International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 9 Issue 2, Mar-Apr 2025 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Cloud Computing in Financial Services

Matthew N. O. Sadiku[1], Paul A. Adekunte[2], Janet O. Sadiku[3]

[1]Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, TX, USA
[2]International Institute of Professional Security, Lagos, Nigeria
[3]Juliana King University, Houston, TX, USA

ABSTRACT

Cloud computing is the on-demand delivery of different computing services over the Internet, including databases, software, servers, and analytics. It means accessing data storage, applications, and computing power via the Internet. Cloud computing has revolutionized various industries, and the financial sector is no exception. It enables financial institutions to reduce their data storage costs with a pay-as-you-go pricing model, as opposed to paying significant upfront costs to deploy and maintain large on-premise systems. The finance sector is experiencing the profound impact of cloud technology. Cloud computing is essential for the financial services industry, driving security, efficiency, and innovation. This paper explores the impact that cloud computing is having on financial services.

KEYWORDS: *cloud, cloud computing, finance, banking, finance industry, financial services*

How to cite this paper: Matthew N. O. Sadiku | Paul A. Adekunte | Janet O. Sadiku "Cloud Computing in Financial Services" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-9 | Issue-2, April 2025, pp.1314-1321, URL: www.ijtsrd.com/papers/ijtsrd79799.pdf

IJTSRD79799

INTRODUCTION

Data generation in the finance industry is growing at an unprecedented rate due to online banking, digital transactions, regulatory obligations, and client interactions. Large volumes of organized and unstructured data can be handled effectively using cloud computing, which also optimizes infrastructure expenses. Cloud platforms protect financial data by implementing multi-factor authentication, encryption, and real-time monitoring. Cloud-enabled solutions that increase agility, security, and adherence to industry standards contribute to enhanced customer service and business resilience. Financial companies may improve risk mitigation procedures, refine investment strategies, and make better decisions by processing massive amounts of data in real-time. Real-time data processing enables organizations to improve risk management and security, guarantee legal compliance, and proactively address new dangers in a changing digital environment [1].

CLOUD COMPUTING BASICS

Cloud computing represents a newly emerging service-oriented computing technology. It is the provision of scalable computing resources as a service over the Internet. It allows manufacturers to use many forms of new production systems such as 3D printing, high-performance computing (HPC), industrial Internet of things (IIoT), and industrial robots. It is transforming virtually every facet of modern manufacturing. It is innovating, reducing cost, and bolstering the competitiveness of American manufacturing [2]. Figure 1 shows the symbol for cloud computing [3]. Some features of cloud computing are displayed in Figure 2 [4].

The key characteristic of cloud computing is the virtualization of computing resources and services. Cloud computing is implemented in one of three major formats: software as a service (SAAS), platform as a service (PAAS), or infrastructure as a service (IAAS). These services are explained as follows:

SaaS: This is a software delivery model in which software and associated data are hosted on the cloud. In this model, cloud service providers offer on-demand access to computing resources such as virtual machines and cloud storage.

PaaS allows the end-user to create a software solution using tools or libraries from the platform service provider. In this model, cloud service providers deliver computing platforms such as programming and execution.

In the IaaS model, cloud service providers can rent manufacturing equipment such as 3D printers.

Just like cloud computing, CM services can be categorized into three major deployment models (public, private, and hybrid clouds) [5]:

- Private cloud refers to a centralized management effort in which manufacturing services are shared within one company or its subsidiaries. A private cloud is often used exclusively by one organization, possibly with multiple business units.
- Public cloud realizes the key concept of sharing services with the general public. Public clouds are commonly implemented through data centers operated by providers such as Amazon, Google, IBM, and Microsoft.
- Hybrid cloud that spans multiple configurations. and is a composed of two or more clouds (private, community or public), offering the benefits of multiple deployment modes.

These services and models are shown in Figure 3 [1]. Cloud computing finds application in almost every field.

CLOUD COMPUTING IN FINANCE

The finance industry deals with large volumes of extremely sensitive data, so it is vital for organizations to be confident in their data storage solution. Due to many factors, including regulatory and risk management, financial services providers have been slower to embrace cloud services. Financial services companies have a unique set of requirements when it comes to adopting cloud-based services. Cloud computing in financial services involves using Internet-hosted servers for data management and processing, offering flexible, scalable, and cost-effective alternatives to traditional IT infrastructure. Cloud computing allows financial services companies to access these resources on demand without having to invest in expensive hardware, software infrastructure, and human expertise.

Cloud computing has revolutionized the financial services industry by offering flexibility, scalability, and cost-effectiveness. Financial institutions must leverage a strong cloud infrastructure to tighten their data security, optimize operations, deliver improved customer experiences, and reduce costs. Cloud computing in banking, insurance, and financial institutions simplifies access to storage, applications, and shared resources, allowing companies to analyze data on remote servers with improved processing speeds and heightened security. Cloud computing enhances data security through advanced features like encryption and multi-factor authentication, helping financial institutions protect sensitive information and comply with regulatory standards. Figure 4 shows the impact of cloud computing on banking and financial services [6].

Cloud services adopted by housing finance entities support a range of business activities and internal operations, including IT and cybersecurity management, monitoring, logging, and reporting. The choice of cloud service provider is a critical decision for financial institutions, with implications for security, compliance, and operational continuity [7]. Effective practices for financial institutions include taking a risk-based approach to their chosen cloud service offerings. Financial institutions generally find SaaS applications to be the easiest cloud-based services to deploy and manage. Common SaaS applications include office productivity systems, compliance tools (such as anti-money laundering tools), order/portfolio management systems, and security monitoring tools [8].

APPLICATIONS OF CLOUD COMPUTING IN FINANCE

Cloud services refer to the delivery of computing resources—such as storage, processing, and software—over the Internet. Cloud computing facilitates the delivery of digital banking services, cloud banking, open banking, mobile banking, and online banking. Common applications of cloud computing in finance include the following [9-11]:

- *Cloud Banking:* Banks process a wide range of transactions. When banks first started to move their services into the cloud, most chose a private cloud environment because it was considered more secure. Cloud banking is a term that refers to the on-demand delivery of banking services by financial institutions via the Internet. Like other cloud computing services, it relies on remote access to compute resources. For consumers, cloud banking has made everyday activities like shopping and transportation much easier. In addition to offering greater ease and accessibility, cloud-based banking improves the customer experience in other ways, including the ability to pay for many things online. In addition to powering many popular consumer services, the cloud ecosystem also helps the financial sector lower costs and meet other business needs.

Because cloud banking is such a vibrant and technologically innovative space, there are new applications and services being designed every day. This means many cloud banking capabilities are off-the-shelf, dramatically shortening the amount of time it takes a bank to offer it to their customers. Cloud banking has changed the overall banking experience so much that some new banks do not have physical locations at all.

- *Open Banking:* Open banking (or "open bank data") is a new practice, enabled by cloud technologies, where financial institutions open their customer's data to third parties, often other financial service providers, to fuel innovation and deliver new services. Banks that practice open banking first must get their customers' permission to share their information. Uses of open banking vary widely but typically include marketing opportunities for loans and other financial services as well as the development of new digital products.
- *Mobile Banking:* Banks face constant challenges on several fronts, such as daunting data handling and storage that consume massive resources, weak cybersecurity that undermines the ability to protect key customer data, and strong competition from high-tech giants that offer more appealing customer experiences. Banks have turned to cloud computing not only for cheaper and quicker solutions to the challenges they face but also for business transformation—a potential game changer to their modernization strategy. Thanks to smartphones, mobile banking has taken off, letting us complete transactions with ease, even when we are on the go. Integrating cloud computing with mobile banking has been instrumental in expanding financial services, enabling secure and scalable solutions that deliver banking capabilities directly to customers' mobile devices. By embracing cloud computing, financial institutions have adopted cloud technology to cater for the growing need for convenient, on-the-go financial management. Biometric authentication, virtual assistants, and AI-powered chatbots that can give personalized financial advice are just a few of the awesome tools at our disposal.
- *Micro Banking:* Another trend emerging is the adoption in developing countries of cloud whereby micro banks are running their entire business on cloud computing. In such greenfield scenarios where there has been limited prior investment in technology, it makes a lot of sense for micro banks to leverage cloud computing as opposed to making the capital expenditure on actual data centers.
- *Fraud Detection:* Cloud computing enhances fraud detection. Fraud within the financial sector encompasses various activities such as identity theft, falsifying loan applications, direct fund embezzlement, counterfeit bank accounts, money laundering, attempted tax evasion, and speculative trading. Cloud adoption in banking is vital in handling vast amounts of data from various resources to analyze transactions and identify suspicious activities. It helps banks detect fraud before any harm is done. Banks and other financial institutions leverage the cloud for fraud detection by analyzing massive amounts of data from diverse sources.
- *Enterprise Resource Planning (ERP):* Adopting cloud ERP enables banks to fully meet customer needs and expectations through improved connectivity, data-driven insights, operational efficiency, and risk management. Cloud-based ERP solutions enhance efficiency and coordination by integrating various departments such as finance, procurement, and human resources.
- *Risk Assessment:* When implementing cloud computing, banks must start with thorough risk assessments. This means identifying potential risks and understanding how they could impact the organization. Regularly reviewing these risks helps in staying ahead of new threats. This involves looking at both internal and external threats and understanding how they might affect the bank's operations. It is crucial to have strong security measures in place, including data encryption, multi-factor authentication, and regular security audits.

BENEFITS

The transition to cloud computing offers significant benefits for financial services. Financial firms no longer need to rely on traditional hard drives or storage devices as they can now store data on cloud platforms and retrieve it effectively. Cloud services have made it easier for businesses to allow employees to work remotely, efficiently, effectively, and securely. With the right cloud platform partner, keeping your data in the cloud is safer than keeping it on-site. Other benefits of cloud computing in financial services include the following [12,13]:

- *Scalability:* Cloud computing offers unparalleled scalability, allowing financial institutions to quickly adjust their IT infrastructure to meet fluctuating demand. Cloud platforms can easily

scale up or down to handle varying workloads, ensuring smooth operations during peak periods and optimizing resource utilization. The flexibility and scalability that cloud adoption offers allow your financial business to quickly adjust to operational changes, empowering you to handle greater volume without worrying about adding more storage capabilities or staff to manage it all.

- *Cost-Efficiency:* The greater efficiency that comes with cloud computing can bring cost savings, too. By leveraging cloud resources on a pay-as-you-go basis, financial institutions can optimize their IT spending. With the pay-as-you-go pricing models provided by the cloud providers, you will enjoy huge savings associated with no longer worrying about buying, maintaining, upgrading, and housing the necessary hardware.
- *Enhanced Innovation:* The cloud provides a fertile ground for innovation, enabling financial institutions to experiment with new technologies and services. Access to a vast array of cloud-based tools and platforms accelerates development cycles and fosters a culture of experimentation.
- *Improved Collaboration:* Cloud-based solutions facilitate collaboration among teams and external partners. Cloud technology facilitates secure remote access, which empowers finance teams to work together. By providing a centralized platform for accessing and sharing data, the cloud breaks down silos and promotes efficient teamwork.
- *Data Storage:* The need for more data increases daily, making it challenging for on-site IT teams to keep up with the demand. With the right cloud service provider, you have access to virtually unlimited cloud storage without worry.
- *Redundancy:* Redundancy, creating backups and fail-safes, can help make applications resilient and more readily available. Many cloud service companies are building various redundancies to guarantee that data is always available and secure.
- *Improving Customer Experience:* Pleasing customers is high on your priority list, and cloud computing in banking offers many ways to do that. Cloud-based digital banking platforms provide customers with seamless access to their accounts, personalized financial advice, and innovative features. With cloud services, you can improve the customer experience and offer instant and accurate information, consistent accessibility, and peak performance to keep their visits brief, easy, and satisfying. Even if there is some disruption, cloud computing resources make it easier to get back online quickly, ensuring continuous availability to customers. Cloud technology enables financial services firms to offer their customers more personalized and efficient services.
- *Disaster Recovery:* Disaster recovery can be accelerated with centralized data storage. Cloud-based solutions often include built-in disaster recovery features. By ensuring smooth backup and disaster recovery options, cloud computing promotes business continuity in the event of hardware failures, natural disasters, or cyberattacks.
- *Automation:* Cloud services streamline loan applications by automating workflows and improving departmental collaboration, leading to faster decision-making. Some companies automate the testing of application and infrastructure code to ensure that it meets security, resiliency, and compliance needs.

Some of these benefits are shown in Figure 5 [6].

CHALLENGES

Although the transition of financial operations to the cloud offers numerous benefits, it also presents unique challenges. Business unit and IT executives accustomed to an on-premise data center may find the prospect of upgrading or replacing legacy systems with an enterprise-level cloud solution to be quite daunting. Other challenges of cloud computing in financial services include the following [12,14]:

- *Data Security:* Data security concerns are top of mind for bank leaders. There are many reasons to be concerned about your data security and protection in the cloud. The migration of sensitive financial data to the cloud raises significant security concerns. Financial institutions have a legal and moral responsibility to keep the extremely sensitive customer data they house safe. Since they deal with such sensitive customer data, there are a number of data, security, and privacy laws to consider. Security is different in the cloud because of the tools that are native to each cloud provider's environment and the fact that cloud providers typically take responsibility for the security of the lower-level infrastructure layers. The shared security responsibility between cloud providers and the clients they host changes how organizations should anticipate and prepare for security risks. Financial institutions must implement robust security measures to protect against data breaches, unauthorized access, and other cyber threats.

- *Data Privacy:* Banks and insurance organizations collect and store a vast amount of personal and financial information from their customers. This data is highly sensitive and confidential, and any unauthorized access to it can result in severe consequences, such as identity theft, fraud, and financial losses.
- *Regulatory Compliance*: Regulators have been concerned about the risks resulting from the complexity of these cloud outsourcing arrangements, especially the potential for disruption to critical functions. To date, most regulatory focus has been on the migration of critical functions to the cloud. The digital world is brimming with risks, making compliance standards essential for everyone, particularly financial institutions. The financial industry is brimming with regulations to protect multiple parties, including customers, investors, and financial institutions, and it is imperative that all parties dealing with a financial institution's data must remain compliant. Ensuring that cloud providers meet compliance standards can be complex, and may involve conducting thorough due diligence and audits. Once you move into the cloud, you will find that your provider must remain compliant with all relevant regulations.
- *Latency:* While cloud providers strive to deliver high-performance services, network latency and other factors can impact the speed of financial transactions. Ensuring that cloud infrastructure meets the performance requirements of critical applications is essential.
- *Data Sovereignty*: In some jurisdictions, data sovereignty laws restrict the storage and processing of data outside national borders. Financial institutions must carefully consider these regulations when selecting cloud providers and data centers.
- *Cloud Governance:* Another key concern around cloud computing services is the topic of governance. It is important to apply a layer of governance to the usage of cloud computing, since of course, all cloud computing services have to be paid for. The central management of cloud service usage also enables effective governance as it provides access to an audit trail indicating usage.
- *Integration with Legacy Systems*: Many banks still rely on old core banking systems, which can be hard to integrate with modern cloud solutions. These older systems may not work well with new cloud technologies, making the migration process complex and time-consuming. To address this, banks can adopt a step-by-step approach to integration.

CONCLUSION

Cloud computing is a key trend shaping the future of financial institutions. It is no longer optional for major banks; it is now the standard for financial institutions worldwide.

With unmatched security, efficiency, and scalability, cloud computing has rapidly transformed the financial services sector. Most financial institutions today have a presence in the cloud, but adoption in the financial-services sector is still at a relatively early stage. Financial, banking, and insurance institutions are increasingly implementing cloud technologies to reduce costs, scale, and innovate their businesses. Forward-thinking banks have already integrated cloud computing into their operations and are experiencing impressive results. By using cloud-based mobile banking apps, financial institutions may reach a wider audience and offer underbanked and unbanked communities safe and affordable banking options. To effectively implement cloud computing in banking, businesses should partner with an experienced cloud services consultant to overcome them and fully realize the potential of cloud computing [15].

In the financial services sector, cloud technology accelerates digital transformation efforts, enhances infrastructure and operations, and updates core financial processes. As more companies see the limitations of their antiquated IT infrastructure, the demand for cloud-based services will grow. Figure 6 shows the future of financial services [6]. More information about cloud computing in financial services can be found in books in [16-20] and the following related journals:

- Journal of Cloud Computing
- IEEE Cloud Computing
- IEEE Transactions on Cloud Computing
- International Journal of Cloud Applications and Computing
- International Journal of Cloud Computing and Services Science
- i-manager's Journal on Cloud Computing
- Journal of Financial Stability

REFERENCES

[1] "Banking on the cloud: The role of cloud computing in modern financial services," February 2025, https://www.neosofttech.com/blogs/cloud-computing-financial-services/

[2] S. Ezell and B. Swanson, "How cloud computing enables modern manufacturing,"

June 2017 https://itif.org/publications/2017/06/22/how-cloud-computing-enables-modern-manufacturing

[3] "Stay safe online: Importance of cloud application security," September 2024, https://litslink.com/blog/cloud-application-security

[4] "Features of cloud computing – 10 major characteristics of cloud computing," https://data-flair.training/blogs/features-of-cloud-computing/

[5] "Cloud manufacturing," *Wikipedia,* the free encyclopedia https://en.wikipedia.org/wiki/Cloud_manufacturing

[6] "5 Key benefits of implementing cloud financial services for your business," https://www.veritis.com/blog/5-key-benefits-of-implementing-cloud-financial-services-for-your-business/

[7] B. Pollard, "The benefits of cloud computing in financial services," November 2024, https://adivi.com/blog/benefits-of-cloud-computing-in-financial-services/

[8] "The financial services sector's adoption of cloud services," https://home.treasury.gov/system/files/136/Treasury-Cloud-Report.pdf

[9] M. Flinders and I. Smalley, "What is cloud banking?" March 2024, https://www.ibm.com/think/topics/cloud-banking

[10] "Cloud computing in banking & financial services industry," March 2025, https://www.pragmaticcoders.com/blog/cloud-computing-in-banking

[11] D. Vizcayno, "Cloud computing : Tips for financial industry," April 2012, https://dcvizcayno.wordpress.com/2012/04/13/cloud-computing-tips-for-financial-industry/

[12] A. Khan, "Cloud computing and financial services: Discussing the benefits and challenges of moving financial operations to the cloud," September 2024, https://www.linkedin.com/pulse/cloud-computing-financial-services-discussing-benefits-asif-khan-aobnc/

[13] Idexcel Technologies, "How is cloud computing transforming the financial services industry?" May 2021, https://www.idexcel.com/blog/how-is-cloud-computing-transforming-the-financial-services-industry/

[14] "Cloud services for the financial services industry," March 2023, https://www.redhat.com/en/topics/financial-services/cloud-services-for-financial-services

[15] V. Kropov, "The impact of cloud computing in banking: benefits, use cases, and success stories," June 2024, https://www.n-ix.com/cloud-computing-in-banking/

[16] M. N. O. Sadiku, *Cloud Computing and Its Applications.* Moldova, Europe: Lambert Academic Publishing, 2024.

[17] B. Nicoletti, *Cloud Computing in Financial Services (Palgrave Macmillan Studies in Banking and Financial Institutions).* Palgrave Macmillan, 2013.

[18] J. Mina et al., *Digitalization of Financial Services in the Age of Cloud: Considerations for Your Organization's Cloud Strategy.* O'Reilly Media, 2023.

[19] D. K. C. Lee et al. (eds.), *Applications And Trends In Fintech Ii: Cloud Computing, Compliance, And Global Fintech Trends (Global Fintech Institute - World Scientific Series On Fintech).* WSPC/OTHERS, 2022.

[20] J. R. Storment and M. Fuller, *Cloud FinOps: Collaborative, Real-Time Cloud Financial Management.* O'Reilly Media, 2019.

Figure 1 The symbol for cloud computing [6].

Figure 2 Some features of cloud computing [4].

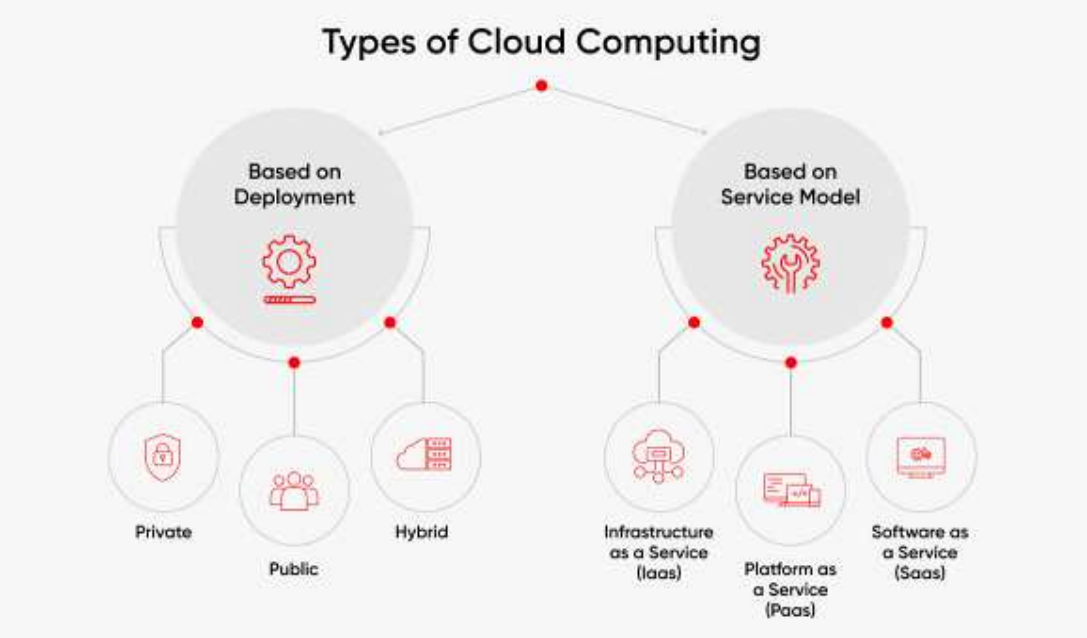

Figure 3 Cloud computing services and models [1].

Figure 4 The impact of cloud computing on banking and financial services [6].

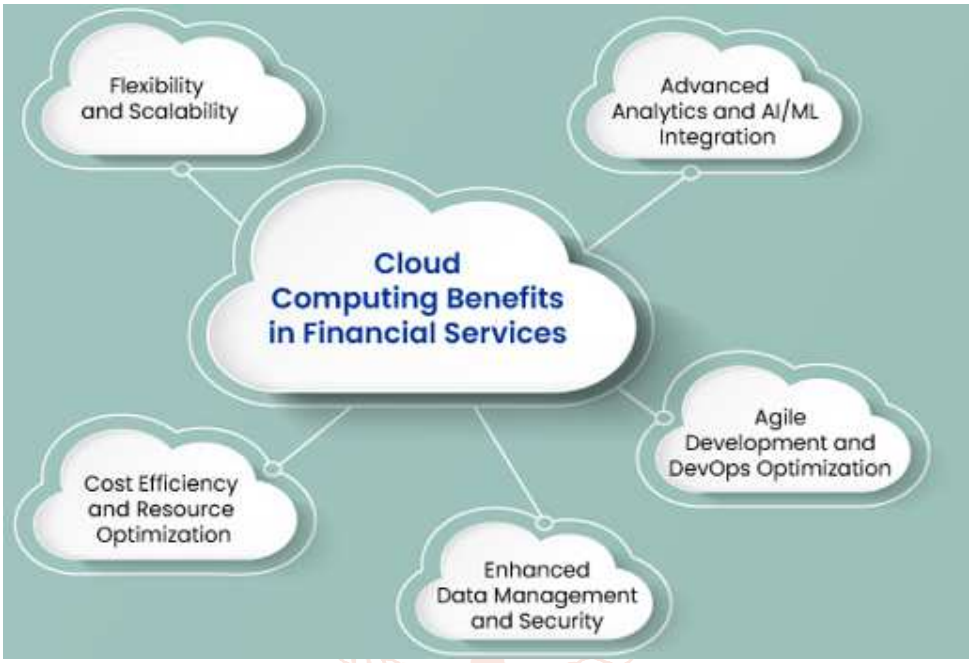

Figure 5 Some of the benefits of cloud computing in financial services [6].

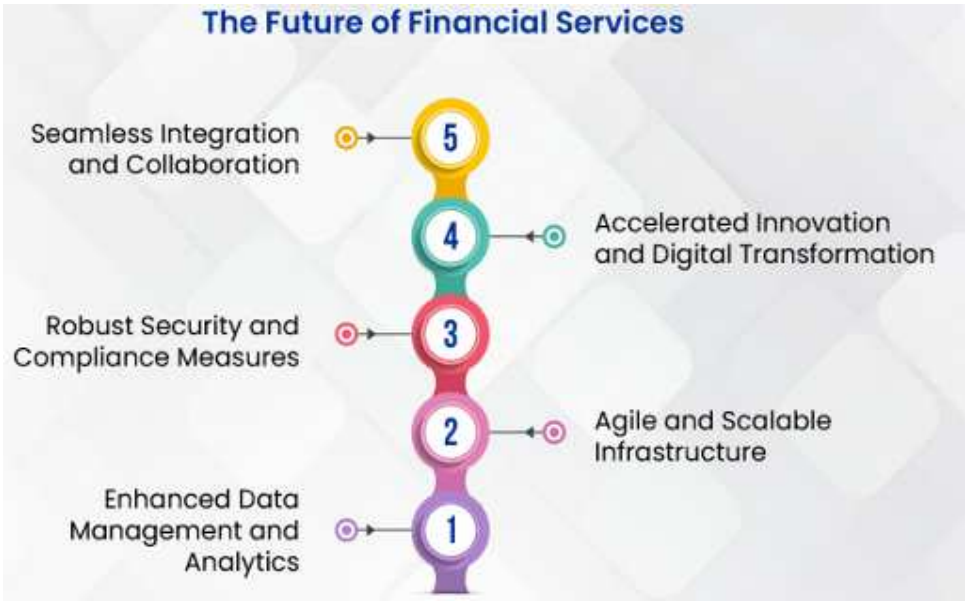

Figure 6 The future of financial services [6].