

**A Literature Review on Cloud computing for building effective information systems in Financial sector**

**Abstract:**

Cloud computing comes with many advantages and risks. However, businesses cannot afford to ignore the security risks in cloud infrastructure due to its use of internet connections. Successful implementation requires planning and awareness so that businesses can determine a solution for enhancing their security in light of these threats.

**Keywords:** Cloud computing, effective, information systems, financial sector.

**Introduction:**

Today, cloud computing is more attractive and highly relevant to financial institutions that provide financial services. They can migrate some low critical services to the cloud provider's side. Cloud computing allows financial institutions to run their entire financial system perfectly and acquire internet-faced technology based on pay per use. Cloud computing reduces capital spending and IT overhead, providing outstanding services at no associated cost. This technology gives customers access to the latest core banking systems available at no cost or other barriers. This technology helps banks achieve cost savings, enabling them to improve data processing and the quality of financial services. All consultants recommend building their private Cloud as a financial cloud for large financial institutions. However, for small businesses, the services of public financial cloud service providers can be used to immediately support their effectiveness in business growth and data isolation connectivity.

Banks, hedge funds, insurance companies, and financial institutions are now in the Cloud, from non-essential services like websites, corporation emails and development applications to main features like payment methods.

**What is Cloud computing:**

Easily cloud computing is someone else data centre. Cloud computing encompasses a broad range of things that involve providing hosted services over the Internet. There are several types of these services, but the main types are:

- Software-as-a-service (SaaS).
- Platform as a service (PaaS).
- Infrastructure as a service (IaaS).

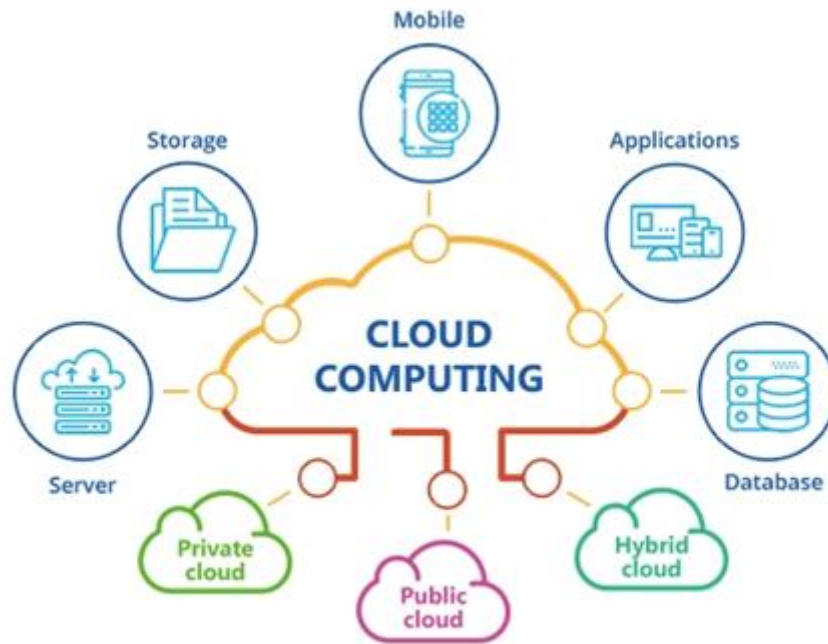


Figure 1, Distributed cloud architecture(GKSOFT, 2022)

In addition, a public or private cloud can be created. A public one sells its products to any Internet user, while limited access and permissions are possible with private ones. The goal in both cases is easy scaling of hosting resources with IT services provided at any moment without worrying about technical details.

Brian talked in his article about the story of cloud computing and how that started to help other businesses. (Hayes, 2008) Outsourcing computation to an Internet service eliminates nearly all these concerns. Cloud-primarily based totally offerings provide a far extra scalable and dependable IT infrastructure designed to streamline enterprise overall performance and aid improvement and growth. The major advantages of cloud computing are on-demand self-service, ubiquitous network access, location-independent resource pooling, and transference of risk. (Sadiku et al., 2014).

Cloud computing is a dynamic form of know-how that makes it possible for smaller firms to benefit from expensive technological services. Before, only large corporations could take advantage of computational exercises like this due to the amount of money needed. These resources are usually used for very short periods but cloud computing has made these provisions easier and more accessible.

The cloud is a virtual space that provides almost immediate access to hardware resources for users without upfront capital investments. When more businesses start to migrate into it, the more balanced and scalable its workload becomes to manage any changes in demand. This arrangement makes the cloud so appealing because more people join, but it does not affect their user experience of using computing power on-demand from anywhere. So they are with this vast infrastructure shared by various end-users who may be doing something different than another person at a time when one needs to compute power. All while being separated from each other and having complete flexibility of how much computing power they want or need throughout the session when they login to this system which has dynamic load balancing. As opposed to other types of servers where if someone logs out, all remaining sessions are affected across multiple devices, which can slow down speeds overall.

## **Types of Cloud:**

No one type of cloud computing will work for everyone, which means many options to choose from. These different models and types have evolved to help meet individual needs.

- **Public Cloud:**

The business does not need to support the appliances and systems using the public cloud, as that is owned and operated by someone else. Amazon Elastic Cloud Compute(EC2), Microsoft Azure platform, and Google App Engine are examples of a public cloud. With this type of service, cloud providers rent their computing resources such as firewalls, servers, load balancers and storage over the Internet to companies or users through internet browsers or client applications for on-demand use where needed. Public cloud serves the general users with on-demand mode, so the small enterprise users can create their IT business systems with low-cost. (Sun et al., 2011)

The public cloud is very risky for the financial and bank sector. The finance industry is heavily regulated, and many banks are concerned that they will not migrate their systems into the cloud. In addition, most countries have regulations about data storage, which means financial companies cannot share the data with a third party.

- **Private cloud:**

A private cloud uses by one company. Typically, these private clouds consist of a single enterprise's IT infrastructure. It includes data centres like networks, servers, and other devices connected to the Internet. In addition, private clouds are managed by the company's engineers with high-security measures.

Financial institutions have historically used a mix of technology infrastructures, each typically designed to support a particular set of applications at a given point in time. (Scott et al., 2019).

- **Hybrid cloud:**

The company owns public and private cloud properties. Connect private cloud resources, including data, applications, and services, to the public one. For instance, a private network connects to one network through an agent server for internet access. This way, the company can ensure security on its cloud while still maintaining accessibility from outside networks if needed.

Organizations using a hybrid cloud-based platform can use the security controls they need with their on-premises infrastructure, including SIEM capabilities. In addition, some organizations have found that cloud-based hybrid security outperforms the security in on-premises data centres because of high availability, disaster recovery and cybersecurity features.

## **Cloud service models:**

Cloud computing has several categories. However, there are distinct differences between the types regarding what they can provide to businesses about storage and pooling of resources. Additionally, they can interact to form a single end-to-end cloud computing model. The types are:

# Separation of Responsibilities

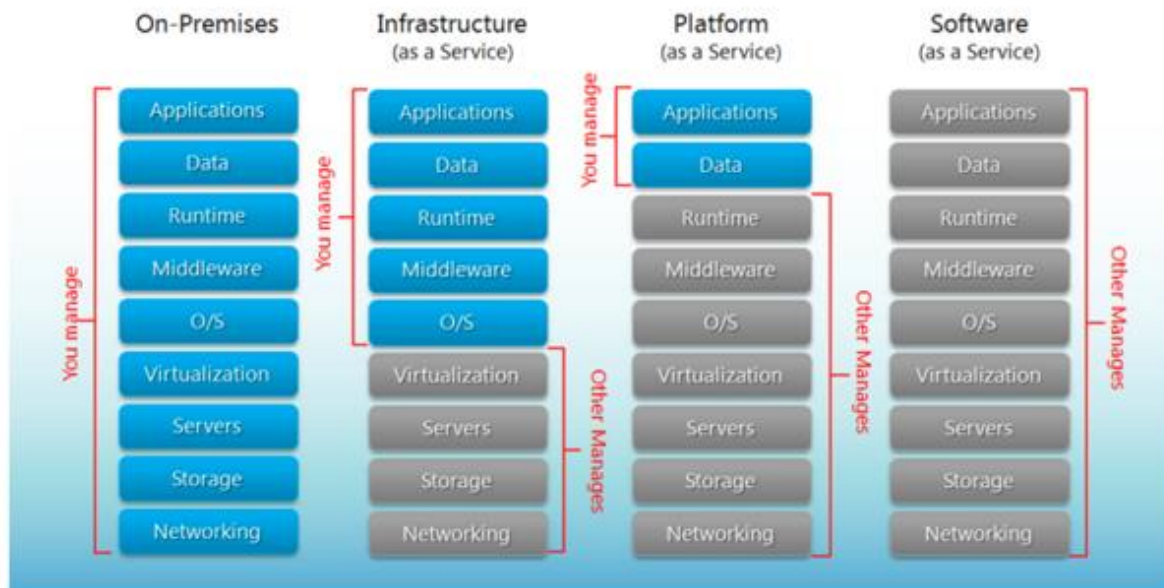


Figure 2, Cloud Separation of Responsibility (Kissami, 2017)

- Infrastructure as a service (IaaS):** It is the popular type of cloud computing service used by organisations. Companies rent the infrastructure that includes hardware like servers and virtual machines and build the network with the required operating systems and applications. Of course, they pay for what they use, but they also need cost management to avoid any overspending.  
 As it is a shared infrastructure, IT professional engineers do not have to manage the cloud infrastructure as the cloud service provider manages it. They have minimal control on the hardware level but more control for the software level like the firewall security groups, operating systems, and applications.
- Platform as a service (PaaS):** PaaS moves one step further than IaaS by providing programming and execution environments to the user.(Yang & Tate, 2012).  
 The cloud computing service builds as the developer's requirements; it provides an environment for implementing, installing, and testing software applications. PaaS focuses on enabling developers to quickly build any application, website, or online API without setting up or operating the underlying infrastructure required for the development.  
 By using PaaS, companies do not have to worry about purchasing and managing software licenses and container orchestrators or development tools such as Kubernetes.
- Software as a service (SaaS):** The model allows customers to run software developed by a third-party service provider on remote cloud servers. (Scott et al., 2019). Gmail, Office365 are excellent examples of it.  
 The cloud service provider's data centres have the underlying infrastructure, virtual machines(VMs), operating systems, and software applications. The service provider keeps track of the infrastructure and ensures that applications are available and secure through appropriate contracts. As a result, SaaS enables organizations to get up and running quickly with minimal upfront costs by providing a platform for their business needs.

### What are the benefits and risks in cloud computing for Financial sector?:

Cloud computing can offer the banks and financial sectors flexibility, resiliency and scalability, especially for international financial companies that offer the same service or application around the world. Financial companies continuously invest in refreshing data centres to ensure they provide the best operation to improve the cost and innovation with cloud computing.

Using Cloud, banking institutions pay only for the services they use. This is easier and more efficient to test new applications on the Cloud to traditional infrastructure. (Nedelcu et al., 2015)

Automating and measuring cloud resources also reduces technology infrastructure costs by turning significant upfront investments into ongoing operational cost savings. Also, Banks have become more vulnerable to cyber threats as they provide customers with more internet and mobile access, which leaves their legacy infrastructures even less secure. Cloud computing could help banks move out the internet access from on-premises data centres.

While cloud computing has significant benefits for financial companies, several risks could harm or damage the banks. Some risks are the same for any heritage or traditional infrastructure, while others could be riskier. The first risk is that companies store the data in someone else data centre, so what happens if the cloud service provider goes bankrupt or completely closed. The second one is the Internet-facing risk. The Third is the loss of control and management for the cloud infrastructure. Fourth is cloud auditing and regulation. Last but not least, what happens if the service provider has an extensive technical incident in multiple tenants and regions and could not fix the issue during the SLA time. All of that will cause a significant outage and significant monetary loss for the financial companies hosting in the cloud.



Figure 3, Cloud computing risks. (KPMG, 2018)

## **What are the gaps in cloud computing for financial sector?:**

**Security:** According to the study done by IDG, confidence in the security of cloud infrastructure is extremely high with 85% of respondents stating they feel secure (or more secure) than on-premises infrastructure—compared to just 15% who believe on-premises is still safer.(Lambert, 2021)

The considerable risk here is that most people trust cloud security when the security part should not be under trust. The company must keep all data under monitoring and agree on a security standard with the cloud service provider. Furthermore, Security is an essential part of using cloud computing. Financial companies can only use these services if security measures are in place and up to date, allowing them to store data remotely without worrying about hardware implementation. A key issue with the service is that it must be confidential, approved by a higher authority, and not miss any information or give away too much access.

**Low-latency:** Financial companies use a low-latency network to work on trading and capital market services and applications. There is always a latency delay response between the user request and the application in a cloud service provider. Latency is significant to how are user devices communicate with hosted servers and appliances. Communications with cloud providers can exacerbate these problems, and high latency will be prone to delays for various reasons. For example, the trading work should be done in milliseconds when the cloud latency could be more than 10 seconds.

**Regulation and Compliance:** Banks are required to adhere to stringent standards in order for them to conduct business. The data protection laws that have been enacted often specify what options banks have for storing and managing information. Executives worry about putting all of this on the cloud because it could lead to heavy fines or lousy publicity if too many factors are overlooked (not provided with enough consideration).

The best practice solution for the financial institutions is to have the services between:

- 1- On-premises data centre for the critical services and very critical storage and databases.
- 2- Cloud computing for lower critical and internet-facing services.

Then connect between them using a very secure private connection to avoid any security issues.

## **Conclusion:**

Cloud computing is evolving as a critical generation for sharing sources through the Internet. Small-medium businesses had been capable of advantage from a number of the capabilities presented with the aid of using this form of innovation. However, some concerns want to be made earlier than adopting cloud computing: loss of privateness or protection issues can also prevent its extensive adoption. Moreover, it is tough to expect precisely what effect cloud computing could have on society in popularity as it is not but mature; nevertheless, there wishes to be a greater exploration into this new development.

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