, cloud computing offers continuous online services year-round, establishing itself as an essential utility comparable to water, electricity, and telecommunications. Services are frequently provided by outsourcing agents on a fee-for-service basis, thereby creating self-employment opportunities for young individuals. Notable examples of such services include electricity bill collection, insurance premium processing, and tax collection. This paper examines the applications, significance, classification, and characteristics of cloud computing, while also addressing the associated risks, challenges, and issues. The research is based on secondary sources, including scholarly articles published in both national and international journals. The objective is to enhance awareness among viewers, students, and youth regarding the substantial potential of cloud computing.

Keywords: Cloud computing, new generation service technology, emerging technology, software service application, service portals, computerised data processing.

1. Introduction

In the present competitive world, according to the requirements, necessity, and with the changing circumstances, we must change ourselves in adopting techno opportunities available in the world. Otherwise, we will not survive in world economic growth and development racing.

We have abundant young human resources after China. And utilising their services, the GDP and economic growth and development should be achieved. Technology updating day by day. Train the youth in the technical courses in addition to the conventional courses. Job oriented courses, according to the industrial requirement, our academic curriculum design should also be changed. Computerisation and information technology, and the adoption of information Technology to the Indian Industrial and Service sector is a revolutionary transformation replacing the traditional and conventional practices. Computerisation of services with data processing and automation in the routine portfolio of industrial and service organisations helpful for the fast disposal of activities.

There are many techno-job opportunities. For getting those jobs., some computer courses like, Microsoft, M. S. Office, JAVA, Dot.net, Oracle, Python, Chat-Gpt, Artificial Intelligence, Machine learning cloud computing, and web-designing, accounting software courses, Tally, Wings etc., software courses are required to qualify and practice while doing jobs.

Recently Artificial intelligence, machine learning, deep learning Blockchain technology are fast moving emerging technologies in the industrial and service sector. E Learning system through computer technology in the educational institutions is now in practice. Taking online classes and giving online coaching and online demonstrations, practical sessions attracting good results for both students and institutions without moving from their places. Time, energy and monetary expenditure also are saved a lot for both the parties.

Today one more feather added in the technology crown i.e. Cloud Computing. It is also fast-moving technology, which is offering wide range opportunities, services to various sectors worldwide with data storage, sharing and data processing advantages through the internet facility. Cloud computing, which is rapidly moving which is a net based technology. Has more advantages in our daily life including in educational institutions. It has on demand network application resources. The Significance and need of Cloud computing applications and services will discuss further.

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i). **Statement of the Problem:** Cloud computing is a service provider IT resources, on cost payment, moreover, it provides "platform for A.I and machine learning applications to apply these technologies more easily with affordable cost". The future of cloud computing should be assessed as the portfolio of Indian service sector is expanding faster. Further it must be estimated and assessed the challenges and risks in advance and steps to be taken up encountering the problems arise from time to time.

ii). **Objectives of Study**

- To study the nature, classification, significance, growth and development of the concept of cloud computing in the present scenario.
- To observe the present status of utility of cloud computing services, characteristics, advantages, challenges, risks and problems.
- To give suggestions to overcome the problems and assessment of future of cloud computing.

i). **Significance of Cloud Computing Technology**

Cloud services in the education field have been expanding rapidly. Educational institutions are making the transformation from traditional classroom-based learning systems to cloud-based systems quickly. A cloud platform makes accessing educational resources easier for students and teachers. The same books, modules, and learning materials are available, regardless of the device used. This eliminates the need for physical textbooks. For students, only one device is needed for all subjects, making learning more convenient.

Moreover, the process of admission enrolment, admission web counselling, lecture schedules, LMS, content developing examination schedule and evaluation process etc., are the common programme which will be carried through the online process, and hybrid model. Communication and sharing the information is very important in the educational institutions. Cloud supports sending E-mail to stake holders for communicating admission schedule, time schedules, on video web counselling programme.

Also, all educational service activities can be done on virtual mode.

For example, conduct of science lab practical through the virtual mode to the distance education beneficiaries. Black board demonstrations of mathematics calculations and statistics and commerce accounting problems are now possible in online classes.

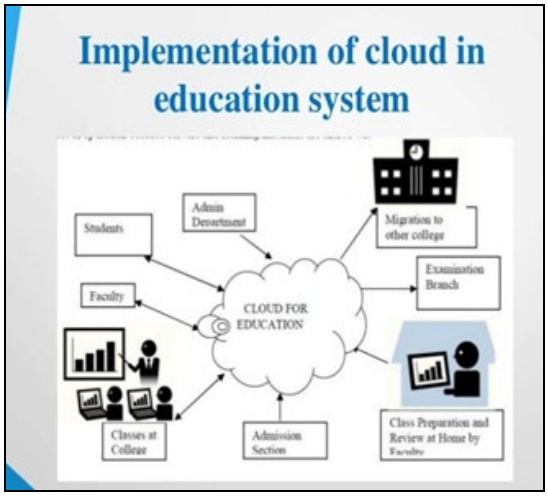

Fig 1: Implementation of Cloud in education system

Review of the Literature

1.1. Overall Review of Literature

Cloud computing has emerged as a transformative technology, revolutionizing the way organizations operate and deliver services. The concept of cloud computing has been extensively studied in various contexts, including its applications, advantages, challenges, and risks.

i). **Nawsher Khan., *et al* (2012):** In the research paper "Cloud Computing-Analysis of various service" examines comprehensively its nature, classification, infrastructural requirements. Also classified various services provided in the cloud computing by various service providers Amazon, Google, Microsoft, Infosys. They observed that it is transformation from conventional, manual shifting from traditional to Desktop or laptop platform with the support of internet-online facility and user can get multi-task operations at a time. Cloud computing is mainly as service provider.

ii). **Raghavendran, Ch, *et al* (2016):** In their research paper '' A Study on Cloud Computing Services" studied overall working performance of cloud computing service and service providers, its nature, infrastructure. They observed in their study it is new system of computerised system with I.T and ICT adoption. It is a data processing. It is a recognised service and so many enterprises have been shifted to cloud computing for their data processing

iii). **Benneth Chukwuemeka Uzoma and Isokpehi Bonaventure Okhuoya (2022):** In their paper "A Research on Cloud Computing", they mainly have been studied on the fundamental concepts of cloud computing, cloud computer organisation infrastructure needed. Variety and variety of service models of cloud computing, characteristics. Benefits and challenges and problems of cloud computing.

iv). **Pratik Narendra Gulhane and Aditi Rajesh Nimodaya (2022):** In their paper titled "A Review Paper on Cloud Computing" they mainly studied complete overview of cloud computing for the awareness data access, its architects, storage services, and the data base services. Also studied the advantages and disadvantages of cloud computing. In their opinion Cloud computing is a wonderful technology of artificial technology. They further opined that the cloud computing is a high computing, performance oriented, having with data security and with cost savings.

v). **Thrishal L. Ramkumar (2023):** In their paper titled "Cloud Computing" is a practical innovation and collective term of huge numbers of developments. Cloud computing merges several already available technologies. It helps and useful to various business-related activities. Cloud computing is a popular phrase with shorthand for application that were developed to the On the observation of the above reviews, it is understood that the authors studied mainly on the overall fundamental, basic concepts, classification of cloud services, characteristics and its working culture, performance and its nature. In this paper. The services, functions, advantages, challenges and the risks of cloud computing in Indian service sector will be studied. Rich internet applications.

1.2. Meaning and Conceptual Definitions

As defined by the National Institute of Standards and Technology , "Cloud computing is a model which provides appropriate accessing of the on-demand network for a shared group of configurable computing resources such as network,

hardware, storage, and applications which is capable of being allocated rapidly scaled and released with the lower effort of management or service provider intervention.

As defined by the Institute of Electrical and Electronics Engineers (IEEE), Cloud computing is "A model in which Information is stored permanently in the internet servers and temporarily cached on clients".

Cloud computing is defined as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell & Grance, 2011).

Cloud computing is a net based computer service provider to the stakeholders with data accessing. It preserves the data, files, images and documents. Stores, backup and retrieval of the data, whenever required. This technology has been adopted in many organisations irrespective of the size of the organisation with affordable cost of maintenance. The following are the leading cloud computing service providers.

- Google develops worldwide network data centres, to serve as search engine of various subjects for the sake of information.
- Microsoft creates the platform for the framework over the internet for M.S developers.
- Amazon is one of the successful web-based service-provider on cloud computing technology.
- IBM provides software and hardware infrastructure for the business organizations.
- Other MNC Organisation like Oracle, Alibaba, Wipro etc., are also offering cloud computing services.
- The concept of cloud computing has started the journey in 1960, is useful to both consumers and corporators. The term cloud computing has been first used by a computer software scientist ''Ramnath Chellappa'' in his paper published in 1997 in the context of emerging technology paradigm delivering computer services. And it has a dynamic and dominant role in providing I.T, & A.I., service provider. And from mid of 2020, cloud computing services has been commercialised. Later many service providers and MNCs, began to offer platforms, software and hardware infrastructure to the corporate organisations w. e. f 2008 onwards.

1.3. Classification of Cloud Computing

Cloud computing can be classified by deployment method and by service model.

i). Deployment Models

a) Public Cloud: Public cloud, in general, is SaaS services offered to users over the internet. The whole computing infrastructure is located on the premises of a cloud computing company that offers the cloud service. It is the IT infrastructure that is used by many companies and services at the same time. It is the most economical option for users in which the service provider bears the expenses of bandwidth and infrastructure. It has limited configurations, and the cost is determined by usage capacity. They offer an easy and affordable way to deploy Web sites and business systems, with high scalability, which in other solutions would be available.

b) Private Cloud: The private cloud is used by large enterprises to develop and manage their own data centers for particular business and IT operations. A secure IT infrastructure is controlled and operated for the benefit of a single organization. The organization can manage its own private cloud or outsource this task from an external contractor.

c) Hybrid Cloud: A hybrid cloud is the combination of a private and public cloud, providing for more flexibility to businesses while having control over critical operations and assets, coupled with improved flexibility and cost-efficiency. Often this type of cloud is used when an organization has seasonal period of activity.

d) Community Cloud: A community cloud is shared between organizations with a common goal or that fit into a specific community (professional community, geographic community, etc.).

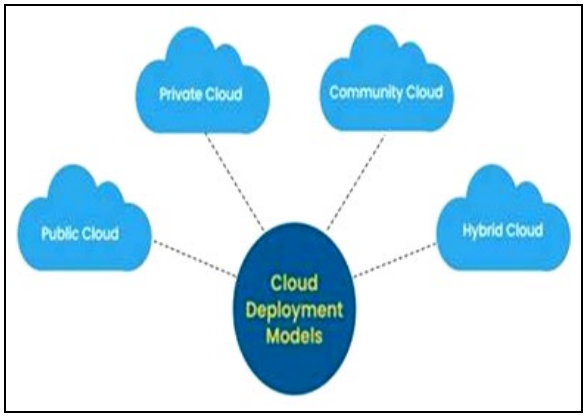

Fig 2: Cloud deployment models

ii). Service Models of Cloud Computing

a) Infrastructure as a Service (IaaS): is equipment is the way of distributing cloud computing infrastructure, servers, storage, network and operating system.

b) Software as a Service (SaaS): is designed and distributed over the internet. Software is managed from central location. And the users are not required to handle software.

c) Platform as a Service (PaaS): A computer Platform that allows the designing of the web application very easily and quickly. Software and infrastructure are known as Platform as a service (PaaS).

d) Big Data as a Service (B Daa S) is a cloud-based infrastructure which presents end to end big data solution to the organizations.

e) Data as a Service: will helps to analyse the data for the decision making in the business organisation. Data collects, processed, analysed in a tabulation and manipulates for the business decisions.

f) Business Process as a Service (B Paa S): Business process is running day to day activities, like trading, accounting, banking, E-commerce, maintenance, staff payments, advertisement and publicity, distribution process etc. are considered as business processing. It is all runs with decision making while processing analysing the data.

g) Information as a Service: Business organisation collects and distributes the information from many sources to many organisations. The entire business organisation completely depends on the processing of information. Information Technology is the revolution which collects, process and distributes through the electronic devices i.e., computers, mobile phone, Internet, Pagers. Providing information from different sources within a time to the various organisations is now as service.

h) Security as a Service (SEC aa S): In the Business organisations there are so many security threats, financial threats, cyber threats, data stolen threats. Careful and precautionary methods are to be taken to safeguard information, confidential matters financial data and decision-making leaks to the competitors. If the important data or data, decisions, leaked big loss and damages may happen.

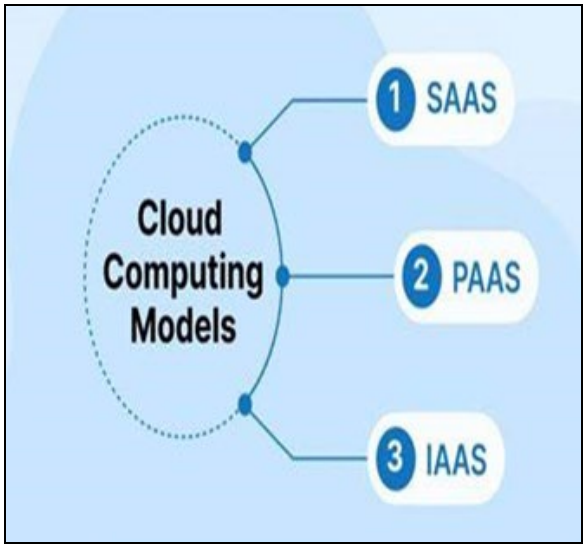

Fig 3: Main Cloud Computing Models

1.4. Characteristics of Cloud Computing

According to the National Institute of Standards and Technology (NIST) Cloud computing has been defined as a model for enabling convenient, on demand net-work access to a shared pool of configurable computing resources (Networks, servers, storage, application and services). So the five characteristics of cloud computing are

i). Self service provider on demand.
ii). Wide network access.
iii). Pooling of all resources at a place.
iv). Rapid Elasticity.
v). Measuring Service.

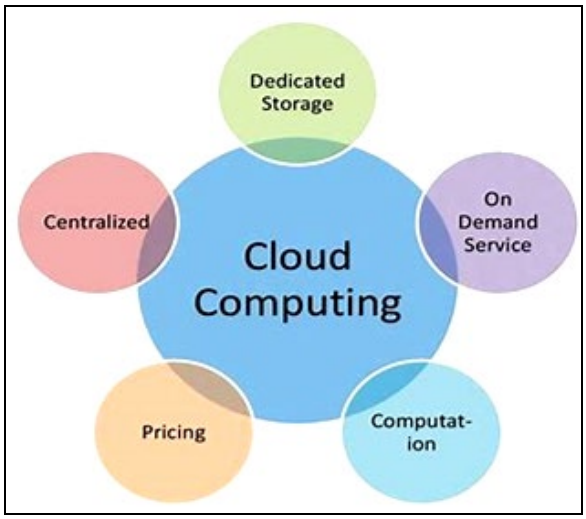

Fig 4: Characteristics of Cloud Computing

Cloud computing is an emerging computerised technology Service on demand to the stakeholders. The main reason for the success of cloud computing is in reducing the size of the organisation which helps the organisation economically. Ex, Data collection, storage and data analysis centres.

For the establishment of Cloud computing data centres, no need of heavy fixed capital investment, on physical building accommodation, and infrastructural equipment and freehold premisses. The following are the advantages of cloud computing.

2. Applications of the Cloud Computing

i). Communication Network: Users can easily connect the network-based access to the apparatus like calendars, calculators and emails. Many apps like Skype and WhatsApp for calling and messaging others are also based on the infrastructure of the cloud.

ii). Productivity: Cloud computing like M.S. Office 365 and Google Docs through the internet making us use our productivity tools. We are capable of doing data analysis through the Excel spreadsheet and presentations through PPT, preparing the documents anytime from anywhere.

iii). Business Processing: Many business management applications such as Enterprise Resource Planning (ERP) and Customer Relation Management (CRM) are the provider of cloud services.

iv). Back-up & Recovery of Data: When the cloud selected for the data storage, the service provider is responsible for the confidentiality of our information in preserving our data securely and with legal requirement. Additionally, the cloud is capable of providing high flexibility of large storing and backup the data on demand. Moreover, the process of recovery of the data in the cloud shall be done very quickly because the data will be stored in physical servers rather than on the data centre.

v). Development of Application: The Cloud platforms are considered as reliable solution' to develop different applications such as mobile, web, games; so that they will be used differently 'as cross platforms like libraries, tools which led to speed up services of directory, security and search.'

vi). Testing and Developing: The cloud environment is capable of reducing, spending and launching our applications in the market very quickly. "The environments of developed testing are also capable of "scaling up and scaling down" depends on their needs. The Common tools of testing are "BLAZE METER and LOAD STORM"

vii). Analysis of Big Data: "Cloud computing allows the scientists of data to benefit from any organised data for analysing it for insights and patterns, get relations to obtain predictions of future disaster and assist in making a decision in data backed".

viii). Social Networking: One of the common and usually forgotten applications in cloud computing is Social-media network like LinkedIn, Facebook, Twitter, Instagram and Myspace. These sites are created for finding human moments where they are and what they are doing, with their communications. Through these sites human connectivity is possible with their private communication.

ix). Usage of Scalable: Cloud computing is capable of offering scalable resources through the different types of subscription. For Ex. NETFLIX is belongs to leveraging the possibility of cloud computing to its usefulness.

Fig 5: Applications of Cloud computing

3. Advantages of Cloud Computing

Business organisations will get the following advantages of cloud computing

i). **Reduction of Cost:** Users can pay according to their consumption. Business organisations are to pay very less for the I.T. resources. Customers can continuously upgrade and maintenance without the costs.

ii). **Increased Productivity:** Due to adoption of information technology, automation process, customers are demanding more and they want products quickly in short time. Cloud computing has increased its mobility, and users can use laptops and mobile phone for web services to access cloud services.

iii). **Scalability:** Cloud computing is scalable. Scalability is another advantage cloud computing. Smaller business units can reduce the cost, and they need not pay fixed charges for a data. As per the data usage, for that only, payment shall be made.

iv). **Minimising the Cost on Hardware:** Companies and corporate organisation can minimise the investment in hardware infrastructure and technicians, because they are not forced on the purchase of additional hardware equipment like server, hardware peripherals.

v). **Reducing the Utility, Energy, A.C Cooling Charges:** While in the cloud computing works, can reduce or minimise the expenditure on additional room maintenance charges. A.C. colling charges, electricity bill charges and other maintenance recurring expenditure.

vi). **Easy to deploy:** The work of I.T. staff both Software, hardware and other technicians will be reduced by raising the speed on work because it is possible to clone the servers and other machines without enhancing the configuration.

vii). **Possibility of Backup and Recover:** In virtual machines, the servers will keep one image file including the whole system settings and configuration. No need to spare much time to do the images repeatedly if saved one image file and no need to copies frequently if the data preserved in a final backup. Can continue the further process.

Fig 6: Advantages of Cloud computing

4. Challenges, Risks and Problems in Cloud Computing Services

i). Though there are many benefits in cloud computing, some of the limitations, issues and challenges are still to be addressed. Privacy problems, Security challenges, and data security issues, data capturing by the third parties are inevitably happens. It is very difficult to identify and trace the culprits.

ii). According to a survey conducted by Gartner more than 70% Chief Technical Officers believed that the primary reason for using the cloud computing services is that of the data security problems and privacy issues. Though we take so many precautionary steps for our data, inevitably our data will be stolen or captured in internet centres, data analysts,

iii). Mainly the financial data while sending to the Auditors, Bankers, branch offices, head offices, governments data will be leaked by somebody will not be known who leaked the data.

iv). Sales returns, stock details in godowns, financial statements, periodical returns are the main source through which the data will be leaked by the staff, outside agencies, to the competitors

v). Mishandling of Uncertainties. Insufficient Bandwidth may not handle the data properly. Factors will be affected with the shortage of bandwidth.

vi). Cloud computing service providers have responsible to keep the confidentiality of the data and security of their customers data. But in many cases, confidential data may be stolen and mishandled in outsourcing agencies when the work entrusted to them.

vii). Decoding of the data with the pass words security may be leaked when the staff changed, deputed.

viii). Cyber security threats, always a big problem.

ix). With mal-software official data will be stolen and data will be captured.
x). While transmitting the data, analysing the data by outsource agencies, the data confidentiality will be disturbed and captured and stolen.
The following are the further possible challenges in the cloud computing
xi). Infrastructure investment is an additional burden.
xii). Acquiring official and original software is very costly.
xiii). Reliability and Trust worthiness staff may not available in the organisations.
xiv). Keeping the confidentiality of data may not be possible always

5. Suggestion and Recommendations

i). Coding and decoding passwords frequently must be changed under the Key.
ii). Security alerts should be followed given by the government and Police departments.
iii). Precautionary warnings under strict vigilance and with secret cameras, staff employees who are dealing with accounting and financial data must closely be watched.
iv). Proper care should be taken while assigning the confidential data analysing work to the outsourcing agencies. And organisation.
v). While offering financial data information, accounting books, financial statement to the auditors, bankers, analysers strict vigilance and observation must be there. They must be alerted properly.
vi). Avoid giving the confidential financial data to the outsiders, if it is inevitable to give financial and confidential data., fake and duplicate data of the books may be offered.

6. Conclusion

Cloud computing is an emerging computer technology service provider to the stake holders on demand for an affordable service charge. Cloud computing builds in existing computer technologies. Cloud computing assign remote services with a user data computation and software. In this paper, the meaning, conceptual definition, application, classification, advantages, challenges in the application of cloud computing have been widely discussed. Finally concluded with the suggestions and recommendations to overcome with the challenges, problems and risks.

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