Cloud Computing in Banking Sector.

- The world of finance is changing dramatically. Consumer demands for a smooth, digitally-first banking experience are changing quickly. In this changing environment, traditional on-premises infrastructure finds it difficult to keep up. With the help of cloud computing, banks are now better equipped to overcome these obstacles and open the door to a more creative, efficient, and flexible future.

- The purpose of this article explores how cloud computing can revolutionize the banking industry. We'll go over its main advantages, which range from scalability and cost reduction to improved security and regulatory compliance. We'll also look at implementation tactics and the difficulties that come with adopting the cloud.

• What is Cloud Computing?

- Cloud Computing, simply, cloud computing is the process of delivering computer services—such as networking, servers, storage, databases, software, analytics, and intelligence—through the internet, or "the cloud," in order to provide economies of scale, flexible resource options, and quicker innovation. Usually, you only pay for the cloud services you use, which helps you scale your infrastructure as your business needs change, reduce operational expenses, and operate your infrastructure more effectively.

- Types of cloud computing

1. Public cloud:
   Third-party cloud service providers, who offer computing resources like servers and storage over the internet, own and run public clouds. One instance of a public cloud is Microsoft Azure. The cloud provider owns and manages all the hardware, software, and other supporting infrastructure in a public cloud. A web browser is used to manage your account and access these services.

2. Private cloud:

- Third-party cloud service providers, who offer computing resources like servers and storage over the internet, own and run public clouds. One instance of a public cloud is Microsoft Azure. The cloud provider owns and manages all the hardware, software, and other supporting infrastructure in a public cloud. A web browser is used to manage your account and access these services.

3. Hybrid cloud

- Public and private clouds are combined in hybrid clouds, which are connected by a system that permits data and applications to be transferred between them. A hybrid cloud allows your company more deployment options and flexibility by enabling data and apps to migrate between private and public clouds. It also helps to optimize your current infrastructure, security, and compliance.

- Service models of Cloud computing

- IaaS (infrastructure as a service), PaaS (platform as a service), and SaaS (software as a service) are the three primary cloud service paradigms in cloud computing. IaaS, PaaS, and SaaS are also referred to as cloud service offerings or cloud computing categories; nonetheless, they all describe how you use the cloud within your company and the level of administration you oversee in your cloud environments.

1. Iaas (Infrastructure as service)

- Through the cloud, infrastructure as a service, or IaaS, provides businesses with on-demand infrastructure resources like computing,

storage, networking, and virtualization. Customers are in charge of the operating system, middleware, virtual machines, and any apps or data, but they are not required to operate, maintain, or update their own data center infrastructure.

2. PaaS (platform as a service)

- Cloud application development requires hardware and software resources, which are delivered and managed via Platform as a Service, or PaaS. PaaS allows developers and IT operations teams to create, execute, and manage applications without requiring them to construct and manage the platform or infrastructure themselves. Although the cloud service provider manages and maintains the environment needed to develop and deploy apps, customers are still responsible for writing the code and maintaining their data and apps.

3. SaaS (software as a service)

- Customers can access and utilize a whole cloud-based application by using software as a service, or SaaS, which offers the complete application stack. SaaS solutions are ready to use and come with all upgrades, bug patches, and general maintenance handled by the service provider. Most SaaS apps can be accessed straight through a web browser, so users don't need to download or install any software on their devices.

- How can Cloud computing be used in the banking sector?
- Digital assets like data algorithms, competences, and software platforms designed especially for banking operations are combined in cloud banking. Banks can quickly develop specialized software applications and infrastructures that simplify banking processes by using cloud services.

- Advantages of Cloud Computing in banking sector:

1. Cost Optimization: Using cloud computing means that large upfront investments in IT infrastructure are no longer necessary.
   Banks can switch to an operating expenditure (OpEx) model, where they only pay for the resources, they really use, from a capital expenditure (CapEx) one. This frees up important capital for innovation and fundamental business operations.

2. Enhanced Scalability: On-demand scalability is provided via cloud-based solutions. To meet varying needs, banks can effortlessly scale their computer resources up or down, guaranteeing seamless operation during peak periods and preventing overprovisioning during slower times. Being nimble is essential for launching new projects and adapting to changes in the market.

3. Enhanced Security: Cloud service providers make significant investments in cutting-edge security protocols, such as intrusion detection systems, access controls, and data encryption. Banks can protect sensitive consumer data and adhere to strict regulatory standards by utilizing these powerful security capabilities.

4. Simplified Innovation: Cloud computing speeds up the creation and introduction of new banking services and apps. Banks can accelerate innovation cycles and introduce new products to the market by utilizing development tools and pre-built cloud-based solutions.

5. Better Customer Experience: Banks can provide a more convenient and customized customer experience thanks to cloud-based solutions. Banks may more efficiently customize their products and services by using cloud analytics to obtain deeper insights into client behaviour and preferences. Furthermore, clients can access their accounts from anywhere at any time with cloud-based mobile banking apps.

6. Business Continuity and Disaster Recovery: Cloud providers offer resilient disaster recovery solutions. In the case of a hardware failure

or natural disaster, banks may quickly and effectively resume operations from geographically diversified data centres, minimizing downtime and ensuring business continuity.

7. Regulatory Compliance: A growing number of cloud service providers are providing cloud solutions that are made to abide by rules particular to certain industries. Ensuring that data management methods of banks comply with regulatory requirements can considerably alleviate their burden.

- Adoption of cloud computing in banking sectors

- To fully profit from cloud computing in banking, a clear and well-defined cloud adoption plan is essential. Here are some essential actions for an effective implementation:

1. Make a detailed analysis of your company's needs: Determining the precise business objectives that the bank hopes to fulfil by implementing cloud computing. This can help the cloud computing organization to fully understand the bank's present and future goals.

2. Formulate an all-encompassing plan for cloud migration: Creating a plan for the cloud migration of apps and data. Depending on the bank's comfort level, the bank may need to migrate more sensitive data in stages, starting with less important apps and working its way up to more important ones.

3. Choose a trustworthy cloud service provider (CSP): Consideration should be given to prospective CSPs' security protocols, compliance certifications, scalability, and prior expertise in the financial services sector.

4. Spend money on effective data security measures: To protect the data in the cloud, putting strong data encryption, access controls, and intrusion detection systems in place can be done.

5. Another method can be creating a cloud adoption culture by teaching the staff about the advantages of cloud computing and their responsibilities during the cloud migration process. Long-term success requires fostering a culture of security awareness and ongoing development.

6. Environmental factors

- According to Fonteset al. (2016), environmental factors have an impact on the adoption of new information systems. Government policies, in the opinion of Chang et al. (2007), positively impact organizations' attempts to implement new IT systems. Another important consideration when deciding whether to use cloud computing is vendor lock-in (Opara-

Martins et al., 2016). Another consideration influencing the choice to work with cloud computing is vendor dependence, as it will be difficult to switch vendors.

Since cloud computing is a new technology, faults will need to be fixed through training and—more importantly—continuous support. Stated differently, one of the most important aspects of technology adoption is the availability of support networks and systems (Gupta et al., 2008). According to Patani et al. (2014), the laws and regulations as a significant impediment to e-banking and view the banking system's endorsement of state laws as one of its success factors.

7. Human factors

- When implementing new technology, human factors have a role, especially for the staff of e-banking information systems (Shah and Siddiqui, 2006). Cloud computing is an information technology innovation for electronic banking, and as such, the CIO is essential to the adoption of this innovation. The organization adopts a fresh mindset and constructive approach when new technology is approved by the CIO (Thong, 1999). The adoption of new information technology is influenced by both employee competency and technological capabilities (Wamba and Carter, 2014). To put it another way, workers need to be knowledgeable about and skilled in using new technologies (Chehrehpak et al., 2018). Employee acceptance of new technology is a topic of discussion in relation to adoption. Reports contend that, despite its high cost, people essentially do not use the most recent technologies. (Wang et al., 2003). Ultimately, the degree of trust that bank customers have in these services and their providers may be a deciding factor. According to Patani et al. (2014), one of the key issues with cloud e-banking is trust.

8. Organizational factor

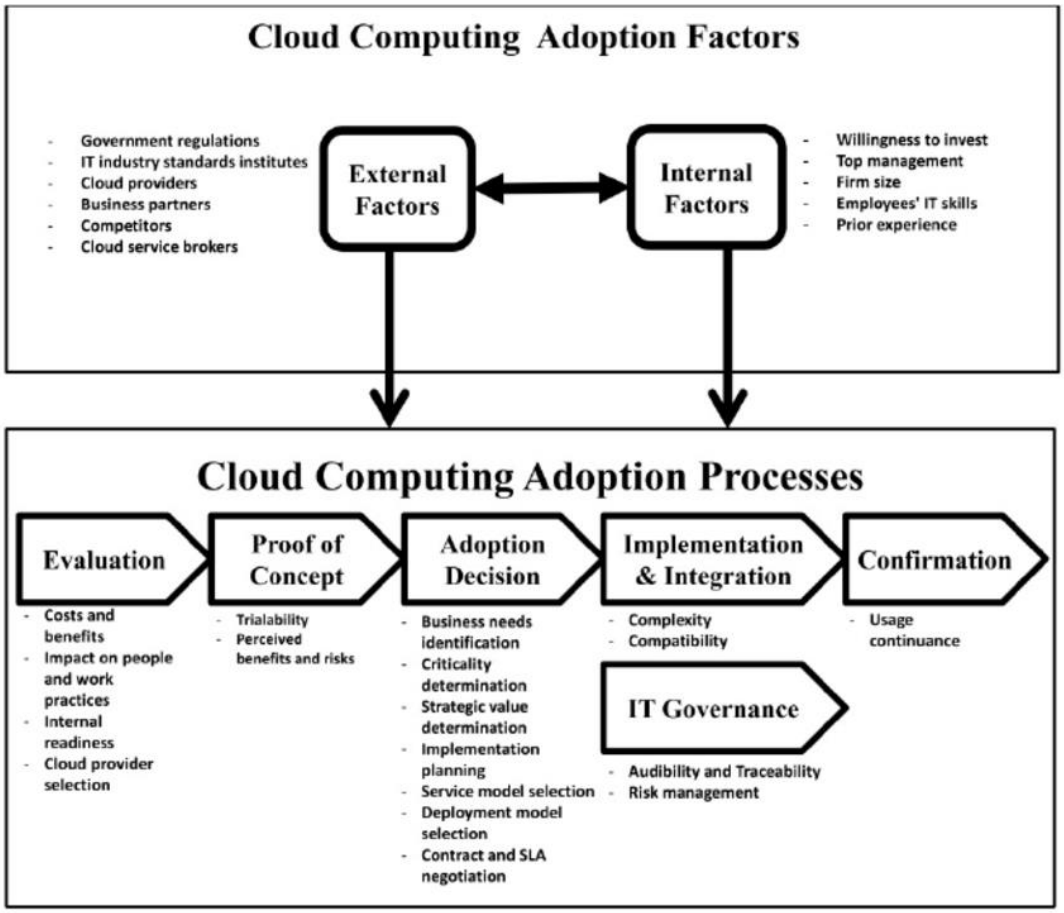
- Organizational considerations have a significant impact on banks' intentions to implement IT systems (Chang et al., 2007; Lee, 2009). Among the organizational elements that relate to the impact of higher operational profits and operating expenses for banks are relative advantages. Capital expenses, capacity, agility, implementation, dependability, compatibility, ease of use, and flexibility are among the relative benefits of cloud computing (Lin and Chen, 2012). Relative

advantages have a positive impact on company and encourage the adoption of new information technology, as demonstrated by Premkumar and Roberts (1999). Sufficient resources are one organizational aspect that is crucial for the adoption of new technologies (Chang et al., 2007). The organizational resources that are required are enough time, money, and human resources. Senior management support is a crucial factor in the acceptance and implementation of new technologies. Even in situations where the conditions are ideal, the adoption of a new technology is hindered by a lack of support from upper management (Lian et al. 2014; Keramati et al., 2013). Numerous expensive investments are needed for cloud computing, including those in system integration, hardware, and software. Due to the wide range of these expenses, this element may be crucial for e-banking cloud computing adoption (Alkhalil et al., 2017; Lian et al., 2014).

9. Technological factors

- Data security and privacy are the main issues with the adoption of electronic banking due to the unique characteristics of cloud computing technology (Botta et al., 2016). For instance, clients need a safe environment in which to conduct business. Prior research has demonstrated that the decision to use information technology is significantly influenced by the complexity of information systems (Peppard and Ward, 2016). The degree to which an innovation is difficult to implement is known as its complexity (Müller-Stewens et al., 2017; Nazari-Shirkouhi et al., 2015).

  According to Sultan & Sultan (2012), disruption is one of the main issues with cloud computing. To make cloud computing services easily accessible to users, they must be available anywhere, at all times, without interruption. Users are encouraged to adopt technology by the services that are offered (Rittinghouse and Ransome, 2016). Another important component of the technological dimension is system compatibility (Altalhi et al., 2017). When cloud computing technology is interoperable with current systems and apps, adoption of cloud computing can be more beneficial and realistic.



A diagram of a cloud computing adoption process www.researchgate.net

- Challenges in adoption of cloud computing in banking sector

- Cloud adoption in banking has its own obstacles, despite its many benefits. Here are some crucial things to remember:

1. Data Security and Privacy: Banks continue to place a high priority on protecting sensitive consumer data. Banks need to make sure cloud service providers follow data privacy laws by closely examining their security policies.

2. Vendor lock-in: When a cloud provider is overused, it can lead to vendor lock-in, which makes future provider switching challenging and costly. To reduce this risk, banks should implement hybrid cloud models or create a multi-cloud strategy.

3. Regulatory Uncertainty: The banking industry's regulatory environment around cloud computing is still developing. Banks must keep up with the latest regulatory changes and make sure their cloud adoption plans abide by all applicable laws.

4. Integration Challenges: Integrating cloud-based solutions with existing on-premises systems can be complex and time-consuming. Banks need to develop a comprehensive integration strategy to ensure smooth data flow and avoid operational disruptions.

- Conclusion

- For the banking industry, cloud computing offers a game-changing possibility. Banks can improve scalability and security, expedite innovation, and save a substantial amount of money by utilizing its capabilities. This enables them to satisfy customers more effectively, stay in compliance with regulations, and prosper in the ever-changing digital environment.

  According to recent polls, over 75% of CIOs stated that cloud computing will be necessary for their organizations soon (Kuo, 2011). Like any other invention, cloud computing adoption requires consideration of a number of issues. This study found 16 sub-criteria and four technological, organizational, human, and environmental aspects that are effective in influencing the adoption of cloud computing in e-banking. Experts used a fuzzy group decision-making model to weigh these aspects.

  In line with Lian et al. (2014), experts claim that technological reasons had the greatest impact on the adoption of cloud computing in e-banking. This could be due to worries about data security and the novelty of cloud computing in e-banking.

  A secure environment is necessary for the storage and retrieval of banking data. Moreover, Zissis and Lekkas (2012) state that one of the primary concerns of electronic banking is privacy.

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