

Cloud Computing and Its Impact on Financial and Banking Domains

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Abstract—The world of computing has undergone significant transformation as a result of recent technological advancements. Distributed computing, cloud computing, grid computing, and parallel computing are just a few examples. One of the most significant developments in computer history may have been the evolution of cloud computing during the last several years. Regrettably, a lot of institutions are still reluctant to use cloud computing. Artificial Intelligence and cloud computing will have the largest effects on the banking sector. Cloud technology gives banks and credit unions the ability to react quickly to shifting market conditions, improving customer experience and operational productivity through the use of data and applied analytics. This allows for better corporate agility. Cloud computing therefore steps in to address these issues and make banking a dependable and trustworthy service. This essay explores the concept of cloud computing, its effects on banks and other financial organizations, and how heavily cloud computing is used.

Keywords—Cloud Computing, Banking, Finance, Security

I. INTRODUCTION

Because banks have historically depended on antiquated methods, they typically resist adopting new technological advancements in their infrastructure. Nevertheless, a lot of banking organizations are now thinking about moving to cloud computing due to growing concerns about consumer data. Cloud computing is promising banking organizations enormous benefits, which will help them overcome the issues they have been having with legacy systems lately, despite the fact that the move is somewhat frightening. According to a recent Fintech survey, 46% of bankers believe that these difficulties are the biggest barrier preventing commercial banks from growing [1]. Thus, the article will consider how the integration of cloud computing into banking institutions' everyday operations may affect them as they set out on this path. A collection of online resources and services is known as cloud computing. As a result, Internet computing is another name for cloud computing [18].

A approach for providing banks with easy, on-demand network access to a shared pool of reconfigurable computer resources is known as cloud computing. These include of storage, servers, networks, apps, and services that may be quickly made available and set up with minimal administration labor or contact with the service provider. Accessibility is enhanced by cloud computing in a number of ways, such as on-demand services that allow the user to unilaterally supply processing power [4]. These include server time and network storage based on the needs of the company and don't often involve direct communication between the customer and the service provider. Broad network access is another feature. It is reinforced by the

network and is easily accessible using standard mechanisms that support a variety of thick and thin client podiums, such as PDAs, laptops, and cell phones. When a service provider permits a banking institution to pool its resources, it can use this arrangement to serve several clients by utilizing a multi-tenant model that is equipped with various virtual and physical resources. This is known as resource pooling. Depending on the needs of the customer, these resources may be dynamically allocated or redistributed. When considering Software as a Service (SaaS) for cloud computing, we have to admit that this is a global package. In actuality, this package enables the provider to license associate use to clients as a service or on demand. This is accomplished through subscription in a manner that appears to be described as a "pay-and-go" approach. When there is a chance of revenue induction from sources other than the user, this is occasionally additionally raised at no additional cost [6]. For example, from the marketing or user list sales SaaS, which may be expanding in the market as previously observed. This anecdote is significant because it signals the ubiquity of this software, which makes it imperative that a wide range of clients and tech users understand what SaaS means and its uses. SaaS provides businesses and organizations with access to a range of labor flow, CMS, CRM, analytics, and third-party services; all of them are based on a pay-per-use approach [8]. Additionally, the platform is professionally managed and safeguarded around-the-clock, 365 days a year in a distant datacenter. This offers cutting-edge cloud computing technologies [13].

II. CLOUD COMPUTING MODELS

Banking organizations stand to benefit from cloud computing by having access to a wide range of software options. The overall goal of cloud architecture [16] is to give users high bandwidth, continuous access to data and apps, an on-demand, flexible network that enables seamless transitions between servers and even between clouds, and—above all—network security.

Using the software as a service to support the development of banking institutions is the first alternative. Instead of depending on conventional applications that are kept on their server or computer, the microbanking institutions can simply use this software to access internet-hosted software services using a browser. The application host is in charge of managing and updating the program, which includes software settings and updates, based on software as a service. For a variety of reasons, this software program has recently gained immense popularity and has been held in high regard. For instance, the way the hardware and software packages are prepared and maintained from the seller's point of view to the client's is interesting to the clients due to these transfers in burden. SaaS is concurrently providing the vendor with a host of advantages. In actuality, WHO just created and maintained this application on their platform and approved the application's customer use choice.

The banking institution can purchase or lease computers and disk space from an internet service provider under the second option, infrastructure as a service. They will be able to access information via a private network or the internet thanks to this. The physical components of computers, including memory, CPUs, network connectivity, and data storage, are maintained by the provider. Windows Azure is one software example of this type. This is thought to be a method of providing cloud computing via servers, storage, networks, operational systems, and as a service that can be accessed on demand [7]. Customers are prevented from shopping for servers, datacenters, software, or network instrumentation; instead, they are limited to purchasing other resources, such as occasionally highly outsourced services on demand. The banking institution will be able to rent operating systems, hardware, network capacity, and storage [17] through infrastructure as a service, together with the associated software application and server environments, by using the platform as a service as their last option. Banks can modify the platform as a service to meet their specific demands and have excellent control over the technical aspects of their computing infrastructure. That being said, the package development environments are where this needs to be implemented.

PaaS is also described as a computing platform that makes it possible to build web applications more quickly and simply, but it does not improve the quality of purchasing and maintaining infrastructure and packaging at a lower end [6]. It is thought to be similar to SaaS in that it is a platform for creating packages that are then delivered via the internet, rather than a product itself.

III. DIFFERENT TYPES OF CLOUD DEPLOYMENTS

These various cloud deployment options [11] have to do with the location and management of the cloud servers, as opposed to the models covered above, which specify how services are provided via the cloud.

The most typical uses of cloud computing are:

Private cloud: A server, data center, or dispersed network that is exclusively used by one company is referred to as a private cloud.

Public cloud: An external vendor's service, known as a public cloud [12], may comprise servers located in one or more data centers. Public clouds, in contrast to private clouds, are shared by numerous organizations. Different businesses may share individual servers through the use of virtual machines; this arrangement is known as "multitenancy" since different tenants are renting server space on the same server.

Hybrid cloud: hybrid cloud deployments mix public and private clouds with the possibility of incorporating legacy servers located on-site. A company may use the public cloud as a backup for its private cloud or utilize both their private and public clouds for different services.

Multi-cloud: This kind of cloud setup uses several different public clouds. To use the previous comparison again, a business doing a multi-cloud deployment hires virtual servers and services from multiple outside providers; this is analogous to renting numerous nearby plots of land from various landlords. Hybrid cloud can also be deployed in multi-cloud environments, and vice versa.

IV. FACTORS INFLUENCING THE ADOPTION OF CLOUD COMPUTING IN BANKS

From an alternative angle, a number of elements have an impact on the banking institution's decision to embrace cloud computing technology. The banking system's classification of information sensitivity is the first factor. Financial institutions possess the autonomy to choose the most appropriate system based on the data they will handle, as long as it complies with legal requirements and data security requirements [19]. Consequently, the financial institution needs to guarantee that the cloud computing solution they select satisfies all requirements [3].

For example, the US carefully assesses its outsourcing practices and makes sure the banks adhere to them. The second factor is Cloud Computing's ability to differentiate itself and offer competitive benefits. Based on the degree of industry competitiveness, the bank will select the organization's computer system for this purpose. Consequently, the company will view cloud computing as a viable option to successfully outperform its rivals. Similarly, because in-house development can quickly meet expectations

in terms of marketing, the bank prefers it when it comes to differentiating its goods.

V. POSITIVE IMPACTS OF CLOUD COMPUTING ON BANKS

Because it serves as a catalyst for banks and other financial institutions to modify the features of their financial services and customize them to meet the needs of their consumers, cloud computing has continued to grow in popularity. As banks keep implementing cloud technology, it will be necessary to move the organizations in the right direction going forward. For banks and other financial organizations, cloud computing is crucial because it eliminates the need for upfront infrastructure investments like software licenses and lowers the risk of unused licenses.

In a similar vein, cloud computing does not require the purchase of hardware or any related maintenance services. Consequently, the capital expense that would have been incurred to fulfill these requirements is converted into operational expenses, allowing the establishments to fulfill their objectives. Users of cloud technology will only be charged for the amount of technology they have really utilized, and they only need to employ the initial number of IT resources. The ability of cloud computing to quickly and easily scale the computer resources needed to support an organization's cloud activities is the second way that cloud computing affects banks and other financial organizations. Through the utility model, cloud technology also significantly contributes to lowering ongoing operating, upgrading, and maintenance expenses. This return is frequently characterized as the technology's immediate result. For large-scale financial organizations, scaling [15] the technology up and down according on demand can be costly because they handle a variety of data types and network bandwidth, hardware, and cost can all vary greatly.

Consequently, banks may now quickly and precisely add or remove resources with a lead time of only a few minutes thanks to cloud computing, as opposed to having to wait many weeks to see how closely resources match workloads.

This demand for cloud technology resources is primarily influenced by peaks. Waiting can lead to a lot of issues for the business when it comes to figuring out how many servers are actually needed for an institution to run its operations without interruption or data breaches. When responding to an organization's needs, the cost-benefit analysis is typically the starting point. But, since cloud computing provides an adaptable solution to the ongoing fluctuations in demand for IT resources, companies should completely disregard the findings. Cloud computing has also strengthened the organization's ability to construct a customized environment above the physical infrastructures by increasing Virtual Machine accessibility, making it more available than other in-house solutions [2].

Organizations may access a vast array of features and apps thanks to cloud technology. Software as a service is one of them; it is a virtualization approach that is fully utilized in the

cloud computing architecture. This suggests that using the web interface to access software programs is simple.

The portfolio of applications is becoming increasingly dynamic in response to the bank's efforts to adapt to changing consumer behavior, which is significant. Applications can be swiftly added to the company's portfolio or removed using cloud computing. However, because cloud computing serves as the major engine for innovation, it has very low maintenance expenses. The affordability and widespread availability of cloud computing is opening up new avenues for innovation to flourish. Additionally, cloud computing offers great data security, dispelling the worry that sensitive information may be lost to hackers, which might have disastrous consequences for both the bank and its clients. Long-term data breaches can be extremely expensive, costing millions of dollars. As a result, there is a greater chance that the rigged institution will lose its customers and be forced out of the market [5]. While the potential of a data breach is increasing due to various technological improvements that give hackers vast means of breaking into business passwords, cloud computing is offering a long-term solution to these issues to prevent hackers from altering sensitive data. Through the use of complex password combinations, cloud computing guarantees that the bank has access to an up-to-date customer-centered platform that protects banking data. Cloud computing has improved partnerships by enabling businesses to exchange and communicate more frequently and effectively than they could with outdated methods. If banks operate in several locations, cloud computing can give all employees, subcontractors, and other parties access to all of the files. It is possible to select a cloud computing paradigm that makes it appear too simple for banks to provide their advisors access to their archives. On the other hand, banks are operating more efficiently thanks to cloud technology. Cloud technology helps these firms' financial services run more efficiently by streamlining all of the operations. During the payment process, both buyers and sellers are linked on a shared application.

This is crucial since it facilitates faster transactions and makes data tracking easier. In addition, cloud computing contributes to business continuity by helping banks and financial services enterprises with data security, fault tolerance, and disaster recovery management. From unprocessed data, data mining is done to extract potentially valuable information. Through the application of cloud computing and data mining [20] techniques, users will be able to obtain valuable information from practically connected data warehouses at a lower cost of infrastructure and storage.

In addition, cloud computing is less expensive than traditional alternatives. Agility and transformation are on the agenda, though. This refers to the financial administrations using the flexible cloud-based operating replicates to experience shorter development cycles for the new items. The related technology enables speedier and more effective responses to the needs of the most recent banking clients [5]. It assists the company in moving non-essential operations, such as software updates, upkeep, and other computer-related issues. This helps the financial firms focus more on the expansion and growth of their businesses. Employees can

also be flexible, particularly with regard to their work practices, thanks to the flexible work practices. Increase the ability to access data, for example, from homesteads, on public holidays, or even during the drive to and from work. Faster and easier connections to the virtual office are feasible if data access is required when off-site. Lastly, there's the option for automatic updates. The cost of the services may include the requirements. Depending on the cloud computing service offered, the system will frequently receive updates using cutting-edge technology. Included are the most recent software versions as well as developments in server and computer dispensing power.

VI. NEGATIVE IMPACTS OF CLOUD COMPUTING

Most financial institutions are still unable to implement cloud computing, despite its many benefits. Data security and privacy are a few of the issues that prevent the banks from putting it into practice. Bank data contains sensitive information, so protecting it from a cyber-breach is essential for all banking industries. No matter the technology, security needs to be tight and will always be a problem. Events involving security breaches are foreseeable, but they can be prevented [2]. Additionally, regulatory and compliance are taken into account, with all institutions authorized to adhere to stringent guidelines.

The financial information of the client located in the same country is required by several banking regulators. Precious data must not be combined with other data on the database or shared servers in order to comply with certain compliance requirements. Organizations may easily unify and connect to a single copy of all of their data thanks to the Data Cloud [14]. As a result, thousands of companies and organizations have created an ecosystem in which they can easily share and use shared data and data services, as well as link to each other's data. Finally, data is a critical concern for financial organizations, and there is no total control over the submissions made by severe firms. A third party managing cloud service providers may make it harder for them to be flexible and stylish. Hence, the inability to manage a massive amount of data deters businesses from transferring to the cloud.

VII. CASE STUDY

Deutsch Bank is a financial company that provides asset management services and products to governments, private individuals, big and small enterprises, and organizations. It also offers retail banking, transaction banking, investment and commercial banking, and wealth administration services. Deutsch Bank is one of the top performing banks in Germany, with a strong brand position throughout Europe and a strong presence in Asia Pacific and America. Conversely, Google is a platform that provides businesses with industry-leading infrastructure, industrial solutions, and enhanced platform capabilities. The platform's goal is to provide businesses with a solid basis for their future

financing decisions by offering them top-notch cloud solutions that make use of Google's superior technology. This will help businesses operate more efficiently and adapt to the changing needs of their customers. Customers in 150 countries have been using Google Cloud as a dependable partner to help them deal with their severe business difficulties. After signing a multi-year agreement in July, Google Cloud and Deutsch Bank have finally finished signing. These companies have gone on to detail several ways that the bank would use the digitization of their operations. The 150-year-old financial organization is excited to use the Google cloud for a lot of its next products. These include cutting-edge lending solutions that provide maintenance for "pay per use" systems as a substitute for buying assets altogether and creating a brand-new, creative interface for their customers to use. The company is also planning to revamp its Autobahn podium in order to create more customized experiences. The podium is responsible for giving users access to Deutsch Bank research, analytics, and commentary. On a more conventional note, Deutsch Bank's tagline is "strong security," as it will offer them top-notch functionality, manage their encryption keys, and choose the data analytics area that can be utilized for application deployment. Improvements in resilience and flexibility are anticipated, all without sacrificing the organization's objective of protecting client information and Deutsch Bank information assets through privacy and security measures. Both Google Cloud and Deutsch Bank will gain a lot from this partnership when their proposal is released in February. A major revamp is suggested by the use of transfer to the cloud to the press materials. About the updated statement that was made public in October 2019, an internal memo stated that a whopping \$12 billion had been invested in the technology, with the promise that this would boost the company's cloud computing strategy. Deutsch Bank was a wonderful fit for Google throughout the three main consumer verticals: finance, healthcare, and retail.

Chief technology, innovation, and data officer of Deutsche firm Leukert claims that the new chapter will benefit the firm in the long run by providing a plethora of options.

The officer went on to say that they will have a strategic partner in Google Cloud by their side who will help them accelerate their technological transformation. This will allow them to use a secure and adaptable environment so they can quickly introduce new services and products to their users [9]. The officer went on to say that this shift toward cloud computing is a model for combining the best aspects of banking and technology for the benefit of Deutsche clients. By granting access to a broad implementation of the bank's cloud-native offerings, Deutsch Bank and Google Cloud are formulating a plan that will precisely co-innovate with many encouraging establishments to Fintech. Because the innovation will have a major impact on how the bank designs and provides its financial goods and services, the bank's client will gain a lot from it. The company will be in a profitable position to respond to the growing flexibility and precisely solve urgent problems, customer needs, and trends with fast application development and the efficient use of forward-

thinking artificial intelligent and broad range data analysis gears.

Furthermore, as noted by Google Cloud President Robin Enslin, cloud computing will also advance the company's mobile self-service options, AI-driven recommendations, and other practical innovations. As a result, the company anticipates a significant transformation of the banking experience for its customers [10]. The president goes on to say that the collaboration will be very helpful in bringing back a lot of innovations and help the bank advance its position as the greatest early adopter of knowledge. As a trailblazer in the services sector, Deutsch Bank expressed their immense joy at collaborating with Google Cloud Computing, a significant player in the market. In an effort to maximize their partnerships, these partners are also thinking about a number of potential areas to investigate. One such is the provision of fresh loan products to offer sufficient assistance to pay-per-use systems, which is an excellent substitute for acquiring the appropriate asset entirely. In order to make it easier for retail customers in each of the partner nations to access the range of products provided by Deutsche Bank and Postbank, the partners are also creating a user-friendly, uniform interface. Last but not least, Deutsch banks and Google Cloud are investigating a variety of approaches to help transform the Autobahn banking platform into an electronic service that has won awards and will give business and organizational clients the ability to create more customized experiences and recommendations.

Deutsch bank is developing plans to sell all Google Cloud products on the Google Cloud marketplace in an effort to reach a wider audience and encourage a more widespread adoption of the organization's new cloud native services and solutions. Crucially, the move to cloud computing will give Deutsch Bank the advantage of utilizing a fully managed environment and current data for their applications. With the new collaboration in place, Deutsch Bank will have the option to choose the kind of datacenter area that best suits their applications' needs during the deployment process in order to satisfy preferences or roles related to data placement. Applications from the bank will be able to encrypt data while it's in motion and at rest. Additionally, Google Cloud will provide Deutsche Bank with the capabilities required to enable the bank to efficiently manage its primary encryption keys.

VIII. CONCLUSIONS

To sum up, it's evident that cloud computing has drastically changed the banking industry. Banks can now rely on more dependable and reasonably priced methods thanks to cloud computing to guarantee the security of their clients' information. Additional benefits include its high scalability and extensive capacities to facilitate cooperation amongst the organization's many shareholders through unrestricted information sharing. Even with its benefits, cloud computing has drawbacks, one of which is that adopting it still comes at a very high cost for small and medium-sized businesses.

REFERENCES

- [1] Tiwari, S., Bharadwaj, S., and Joshi, S. (2021). A Study of Impact of Cloud Computing and Artificial Intelligence on Banking Services, Profitability and Operational Benefits. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(6), 1617-1627.
- [2] Kaya, F., Van Den Berg, M., Wieringa, R., and Makkes, M. (2020, June). The Banking Industry Underestimates Costs of Cloud Migrations. In *2020 IEEE 22nd Conference on Business Informatics (CBI)* (Vol. 1, pp. 300-309). IEEE.
- [3] Rieger, P., Gewald, H., and Schumacher, B. (2013). Cloud-computing in banking influential factors, benefits and risks from a decision maker's perspective.
- [4] Parry, R., and Bisson, R. (2020). Legal approaches to management of the risk of cloud computing insolvencies. *Journal of Corporate Law Studies*, 20(2), 421-451.
- [5] Kshetri, N. (2010, January). Cloud computing in developing economies: drivers, effects, and policy measures. In *Proceedings of PTC* (pp. 1-22).
- [6] Satish, Karuturi S R V, and M Swamy Das. "Review of Cloud Computing and Data Security." *IJAEMA (The International Journal of Analytical and Experimental Modal Analysis)* 10, no. 3 (2018): 123-130.
- [7] Marcel Decker, "Security of the Internet", *The Froehlich/kent reference work of Telecommunications* vol, 15.
- [8] www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/vk5/report.html.
- [9] Rerns Grobauer Tobias Walloschek, Elmar Stocker, Co published by IEEE Computer and Reliability Societies" *March-2011*, Pg 53.
- [10] S Sokolov, O Idiriz, M Vukadinoff, S Vlaev (2020). Scaling and automation in cloud deployments of enterprise applications, *Journal of Engineering Science and Technology Review jestr.org*.
- [11] B Hayes (2008). Cloud computing, <https://dl.acm.org/doi/fullHtml/10.1145/1364782.1364786> dl.acm.org.
- [12] L Wang, G Von Laszewski, A Younge, X He, M Kunze, J Tao & C Fu (2010). *Cloud computing: a perspective study generation computing*, 2010. Springer.
- [13] Satish, Karuturi S R V, and M Swamy Das. "Multi-Tier Authentication Scheme to Enhance Security in Cloud Computing." *IJRAR (International Journal of Research and Analytical Reviews)* 6, no. 2 (2019): 833-840.
- [14] N Antonopoulos, L Gillam (2017). *Cloud computing*. Springer, 191-233.
- [15] M Armbrust, A Fox, R Griffith, AD Joseph, R Katz, A Konwinski, G Lee, D Patterson, A Rabkin, I Stoica, M Zaharia (2010). A view of cloud computing, dl.acm.org. Volume 53, Number 4 (2010), Pages 50-58.
- [16] Y Jadeja, K Modi (2012). Cloud computing-concepts, architecture and challenges. *International Conference on Computing, Electronics and Electrical Technologies (ICCEET)*. IEEE.
- [17] DC Marinescu - 2017. *Cloud computing: theory and practice*, second edition. 195-230. [18] MNO Sadiku, SM Musa, OD Momoh (2014). *Cloud computing: opportunities and challenges*. IEEE potentials, Volume: 33, Issue: 1, Jan.-Feb. 2014. IEEE.
- [19] JF Ransome (2017). *Cloud Computing: Implementation, Management, and Security*. taylorfrancis.com. 153-182.