JPPIPA 11(5) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Implementation of Digital Technology in Industry 5.0 Era

Gregorius Paulus Tahu[1*]

1 Universitas Mahasaraswati Denpasar, Indonesia.

Received: January 22, 2025
Revised: April 29, 2025
Accepted: May 25, 2025
Published: May 31, 2025

Gregorius Paulus Tahu
gregori_tahu@unmas.ac.id

DOI: 10.29303/jppipa.v11i5.11191

Abstract: This research discusses the implementation of digital technology in industry 5.0 era. In the digital era, industry is undergoing a fundamental transformation due to the development of digital technology. This research uses the literature review method to analyse trends, benefits, challenges, and strategies related to the implementation of these technologies. The results show that digital technologies, such as internet banking, mobile banking, digital payment applications, and fintech, have become a catalyst for transformation in the banking industry. Banks are adopting strategies of developing digital platforms, partnering with fintechs, and developing HR skills to cope with these changes. Although faced with challenges such as data security, complex regulations, and system integration, the implementation of digital technology has great potential to improve banking services and operational efficiency. This research also identifies the positive and negative impacts of digital technology implementation on banking performance, including changes in people's behaviour in managing their organisations and improved performance of MSMEs. By understanding the challenges and associated strategies, this research provides valuable insights into how digital technology is changing the modern banking landscape and demonstrates the need for banks to continue to adapt and utilise these technologies to improve their performance and deliver better services to their customers.

Keywords: Algorithm; Digital technology; Industry 5.0

Introduction

In today's digital age, the industry is one of the sectors most affected by the development of digital technology (Kim et al., 2021; Zhang & Chen, 2023). The digital revolution has fundamentally changed the way banks interact with customers, manage their operations, and even understand financial markets. Digital financial technology has opened the door to innovations that allow banks to expand their services, improve operational efficiency, and optimise their management (Roberto, 2020).

This research aims to deeply investigate the implementation of digital financial technology in banking management, focusing on the strategies used and their impact on banking performance. By better understanding how banks adopt and integrate digital technologies into their practices, we can gain valuable insights into how these technologies are changing the modern banking landscape (Varma et al., 2022).

The development of digital technologies such as internet banking, mobile banking, digital payment applications, and fintech has been a catalyst for transformation in the banking industry (Raharjo, 2021). Banks are facing pressure to utilise these technologies to improve their operational efficiency. For example, the use of business process automation systems has enabled banks to reduce the cost and time required for various operational activities, such as identity verification, insurance claim processing, and risk management (Susilo, 2023). In addition, digital technology allows banks to reach more customers by providing more innovative services. Banks can utilise internet banking and mobile banking to provide access to their customers, allowing them to bank anytime and anywhere. In addition, digital payment applications and fintech

How to Cite:
Tahu, G. P. (2025). Implementation of Digital Technology in Industry 5.0 Era. *Jurnal Penelitian Pendidikan IPA*, *11*(5), 557–562. https://doi.org/10.29303/jppipa.v11i5.11191

enable banks to offer new services such as online bill payments, fast interbank money transfers, and online investments (Tut, 2023).

Figure 1. AI the Fin-tech Tools (Source: Google.com)

However, the implementation of digital technology also presents a number of challenges for banks. One of them is data security. As more and more sensitive data is stored and processed by banks in digital form, the risk of data security becomes greater (Sargiotis, 2024). Banks must ensure that their security systems are robust enough to protect customer data from cuber attacks and other security breaches. Complex regulations are also an obstacle to the implementation of digital financial technology.

Each country has different regulations related to the use of digital financial technology in the banking industry. Banks must ensure that they comply with all applicable regulations to prevent legal sanctions and representational damage. System integration is also another challenge that banks face in adopting digital financial technology. Banks often have various legacy systems that have been in place for years. Integrating these systems with new digital financial technologies can be a complicated and time-consuming process.

With internet banking, customers can perform various transactions such as fund transfers, bill payments, and checking their balances online (Wonglimpiyarat, 2017). Customers can use mobile banking applications to carry out banking transactions such as transferring funds, paying bills, and checking balances easily and quickly (Ma'ruf, 2021). on technologies used to improve financial services. Fintech includes innovations such as online lending services, peer-to-peer payments, investment robo advisors, and financial planning applications (Nizar, 2017).

Method

The type of research used in this study is descriptive research with a qualitative approach. The data taken, identified in the following order: data collection; data sorting; data analysis; conclusion making. As for data analysis, there is a predetermined sequence in accordance with the empirical steps taken, namely as follows: Examination of data; suspected data findings; Data confirmation; Diagnosis; and Action (Grieshaber, 2020).

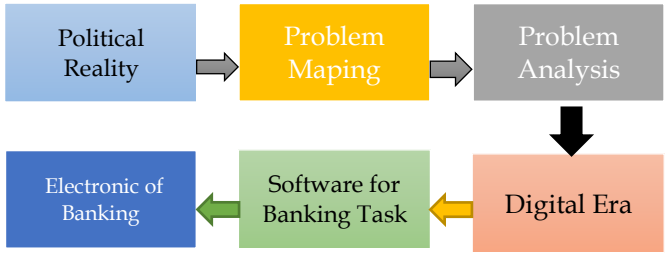

Figure 2. Flow of Logic

This research uses the literature review method to collect and analyse a number of literature related to the implementation of digital financial technology in banking management (Begum et al., 2022; Kajol et al., 2022). Data and information were obtained from various sources, including scientific journals, books, research reports, and relevant online resources. Analyses were conducted to identify trends, benefits, challenges, and strategies related to the implementation of digital financial technology in banking financial management.

Through a literature study approach with a descriptive qualitative approach, this research identifies that Fin-tech has penetrated various financial sectors, including payments, lending, financial planning, investment, and others. The results show that Fintech has both positive and negative impacts on society, by changing people's behaviour in collecting, saving, and using money for transactions. Fin-tech has provided benefits to the community, such as obtaining funds to develop businesses through micro-financing and borrowing money through P2P Lending Service, as well as facilitating financial planning and investment through Market Comparison and Investment.

Result and Discussion

The discussion will highlight the results of the analysis of the literature collected. This includes a discussion of the trends in the use of digital technologies in banking, the benefits that can be gained by banks and customers, the challenges faced in implementing these technologies, effective strategies to overcome these challenges, as well as the impact on banks' financial performance.

Impact of Digital Technology in the Banking Industry

The study reveals the rapid development of digital technology in today's digital age has fundamentally changed the way the banking industry operates (Murinde et al., 2022). Banks continue to adapt to new technologies to enhance their services, improve operational efficiency, and optimise their management. The implementation of digital technologies such as internet banking, mobile banking, digital payment applications, and fin tech has been a catalyst for transformation in the banking industry (Anagreh et al., 2024; Ononiwu et al., 2024). This is reflected in the strategies employed by banks in adopting these technologies, which include developing digital platforms, partnering with fin-tech companies, and developing HR skills in managing digital technologies (Kim, 2023).

Despite its great potential, the implementation of digital technology is also faced with a number of challenges. One of these is data security, where the increasing amount of sensitive data that banks store and process in digital form increases data security risks. Complex regulations are also an obstacle to the implementation of digital technology, with banks having to ensure that they comply with all applicable regulations to prevent legal sanctions and reputation damage. System integration is also another challenge that banks face in adopting digital technology, especially given the various legacy systems that have been in place for years (Jameaba, 2024).

Despite the challenges, the implementation of digital technology has a significant impact on banking performance. Literature studies show that digital technology has had both positive and negative impacts on society, by changing people's behaviour in collecting, saving and using money for transactions. This is reflected in the results of research showing that digital management training for Micro, Small and Medium Enterprises (MSMEs) improves their performance, and that Fintech has provided benefits to the community in terms of obtaining funds to develop businesses, borrowing money, and facilitating investment planning (Łasak, 2022).

Based on the analyses conducted, the implementation of digital technology has significant implications for the banking industry. Therefore, a number of recommendations are proposed to improve the effectiveness of digital financial technology implementation in banking management (Kitsios et al., 2021). These recommendations include improving data security, monitoring and adjusting to applicable regulations, integrating more efficient systems, and increasing training and developing human resource skills in managing digital technology.

Digital Banking Architecture

In recent years, digital banking architecture has undergone a massive transformation to respond to the demands of the fast-paced technological era. Banking that used to rely on physical systems and face-to-face transactions is now shifting to a more dynamic and responsive digital platform. This digital architecture includes the integration of various technologies such as cloud computing, API (Application Programming Interface), blockchain, and artificial intelligence (Ahmed et al., 2022; Dhanaraj et al., 2021). This change aims not only to improve service speed, but also to provide a more personalised and secure customer experience. Banks are no longer just a place to store money, but a complete financial services ecosystem. In its design, digital banking architecture also pays attention to scalability so that it can grow as the number of users increases. Flexibility is key, allowing banks to quickly adopt new innovations. With a strong technological foundation, digital banks can launch new products in weeks, not years. All these changes show how technology is fundamentally changing the foundations of the financial sector.

The modern architecture in digital banking is designed around microservices, rather than monolithic systems as before. Each service, such as payment, lending, or risk management, is built as a small unit that can be developed, tested, and operated independently (Solberg, 2022). This approach allows banks to be more agile in the face of market changes and customer needs. Micro services also support the implementation of DevOps and CI/CD (Continuous Integration/ Continuous Deployment), accelerating the process of system development and improvement. In addition, this approach improves system reliability as the failure of one service does not necessarily cripple the entire platform. With this architecture, digital banking is able to innovate faster, increase resilience, and reduce the risk of major failures. Previously sluggish large banks are now racing to rebuild their IT infrastructure to be more modular. Not only that, this design allows for easier integration with fintech and third-party companies. Thus, the banking ecosystem becomes more open and collaborative.

Security is a crucial element in digital banking architecture, given the increasing cyber threats in the modern era (Aslan et al., 2023). Every component of the architecture is designed with the principle of 'security by design', meaning that security has been taken into account since the early stages of system development. The use of technologies such as end-to-end data encryption, multifactor authentication, and AI-based anomaly detection systems are becoming the new standard. In addition, many banks are now adopting

zero trust architecture, which requires every user and device to be strictly verified before being granted access to the network. This strategy reduces the risk of unauthorised access and minimises the potential for data leakage. Regulations such as GDPR and local rules on data protection are also key considerations in designing this architecture. Regulatory compliance is a necessity, not an option. In digital banking architecture, detailed audit trails and real-time logging are implemented to ensure transparency and accountability. Thus, banks not only protect their assets, but also build customer trust.

One of the key challenges in building a digital banking architecture is the integration of legacy systems with new technologies (Ogunwole et al., 2023). Many traditional banks still rely on mainframe systems or databases that are decades old. To overcome this, digital architects usually adopt a 'strangler pattern' strategy, where new functions are gradually developed around legacy systems, and then slowly replace them. This approach allows for a safer transition without stopping ongoing business operations.

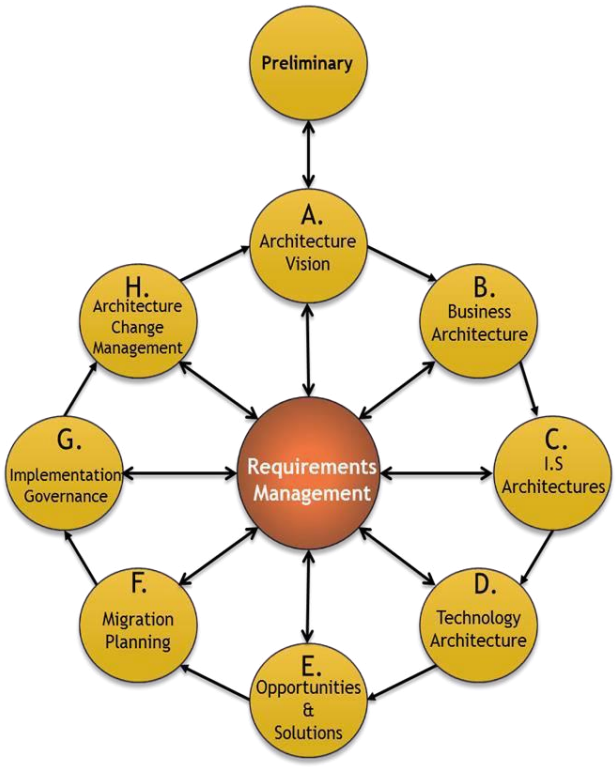

Figure 3. Architecture Development Method (Ibrahim & Nurpulaela, 2018)

On the other hand, some banks opt for a total 'core banking modernisation', although this process is more expensive and risky. Cloud computing adoption is also a solution to reduce dependence on legacy infrastructure. With the cloud, banks can accelerate innovation, increase scalability, and optimise operational costs. Even so, a careful migration strategy is needed to avoid downtime or service disruption. The integration of new and old systems is one of the most important aspects in the evolution of digital banking architecture.

Looking ahead, the digital banking architecture will be increasingly influenced by new technologies such as blockchain, 5G, and quantum computing. Blockchain, for example, offers great transparency and security for financial transactions. Meanwhile, 5G will open up new opportunities in mobile banking services with low latency and high speed. In the future, we may also see the application of quantum computing to accelerate the process of big data analysis and financial optimisation. The digital banking architecture will also increasingly favour AI-based user experiences, such as intelligent chat-bots, personalized financial recommendations and voice-based virtual assistants. Banks that are able to adopt these technologies faster will gain a significant competitive advantage. Therefore, flexibility and readiness to adapt must be the foundation in building the architecture going forward. Innovation is no longer an option, but a necessity to survive and thrive. The world of digital banking will continue to evolve, and its architecture must be ready to keep up with the changing times.

Conclusion

In conclusion, this study highlights the importance of digital technology implementation in the management of banking in the current digital era. We have identified strategies used by banks in adopting these technologies, such as the development of digital platforms, partnerships with fintech companies, and HR skills development. Although faced with challenges such as data security, complex regulations, and system integration, the implementation of digital technology has great potential to improve banking services, operational efficiency, and national inclusion. The positive and negative impacts of these technologies have been seen in the changes in people's behaviour in managing them. Therefore, recommendations have been put forward to improve the effectiveness of digital technology implementation, including strengthening data security, monitoring regulations, improving system integration, and enhancing HR skills. As such, this research provides a deeper understanding of how digital technology is changing the modern banking landscape and demonstrates the importance of banks continuing to adapt and utilise these technologies to improve their performance and provide better services to customers.

Acknowledgments
Deepest gratitude to God Almighty and friends who have helped this study. It is only by God's grace that this self-writing can be completed on time and can also be published widely to the academic community in particular.

Author Contributions
This study was conducted by me personally, so the content presented is my full responsibility. The single author provides a space for free expression so that the satisfaction of pouring thoughts can be accommodated.

Funding
The source of funds in this research is the researcher himself, there is no funding assistance from any party. The absence of a funding group makes this paper truly academic and free of interest from any party.

Conflicts of Interest
There is no interest conflict in this research. this research is conducted for scientific studies that are widely disseminated through this journal. Writings that are free of conflicts of interest will be disseminated without fear of the author, so that they can be free to continue working.

References

Ahmed, I., Zhang, Y., Jeon, G., Lin, W., Khosravi, M. R., & Qi, L. (2022). A blockchain-and artificial intelligence-enabled smart IoT framework for sustainable city. *International Journal of Intelligent Systems*, *37*(9), 6493–6507. https://doi.org/10.1002/int.22852

Anagreh, S., Al-Momani, A., Maabreh, H. M. A., Sharairi, J. A., Alrfai, M. M., Haija, A. A. A., Rahahle, M. Y., Alzyoud, M., Mohammad, A. A. S., & Al-Hawary, S. I. S. (2024). Mobile payment and digital financial inclusion: a study in Jordanian banking sector using unified theory of acceptance and use of technology. In *Business Analytical Capabilities and Artificial Intelligence-Enabled Analytics: Applications and Challenges in the Digital Era, Volume 1* (pp. 107–124). Springer. https://doi.org/10.1007/978-3-031-56015-6_8

Aslan, Ö., Aktuğ, S. S., Ozkan-Okay, M., Yilmaz, A. A., & Akin, E. (2023). A comprehensive review of cyber security vulnerabilities, threats, attacks, and solutions. *Electronics*, *12*(6), 1333. https://doi.org/10.3390/electronics12061333

Begum, A., Munira, M. S. K., & Juthi, S. (2022). Systematic Review Of Blockchain Technology In Trade Finance And Banking Security. *American Journal of Scholarly Research and Innovation*, *1*(01), 25–52. https://researchinnovationjournal.com/index.php/AJSRI/article/view/12

Dhanaraj, R. K., Jena, S. R., Yadav, A. K., & Rajasekar, V. (2021). *Mastering Disruptive Technologies: Applications of Cloud Computing, IoT, Blockchain, Artificial Intelligence & Machine Learning Techniques*. HP Hamilton Limited, UK.

Grieshaber, S. (2020). Equity and research design. In *Doing early childhood research* (pp. 177–191). Routledge. https://doi.org/10.4324/9781003115403-12

Ibrahim, I., & Nurpulaela, L. (2018). Rancangan model arsitektur teknologi informasi sistem perbankan dengan menggunakan kerangka kerja togaf. *Prosiding Seminar Nasional Teknologi, Inovasi Dan Aplikasi Di Lingkungan Tropis*, *1*(1), 51–58. https://core.ac.uk/reader/268075690

Jameaba, M.-S. (2024). Digitalization, emerging technologies, and financial stability: challenges and opportunities for the Indonesian banking sector and beyond. *Emerging Technologies, and Financial Stability: Challenges and Opportunities for the Indonesian Banking Sector and Beyond (April 26, 2024)*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4808469

Kajol, K., Singh, R., & Paul, J. (2022). Adoption of digital financial transactions: A review of literature and future research agenda. *Technological Forecasting and Social Change*, *184*, 121991. https://doi.org/10.1016/j.techfore.2022.121991

Kim, S., Choi, B., & Lew, Y. K. (2021). Where is the age of digitalization heading? The meaning, characteristics, and implications of contemporary digital transformation. *Sustainability*, *13*(16), 8909. https://doi.org/10.3390/su13168909

Kim, S. H. (2023). A Study on the Change of the Payments System: Focusing on the Strategies of Distribution Companies and Fin-tech Companies. *Journal of Distribution Science*, *21*(5), 113–120. https://doi.org/10.15722/jds.21.05.202305.113

Kitsios, F., Giatsidis, I., & Kamariotou, M. (2021). Digital transformation and strategy in the banking sector: Evaluating the acceptance rate of e-services. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(3), 204. https://doi.org/10.3390/joitmc7030204

Łasak, P. (2022). The role of financial technology and entrepreneurial finance practices in funding small and medium-sized enterprises. *Journal of Entrepreneurship, Management and Innovation*, *18*(1), 7–34. https://www.ceeol.com/search/article-detail?id=1028430

Ma'ruf, M. (2021). Pengaruh Fintech Terhadap Kinerja Keuangan Perbankan Syariah. *Yudishtira Journal: Indonesian Journal of Finance and Strategy Inside*, *1*(1), 42–61. https://doi.org/10.53363/yud.v1i1.53

Murinde, V., Rizopoulos, E., & Zachariadis, M. (2022).

The impact of the FinTech revolution on the future of banking: Opportunities and risks. *International Review of Financial Analysis*, *81*, 102103. https://doi.org/10.1016/j.irfa.2022.102103

Nizar, M. A. (2017). *Teknologi keuangan (fintech): Konsep dan implementasinya di indonesia [financial technology (fintech): It's concept and implementation in indonesia]*. https://ideas.repec.org/p/pra/mprapa/98486.html

Ogunwole, O., Onukwulu, E. C., Joel, M. O., Adaga, E. M., & Ibeh, A. I. (2023). Modernizing legacy systems: A scalable approach to next-generation data architectures and seamless integration. *International Journal of Multidisciplinary Research and Growth Evaluation*, *4*(1), 901–909. https://doi.org/10.54660/.IJMRGE.2023.4.1.901-909

Ononiwu, M. I., Onwuzulike, O. C., Shitu, K., & Ojo, O. O. (2024). The impact of digital transformation on banking operations in developing economies. *World Journal of Advanced Research and Reviews*, *23*(3), 285–308. https://doi.org/10.30574/wjarr.2024.23.3.2706

Raharjo, B. (2021). *Fintech Teknologi Finansial Perbankan Digital*. Semarang: Penerbit Yayasan Prima Agus Teknik.

Roberto, A. (2020). *Lebih Mengenal Digital Banking Manfaat, Peluang, dan Tantangan*. http://pasca.ugm.ac.id/. https://repository.upstegal.ac.id/3051/

Sargiotis, D. (2024). Data security and privacy: Protecting sensitive information. In *Data governance: a guide* (pp. 217–245). Springer. https://doi.org/10.1007/978-3-031-67268-2_6

Solberg, E. (2022). *The transition from monolithic architecture to microservice architecture: A case study of a large Scandinavian financial institution* [Thesis:]. https://shorturl.asia/ruXyI

Susilo, A. (2023). Regulatory Technology Untuk Digitalisasi Proses Kepatuhan (Studi Kasus Bank Swasta Di Indonesia). *Infotech Journal*, *9*(1), 252–258. https://doi.org/10.31949/infotech.v9i1.5460

Tut, D. (2023). FinTech and the COVID-19 pandemic: Evidence from electronic payment systems. *Emerging Markets Review*, *54*, 100999. https://doi.org/10.1016/j.ememar.2023.100999

Varma, P., Nijjer, S., Sood, K., Grima, S., & Rupeika-Apoga, R. (2022). Thematic analysis of financial technology (Fintech) influence on the banking industry. *Risks*, *10*(10), 186. https://doi.org/10.3390/risks10100186

Wonglimpiyarat, J. (2017). FinTech banking industry: a systemic approach. *Foresight*, *19*(6), 590–603. https://doi.org/10.1108/fs-07-2017-0026

Zhang, J., & Chen, Z. (2023). Exploring Human Resource Management Digital Transformation in the Digital Age. *Journal of the Knowledge Economy*, *29*. https://doi.org/10.1007/s13132-023-01214-y