

As a strategic move, Payment System Transformation in Indonesian Banks: A Literature Review on Its Impact on Financial Efficiency and Inclusion

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Abstract :

The digital transformation of Indonesia's payment system has seen rapid progress driven by technological advancements and government policies aimed at financial inclusion. While the adoption of digital payment technologies like e-wallets and QRIS has streamlined transactions and boosted operational efficiency, significant challenges remain. This study analyzes the impact of this transformation on financial efficiency and inclusion, identifying both inhibiting factors and opportunities for innovation. Using a literature review as the primary research method, this paper descriptively analyzes various scientific sources to build a deep theoretical framework. Findings show that digital payment systems improve bank operational efficiency and broaden access to financial services, especially for MSMEs and communities in remote areas. Despite this progress, there is a persistent gap in access between urban and rural regions, along with low digital literacy in some communities. The research also identifies that emerging technologies such as blockchain and AI have the potential to enhance transaction security and transparency.

Keywords : *Digital payment system, financial inclusion, digital literacy, infrastructure, technology adoption*

Abstrak :

Transformasi sistem pembayaran digital di Indonesia telah berkembang pesat seiring dengan kemajuan teknologi dan kebijakan pemerintah yang mendukung inklusi keuangan. Meskipun telah ada adopsi teknologi pembayaran digital seperti e-wallet dan QRIS yang memfasilitasi transaksi dan meningkatkan efisiensi operasional, masih ada tantangan signifikan yang menghambat penerapannya. Penelitian ini bertujuan untuk menganalisis dampak transformasi tersebut terhadap efisiensi dan inklusi keuangan, dengan menyoroti faktor-faktor penghambat dan peluang inovasi. Metode yang digunakan adalah studi literatur, yang melibatkan pengumpulan dan analisis deskriptif dari berbagai sumber ilmiah seperti jurnal dan artikel. Analisis ini berfokus pada pendekatan filosofis dan teoritis untuk membangun kerangka pemahaman yang mendalam. Hasil penelitian menunjukkan bahwa adopsi sistem pembayaran digital meningkatkan efisiensi operasional perbankan dan memperluas akses layanan keuangan, terutama bagi UMKM dan masyarakat di daerah terpencil. Meskipun demikian, masih terdapat kesenjangan akses antara daerah perkotaan dan pedesaan, serta rendahnya literasi digital di beberapa kalangan. Temuan ini juga mengidentifikasi bahwa teknologi seperti blockchain dan kecerdasan buatan (AI) berpotensi meningkatkan keamanan dan transparansi transaksi.

INTRODUCTION

The payment system plays an important role in the modern economy, including in Indonesia, by facing the global and local challenges facing Islamic banking. The transformation of the payment system in Indonesia has been accelerated by technological advancements and the development of the digital economy, which has changed people's behavior from the use of paper-based instruments to digital payments. Bank Indonesia has issued new regulations to support this change, in line with the increase in the number of digital payment users every year (Soegoto et al., 2024).

Islamic banking in Indonesia faces global and local challenges in adopting digital payment systems. This transformation is driven by technological advancements and the need for transaction efficiency. Banks in Indonesia, including Bank Indonesia, play a significant role in supporting this transition through innovations such as the BI-Fast program and the development of the National Payment Gateway (GPN), which reduces dependence on foreign operators and lowers transaction costs (Soegoto et al., 2024).

Global and local payment systems face a variety of challenges, including low efficiency, limited access, and lack of financial inclusion, especially in certain regions. In the context of Islamic banking, these challenges are exacerbated by factors such as regulatory differences and a lack of public awareness about Islamic financial services. In addition, Islamic banking often faces problems in improving financial efficiency and inclusion, which is essential for sustainable growth (Banna & Alam, 2020).

What are the factors that cause the low level of efficiency of the digital payment system in Indonesia, despite digital transformation efforts?, How does the gap in access to digital payment systems affect financial inclusion in various segments of Indonesian society, especially in remote areas?, What is the impact of limited access to digital payment systems on inclusive economic growth in Indonesia?

The urgency of this research is very high, considering that the transformation of the digital payment system in Indonesia has a wide impact on financial efficiency and inclusion. In recent years, the Indonesian government has pushed for various policies to accelerate the adoption of digital technology through initiatives such as the cashless society movement and the development of the fintech sector. This policy aims to create a faster, more efficient, and inclusive payment system, which in turn is expected to encourage economic growth at both the macro and micro levels. However, despite progress in the implementation of digital payment systems, there are still many challenges faced, such as the access gap between urban and rural areas, as well as the lack of digital literacy in most communities. This research is important to understand how this transformation affects the efficiency of the payment system and the extent to which existing policies have succeeded in increasing financial inclusion, especially in historically marginalized areas. Thus, the results of this study can provide useful insights for policymakers and stakeholders in designing strategic measures to increase the effectiveness of digital transformation in the banking and finance sector.

The rationalization of this study is based on the crucial role of the payment system in supporting the achievement of more equitable and efficient financial access throughout Indonesia. In the midst of increasingly digital economic dynamics, efficient payment systems are a key pillar to accelerate financial inclusion, which in turn encourages more inclusive economic development. By facilitating wider access to financial services, digital payment systems have the potential to reduce economic and

social inequality, especially for groups of people who have been marginalized from formal financial services. For example, a more efficient payment system can help increase access for MSMEs, farmers, and communities in remote areas to obtain credit, access banking products, and facilitate transactions in daily life. Therefore, this study is important to explore how the transformation of the payment system can contribute to the achievement of sustainable economic development goals, where the well-being of society is not only dependent on the formal sector, but can also be enjoyed by all levels of society through increased access to financial services.

The main objective of this study is to analyze the impact of payment system transformation on financial efficiency and inclusion in Indonesian banks. Focusing on the changes that occur along with the adoption of digital technology, this study aims to identify the extent to which the implementation of digital payment systems can improve bank operational efficiency and expand access to financial services to the public, especially for those who are marginalized or have limited access. The expectation of the results of this study is to provide in-depth insight into the challenges and opportunities faced by Indonesian banks in implementing digital payment systems. In addition, this research is expected to produce useful policy recommendations for the government and regulators to support the creation of a more inclusive and efficient payment ecosystem. For banking practitioners, the results of this research are also expected to provide practical solutions that can be implemented to improve the effectiveness of payment systems, accelerate the adoption of digital technology, and advance financial inclusion throughout Indonesia.

Although there have been many studies that have discussed the transformation of payment systems, efficiency, and financial inclusion, there are still some shortcomings or gaps in the existing literature, especially related to the specific context of Indonesia. Most previous studies have focused more on the technical or macroeconomic aspects of digital payment systems, but have less explored their impact on financial inclusion in areas that are less accessible by digital technology or infrastructure. In addition, although there are studies that discuss government policies or fintech developments, there has not been much that examines the direct relationship between the transformation of the payment system and the improvement of bank operational efficiency and access to financial services at all levels of society. This research will fill the gap by conducting a more in-depth and comprehensive literature review, which not only highlights the challenges of digital transformation in the banking sector, but also how technology policies and implementations can expand financial inclusion. With this new perspective, this research is expected to make a significant contribution to the development of theory and practice in the Indonesian banking sector, as well as provide direction for further research in the future.

In the face of global and local challenges, Islamic banking in Indonesia must adapt to the rapid transformation of the payment system. This study emphasizes novelty through a comprehensive literature review approach, examining the impact of digitalization on Islamic banking. This digital transformation is important to improve competitiveness and operational efficiency, despite regulatory challenges and limited digital infrastructure.

Islamic banking faces significant global and local challenges, especially in terms of payment innovation and financial inclusion policies. This research contributes to the development of theory and practice by highlighting the role of Islamic banking in

increasing financial inclusion through products that are in accordance with sharia principles. This is important to address the financial barriers faced by financially underserved communities, especially in Muslim-majority countries (Khmous & Besim, 2020).

Islamic banking faces various challenges both at the global and local levels, including complex financial and regulatory crises. This research can provide insights for regulators, banks, and fintech companies in formulating policies and strategies to develop better payment systems. By understanding the trends and challenges in Islamic fintech, stakeholders can improve financial inclusion and stability of the Islamic financial system (Mohd Sollehudin Shuib et al., 2023)

RESEARCH METHOD

This study uses the literature study method as the main technique in data collection, namely by examining various literature relevant to the topic being studied. According to Nazir, this method involves searching and collecting information from various written sources such as books, scientific journals, magazines, and other academic materials (Mardalis, 2006). Meanwhile, Muhadjir stated that literature research focuses more on philosophical and theoretical approaches than empirical testing in the field (Hadi, 1993). This approach is applied to gain a deep understanding of the concepts and theories underlying the phenomenon being researched and to build a solid theoretical framework.

In the process, data collection is carried out by identifying, collecting, and evaluating written sources that have been selected based on their level of relevance and credibility. The data obtained are then analyzed descriptively to find the main themes and patterns that appear in various literatures, so that it can provide more comprehensive insights into the research topic. Thus, the literature study method allows researchers to build theory-based arguments supported by academic evidence. In addition, this approach also provides a strong foundation in explaining the problems being researched and developing a deeper conceptual framework on the transformation of the payment system and its impact on financial efficiency and inclusion in Indonesia.

FINDINGS AND DISCUSSION

Development of Digital Payment Systems in Indonesia

The transformation of the payment system in Indonesia has experienced rapid development in line with the adoption of digital technology and government policies that support financial inclusion. The digitalization of the payment system includes the implementation of technologies such as real-time payments, mobile banking, and fintech that make financial transactions easier. According to Bank Indonesia (2023), the volume of digital transactions has increased significantly in the last five years, showing widespread adoption in various economic sectors. The government and Bank Indonesia have issued policies such as QRIS (Quick Response Code Indonesian Standard) and BI Fast Payment to speed up transactions and reduce dependence on cash.

The adoption of digital payment systems in Indonesia is driven by several factors, including ease of use and government support (Pratama & Anas, 2024). QRIS, for example, has become an effective solution in facilitating payment transactions in Indonesia, with a significant increase in transaction volume (Kumoro et al., 2024). In addition, the adoption of digital payments is also influenced by changes in people's

behavior that has shifted from paper-based instruments to digital payments, in line with the growth of information technology and changes in business models (Soegoto et al., 2024).

The use of mobile payment applications such as OVO is also showing rapid growth, driven by architectural innovations that improve user experience and system efficiency (Yani et al., 2024). However, challenges such as low financial inclusion and limited access to financial services still need to be overcome to ensure inclusive growth (Indonesia, 2021). Thus, the transformation of the payment system in Indonesia not only facilitates transactions but also has the potential to reduce poverty and improve the performance of the MSME supply chain (Kilay et al., 2022).

Banking Efficiency and Technological Innovation

Banks in Indonesia have adapted to digital innovation through the development of digital banking applications, the use of blockchain for transaction security, and the improvement of IT infrastructure to support more efficient operations. This transformation not only improves operational efficiency but also expands the bank's customer base and cost-based revenue. By adopting digital technology, banks can collaborate with fintech and e-commerce, which in turn can significantly increase bank profits (Shankar & Jebarajakirthy, 2019).

The use of digital technology in banking has also improved the quality of service to customers. Digital banking applications facilitate transactions, improve time efficiency, and provide greater flexibility to users. This is in line with the standards set by Bank Indonesia, which aims to increase customer loyalty (Shabani et al., 2022). However, this digital transformation also requires banks to have a strong foundation in terms of infrastructure and customer data security, given the increasing risk of cyberattacks (Shankar & Jebarajakirthy, 2019).

In addition, the digitalization of banking in Indonesia has encouraged banks to develop digital competencies at the corporate level, which is important to meet evolving customer expectations (Irawan et al., 2022). Thus, digital innovation in banking is not only important for business sustainability but also to ensure an inclusive and efficient payment system in the era of the Industrial Revolution 4.0 (Irawan et al., 2022).

The adoption of digital banking technology in Indonesia shows a significant impact on bank efficiency, despite the challenges in finding an optimal adoption strategy (Wirdiyanti, 2019). Banks that are too aggressive in adopting this technology can face a decline in financial performance efficiency, while slow adoption can reduce market reach (Wirdiyanti, 2019). Therefore, banks need to balance their digital technology adoption strategies to maintain their competitiveness.

In addition, innovations in e-payment services have also been shown to improve bank financial performance, with bank size strengthening the relationship between e-payment innovation and financial performance (Rahayu et al., 2022). Banks in Indonesia continue to innovate in services and products to remain competitive in the increasingly tight financial services industry (Rahayu et al., 2022).

Overall, adapting to digital innovations not only improves the bank's operational efficiency, but also strengthens their position in facing challenges in the digital economy era. This transformation is important to ensure that the bank can continue to grow and meet the needs of customers in the future.

The Impact of Digital Transformation on Financial Efficiency

Digital transformation has brought significant changes in the efficiency of payment systems, especially through increased speed and reduced transaction costs. The implementation of real-time payment systems, such as BI Fast Payment, has reduced interbank transaction time from a few hours to just seconds, as revealed by Setiawan et al. (2022). This not only speeds up the transaction process but also improves overall operational efficiency (Mavlutova et al., 2022)

In addition, increasingly fierce competition among digital service providers has driven down transaction costs. Consumers and businesses can now enjoy lower costs, which in turn improves financial inclusion and operational efficiency of financial institutions (Mavlutova et al., 2022). Another study shows that digital payment systems, such as those implemented in Nigeria, contribute positively to non-interest income and return on bank equity, showing that a well-developed digital payment system can improve the performance of the banking sector (Takou et al., 2019).

Furthermore, blockchain technology also plays an important role in improving payment efficiency by offering a more secure and transparent process, as well as reducing transaction costs (Tang et al., 2023). Thus, digital transformation in the payment system not only speeds up transactions but also reduces costs, improves efficiency, and expands access to financial services.

Overall, digital transformation in the payment system has brought about a significant positive impact on operational efficiency, transaction speed, and costs, all of which have contributed to the development of a more inclusive and efficient financial sector.

The digitalization of the payment system has brought significant changes in the way banking works and transaction efficiency for customers. With the increasing number of application-based services, banks can reduce their reliance on conventional services such as physical branches and ATMs. This allows banks to reduce operational costs by up to 30%, as stated by Rahman & Putri (2021). In addition, digitalization also allows banks to offer more convenient and efficient services to customers, such as 24/7 access to financial services through internet banking and smartphone applications. The development of digital technology in the banking sector has also encouraged the emergence of fintech, which challenges traditional banking structures and encourages greater innovation and competition. However, with the adoption of advanced technologies such as artificial intelligence (AI) and blockchain, banks can improve transaction security and provide more personalized services (Department of Economics, Jamshedpur Co-operative College, Jamshedpur, India & Lugun, 2024).

Research also shows that digitalization can improve bank profitability by reducing operational costs and improving customer service (Mr. Yasin Vikyani & Dr. Kirit Chauhan, 2024). In India, for example, the growth of digital payments has been shown to increase the profitability of public sector banks (Mr. Yasin Vikyani & Dr. Kirit Chauhan, 2024). Thus, digitalization not only changes the way banking works but also improves efficiency and profitability in the industry.

The digital payment system in Indonesia has shown significant growth in recent years. This is driven by changes in people's behavior that has shifted from the use of paper-based instruments to digital payment methods, in line with the development of information technology and changes in business models (Soegoto et al., 2024). Nonetheless, a study by Chen (2021) shows that countries such as China and India have

already adopted digital payment systems with a wider scope, especially in the use of digital wallets and biometric technology. In Indonesia, the digitization of micro, small, and medium enterprises (MSMEs) through e-payment and e-commerce services has had a positive impact on the performance of the MSME supply chain (Kilay et al., 2022). However, there are still challenges that must be overcome to accelerate this digitalization. In addition, digital payment systems such as Go-Pay and OVO have become popular, especially during the Covid-19 pandemic, when online transactions increased (Widjojo, 2020).

The application of digital payment technology such as the Unified Payments Interface (UPI) from India has also shown success in the Indonesian market, thanks to cross-border cooperation and technology transfer (Anand et al., 2024). However, despite the progress, there are still opportunities to further improve efficiency in Indonesia's digital payment system. This can be done by expanding infrastructure and supporting facilities, especially outside of major cities, to ensure wider adoption (YUCHA et al., 2020).

Overall, although Indonesia has made progress in the digital payment system, there is still room for further improvement and innovation to achieve greater efficiency and wider coverage.

The Role of Digital Payment Systems in Financial Inclusion

The transformation of digital payment systems has been a key driver in increasing financial inclusion, especially for people who previously did not have access to traditional banking services. The use of e-wallets and digital financial applications allows individuals in remote areas to make transactions without having to visit a physical bank, as shown in a study by Kusuma (2020). This is in line with research findings that show that digital transformation in the financial sector can improve financial inclusion and operational efficiency (Mavlutova et al., 2022).

In Kenya, for example, digital payment systems such as M-PESA have revolutionized the financial landscape by improving the accessibility and efficiency of payment systems, which in turn increased the rate of financial inclusion from 26% in 2006 to more than 75% in 2016 (Mugo et al., 2021). Additionally, in India, the adoption of digital payment systems such as UPI and e-wallets has driven an increase in the volume of online transactions, indicating a shift towards a cashless economy (Khan, 2024).

However, despite significant progress, challenges remain, especially in achieving complete financial inclusion. In India, for example, there are still around 190 million adults who do not have access to banking services (Khan, 2024). Therefore, it is important to continue to develop digital infrastructure and policies that support digital financial transformation to ensure that all segments of society can enjoy the benefits of financial inclusion (Arner et al., 2020).

Overall, the transformation of the digital payment system has great potential to improve financial inclusion by providing more accessible and affordable services to people who were previously underserved by the traditional banking system.

MSMEs (Micro, Small, and Medium Enterprises) are one of the sectors that benefit the most from the development of digital payment systems. With the adoption of QRIS (Quick Response Code Indonesian Standard), MSMEs can accept payments digitally without the need for expensive EDC (Electronic Data Capture) devices. This

allows MSMEs to reduce operational costs and increase transaction efficiency. Research by Nugroho et al. (2022) shows that digital transactions in MSMEs have increased by 40% in the last two years, helping them in expanding their markets and improving operational efficiency.

Digitization of MSMEs through digital payment services and e-commerce has been proven to improve the performance of MSME supply chains in Indonesia (Kilay et al., 2022). In addition, the adoption of financial technology and digital payment systems also contributes positively to the financial performance of MSMEs, with consumer trust being an important factor moderating this relationship. In addition, the adoption of financial technology and digital payment systems also contributes positively to the financial performance of MSMEs, with consumer trust being an important factor moderating this relationship (Nurchayati et al., 2024). The use of QRIS and e-commerce as digital payment tools has also been proven to improve MSME sales performance through competitive advantages (Nanang Wahyudin et al., 2022).

However, despite the many benefits felt, MSMEs also face challenges in the adoption of digital payments, such as lack of knowledge about digital payment systems and network disruptions during transactions (Faizah & Siregar, 2023). Therefore, it is important for MSME actors to continue to improve digital literacy and adapt to technological developments to maximize the growth potential of their businesses.

Key Challenges in Digital Payment System Transformation

Digital transformation has brought many benefits, but there is still an access gap between urban and rural areas. A study by Santoso & Widodo (2023) shows that the lack of telecommunication infrastructure and low digital literacy are the main obstacles in the adoption of digital payment systems in rural areas. This is in line with the findings of other studies that show that the disparity in the quality of data infrastructure between urban and rural areas continues to increase, and existing public policies are often unable to keep pace with rapid market developments (Salemink et al., 2017).

In the United States, for example, rural communities face major obstacles such as the absence of ICT infrastructure and geographical isolation from technological advancements (Li et al., 2020). In Brazil, the difference in internet penetration between urban and rural areas is also very striking, with internet penetration rates in rural areas much lower than in urban areas (Cavalcante et al., 2021).

To address this gap, more inclusive policies are needed and adapted to local needs. Research shows that policies that combine connectivity and inclusion issues can help inform more targeted policies for digitally disconnected and marginalized rural communities (Salemink et al., 2017). In addition, the acceleration of digital infrastructure development in rural areas and the integration of digital industries with traditional industries can help reduce the consumption gap between urban and rural areas (Zhang et al., 2023)

Thus, more inclusive policies that focus on improving infrastructure and digital literacy in rural areas are urgently needed to ensure that the benefits of digital transformation can be felt by all levels of society.

Cybersecurity and Digital Infrastructure

The availability of adequate infrastructure is a key factor in the success of the transformation of the payment system. Good infrastructure allows for wider and more efficient access to digital payment services, which in turn can improve financial inclusion

and operational efficiency of financial institutions (Mavlutova et al., 2022). However, there are still limitations in internet and network access in some regions, which hinders the use of digital payment services. These limitations can hinder the growth and adoption of digital payment systems, especially in remote or underdeveloped areas (Zverev et al., 2021).

Digital transformation in the payments sector depends not only on technology, but also on the infrastructure that supports it. A robust infrastructure enables the development of faster and more secure payment systems, and supports innovation in financial services (Toucinho, 2020). In Russia, for example, the development of a fast payment system is a priority to increase the availability of financial services in remote areas, which shows the importance of infrastructure in supporting digital transformation (Zverev et al., 2021).

In addition, adequate infrastructure is also important to ensure the security and protection of consumers in digital transactions. Regulations and policies that support this infrastructure can increase user trust in the digital payment system (Mahgoub, 2021). As such, investing in a robust and reliable digital infrastructure is essential to support a successful and inclusive transformation of the payment system.

In addition to infrastructure, digital literacy is also a major challenge in the adoption of digital technology. A study by Pratama (2021) shows that some people are still reluctant to use digital services due to a lack of understanding of security. This is in line with research findings that show that information literacy and digital skills play an important role in the adoption of information and communication technology (ICT) (Yu et al., 2017). In rural areas, despite the availability of ICT facilities, users often find it difficult to access information technology and overcome the digital divide (Yu et al., 2017).

In addition, the challenge of digital literacy is also felt by small and medium enterprises (SMEs) in regional and rural areas, where the lack of digital understanding and skills is the main obstacle in the adoption of digital technology. Ongoing training programs are recommended to increase digital awareness and knowledge, as well as the skills needed to harness digital innovation (Ollerenshaw et al., 2021).

In the context of education, digital literacy in universities is also an important focus, where the development of digital competencies is part of the curriculum to prepare students for future digital challenges (Gutiérrez-Ángel et al., 2022). Therefore, a comprehensive education program is needed to increase awareness and trust in the digital payment system, as well as overcome existing digital literacy challenges.

Overall, increasing digital literacy through appropriate education and training programs can help people and organizations to be more confident in using digital services, so that they can make the most of digital technology.

Cybersecurity is a major concern in the transformation of digital payment systems. With the increase in digital transactions, the risk of cybercrime such as data theft and fraud is also getting higher. This is due to technological advances that not only provide convenience, but also open loopholes for cybercriminals to carry out attacks. For example, in India, although the digitization of payments provides many benefits, cyber threats such as attacks and data theft are a major concern that requires an inclusive cybersecurity policy (IMS Ghaziabad, India et al., 2024).

Governments in various countries have issued various regulations to improve the security of digital transactions. However, regulation alone is not enough. Stricter

oversight and better consumer protection are needed to address evolving threats. Studies show that technologies like blockchain can improve security by providing transparency and decentralization, which are essential for secure payments (Roy & Tinny, 2024). In addition, the implementation of advanced cybersecurity measures, such as encryption and multi-factor authentication, is also crucial to protect personal data in online financial transactions (Edith Ebele Agu et al., 2024).

To achieve a balance between convenience and security, collaboration between the government, financial institutions, and the community is urgently needed. Thus, the adoption of secure technology and the right policies can ensure a safer and more reliable digital payment ecosystem.

This research makes a significant contribution to payment system theory by highlighting the relationship between digitalization and financial efficiency. Digitalization, especially through digital payment services, has been shown to improve financial efficiency by enabling easier, faster, and more secure transactions. This provides a more affordable alternative to conventional payment methods (Sriyono et al., 2023). In the context of financial inclusion, digitalization plays an important role by expanding access to financial services for individuals who were previously underserved by the traditional banking system. In Indonesia, the use of digital payment services through fintech has made a positive contribution to financial inclusion, allowing for wider access to financial services (Sriyono et al., 2023).

In addition, this study enriches the literature on financial inclusion, especially in the context of developing countries such as Indonesia. Digitalization has enabled broader financial inclusion by reducing barriers to access to financial services, which was previously a major challenge in developing countries (Bani Rachmad & Raharjo, 2023). For example, the adoption of digital wallets in Indonesia shows a positive correlation with increased financial inclusion, which suggests that digital technology can be an effective tool for improving access to financial services (Riandani et al., 2022). As such, these findings provide valuable insights for policymakers and industry players in developing strategies to improve financial inclusion through digitalization in developing countries (Sriyono et al., 2023).

In addition, collaboration between banks, fintech, and the government can accelerate financial inclusion through various innovative programs that target segments of society that have not been reached by banking services. Blockchain technology can lower barriers to financial services for underserved communities, reduce fraud, and simplify the transaction process (Oluwafunmike et al., 2024; Eziamaka et al., 2024). AI is also playing a crucial role in improving financial accessibility by providing personalized financial advice and credit assessments based on alternative data (Nnaemeka Valentine Eziamaka et al., 2024). This collaboration can create a more inclusive financial ecosystem, empower individuals, and drive economic growth globally (Theodore Narku Odonkor et al., 2024).

CONCLUSION

The conclusion of this study shows that digital transformation in the payment system has had a significant impact on financial efficiency and inclusion in Indonesia. The adoption of digital payment technologies, such as e-wallets and QRIS, has enabled wider access to financial services, speeding up transactions, and reducing operational costs. However, major challenges remain, especially related to limited infrastructure in

rural areas and low digital literacy. The research also reveals the importance of new technologies such as blockchain and AI in improving the security and transparency of transactions, as well as accelerating financial inclusion through fintech innovation. The limitations of this study lie in the lack of comprehensive data on the long-term impact and the differences between the formal and informal sectors. For further research, it is recommended to explore the role of government policies in supporting the adoption of digital payment technology in rural areas and developing more specific inclusive models for MSMEs. In practical terms, policies that focus on building digital infrastructure and increasing digital literacy in remote areas are urgently needed to optimize the benefits of digital transformation in the payment system.

REFERENCES

- Arner, D. W., Buckley, R. P., Zetsche, D. A., & Veidt, R. (2020). Sustainability, Fintech and Financial Inclusion. *European Business Organization Law Review*, 21(1), 7–35. <https://doi.org/10.1007/s40804-020-00183-y>
- Bani Rachmad, A. A., & Raharjo, M. (2023). 'Qris Cross Border' as Digital Financial Inclusion Acceleration in Southeast Asia. *Global Local Interactions: Journal of International Relations*, 3(1), 151–161. <https://doi.org/10.22219/gli.v3i1.25234>
- Banna, H., & Alam, M. R. (2020). Islamic Banking Efficiency and Inclusive Sustainable Growth: The Role of Financial Inclusion. *Journal of Islamic Monetary Economics and Finance*, 6(1). <https://doi.org/10.21098/jimf.v6i1.1089>
- Cavalcante, A. M., Marquezini, M. V., Mendes, L., & Moreno, C. S. (2021). 5G for Remote Areas: Challenges, Opportunities and Business Modeling for Brazil. *IEEE Access*, 9, 10829–10843. <https://doi.org/10.1109/ACCESS.2021.3050742>
- D Priyadarshana, T Ramachandra Rao, & M Sambasiva Rao. (2024). Ai and Blockchain Technology for Secure and Transparent Financial Transactions. *International Journal of Science and Research Archive*, 13(1), 2013–2019. <https://doi.org/10.30574/ijrsra.2024.13.1.1845>
- Department of Economics, Jamshedpur Co-operative College, Jamshedpur, India, & Lugun, A. A. (2024). Impact of Digitalisation on Banking Sector. *International Journal of Education, Modern Management, Applied Science & Social Science*, 06(03(I)), 140–146. [https://doi.org/10.62823/IJEMMASSS/6.3\(I\).6844](https://doi.org/10.62823/IJEMMASSS/6.3(I).6844)
- Edith Ebele Agu, Anwuli Nkemchor Obiki-Osafiele, & Njideka Rita Chiekezie. (2024). Addressing Advanced Cybersecurity Measures for Protecting Personal Data in Online Financial Transactions. *World Journal of Engineering and Technology Research*, 3(1), 029–037. <https://doi.org/10.53346/wjetr.2024.3.1.0052>
- Faizah, I., & Siregar, S. E. (2023). Factors that Influence MSMEs Using Digital Payments. *Journal of Islamic Financial Technology*, 2(2). <https://doi.org/10.24952/jiftech.v2i2.11994>
- Gutiérrez-Ángel, N., Sánchez-García, J.-N., Mercader-Rubio, I., García-Martín, J., & Brito-Costa, S. (2022). Digital Literacy in the University Setting: A Literature Review of Empirical Studies Between 2010 and 2021. *Frontiers in Psychology*, 13, 896800. <https://doi.org/10.3389/fpsyg.2022.896800>
- Hadi, S. (1993). *Metodologi research jilid I: Vol. Cet. Ke-24*. Andi offset.
- IMS Ghaziabad, India, Anand, S., Sanchayita, S., IMS Ghaziabad, India, Pandey, M. K., IMS Ghaziabad, India, Suresh, V., Dayanand Sagar University, India, M, G., Christ University, India, S, M. S., ISBR Business School, Sahdev, S. L., ISBR Business School, Chidera, A. G., Alex Ekwueme Federal University, Natanael, N., & Universitas Brawajiya, Indonesia. (2024). Cross-Border Collaboration: India's Upi

- Success Story in Indonesia (a Case Study on Unified Payments System). *International Journal of Accounting & Finance in Asia Pasific*, 7(1), 124–139. <https://doi.org/10.32535/ijafap.v7i1.2903>
- Irawan, B. A., Tjakraatmadja, J. H., Ghazali, A., & Mulyono, N. B. (2022). Corporate Digital Competencies for Digital Banking Innovation: Case Studies in Indonesian Banking Sector. *Journal of Educational, Health and Community Psychology*, 11(4), 712. <https://doi.org/10.12928/jehcp.v11i4.24856>
- Khan, R. (2024). Digital payments Impact on Indian Economy through Banking systems & Global Comparisons. *INTERANTIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT*, 08(05), 1–5. <https://doi.org/10.55041/IJSREM33022>
- Khmous, D. F., & Besim, M. (2020). Impact of Islamic Banking Share on Financial Inclusion: Evidence from Mena. *International Journal of Islamic and Middle Eastern Finance and Management*, 13(4), 655–673. <https://doi.org/10.1108/IMEFM-07-2019-0279>
- Kilay, A. L., Simamora, B. H., & Putra, D. P. (2022). The Influence of E-Payment and E-Commerce Services on Supply Chain Performance: Implications of Open Innovation and Solutions for the Digitalization of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(3), 119. <https://doi.org/10.3390/joitmc8030119>
- Mahgoub, Y. A. (2021). The Transformation of Payments Industry: The European Regulatory Perspective. In A. Sghari & K. Mezghani (Eds.), *Advances in Finance, Accounting, and Economics* (pp. 121–139). IGI Global. <https://doi.org/10.4018/978-1-7998-7110-1.ch006>
- Mardalis. (2006). *Metode Penelitian: Suatu pendekatan proposal* (Cet. 8). Bumi aksara.
- Mavlutova, I., Spilbergs, A., Verdenhofs, A., Natrins, A., Arefjevs, I., & Volkova, T. (2022). Digital Transformation as a Driver of the Financial Sector Sustainable Development: An Impact on Financial Inclusion and Operational Efficiency. *Sustainability*, 15(1), 207. <https://doi.org/10.3390/su15010207>
- Mohd Sollehudin Shuib, Mohd Adib Abd Muin, Mohamad Naimi Mohd Noor, Mohd Taquiuddin Mohamad, & Nuruul Hidayah Mansor. (2023). Digital Payment Transactions: Islamic Finance Perspective. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 36(2), 12–20. <https://doi.org/10.37934/araset.36.2.1220>
- Mr. Yasin Vikyani & Dr.Kirit Chauhan. (2024). A Study on Impact of Digital Payment on Profitability of Public Sector Bank in India. *International Research Journal on Advanced Engineering and Management (IRJAEM)*, 2(09), 2811–2815. <https://doi.org/10.47392/IRJAEM.2024.0410>
- Mugo, M., Evelyne, K., & Mariga, A. W. (2021). Powering Financial Inclusion through

Innovative Payment Systems. In M. Mugo, K. Evelyne, & A. W. Mariga, *50 Years of Central Banking in Kenya* (pp. 349–380). Oxford University Press. <https://doi.org/10.1093/oso/9780198851820.003.0016>

- Nanang Wahyudin, Novita Herlissha, Christianingrum, & Dwi Rizki Aldiesi. (2022). The Utilization of E-Commerce and QRIS as Digital Payment Tools to Improve Sales Performance through Competitive Advantage in MSME: The Utilization of E-Commerce and QRIS as Digital Payment Tools to Improve Sales Performance through Competitive Advantage in MSME. *Journal of Consumer Sciences*, 7(2), 134–147. <https://doi.org/10.29244/jcs.7.2.134-147>
- Nnaemeka Valentine Eziamaka, Theodore Narku Odonkor, & Adetola Adewale Akinsulire. (2024). Pioneering Digital Innovation Strategies to Enhance Financial Inclusion and Accessibility. *Open Access Research Journal of Engineering and Technology*, 7(1), 043–063. <https://doi.org/10.53022/oarjet.2024.7.1.0029>
- Nurchayati, N., Ariyanti, R., & Marianingsih, I. (2024). How Fintech Adoption, Digital Payment Systems, and Consumer Trust Shape Financial Performance of MSMEs. *International Journal of Business, Law, and Education*, 5(2), 2458–2469. <https://doi.org/10.56442/ijble.v5i2.895>
- Ollerenshaw, A., Corbett, J., & Thompson, H. (2021). Increasing the Digital Literacy Skills of Regional Smes Through High-Speed Broadband Access. *Small Enterprise Research*, 28(2), 115–133. <https://doi.org/10.1080/13215906.2021.1919913>
- Rahayu, R., Mariska, W., & Garantjang, M. F. (2022). E-Payment Innovation in Improving Bank Indonesia's Financial Performance. *International Journal of Economics, Business and Accounting Research (IJEBAR)*, 6(1), 381. <https://doi.org/10.29040/ijebar.v6i1.4663>
- Riandani, O., Sari, D., Rubiyanti, N., Moeliono, N. K., & Fakhri, M. (2022). The Relationship Between Digital Wallet Adoption and Usage to Financial Inclusion. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 1–5. <https://doi.org/10.46254/AF03.20220203>
- Roy, A., & Tinny, S. S. (2024). Cybersecurity and Blockchain for Secure Financial Transactions: Evaluating, Implementing, and Mitigating Risks of Digital Payments. *International Journal of Applied and Natural Sciences*, 1(2), 38–48. <https://doi.org/10.61424/ijans.v1i2.95>
- Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies*, 54, 360–371. <https://doi.org/10.1016/j.jrurstud.2015.09.001>
- Shabani, L., Behluli, A., Qerimi, F., Pula, F., & Dalloshi, P. (2022). The Effect of Digitalization on the Quality of Service and Customer Loyalty. *Emerging Science Journal*, 6(6), 1274–1289. <https://doi.org/10.28991/ESJ-2022-06-06-04>

- Shankar, A., & Jebarajakirthy, C. (2019). The Influence of E-Banking Service Quality on Customer Loyalty: A Moderated Mediation Approach. *International Journal of Bank Marketing*, 37(5), 1119–1142. <https://doi.org/10.1108/IJBM-03-2018-0063>
- Soegoto, H., Apsarini, F., & Supandi, A. (2024). Payment System Development in Indonesia. *Jurnal Riset Bisnis Dan Manajemen*, 17(1), 11–20. <https://doi.org/10.23969/jrbm.v17i1.10416>
- Sriyono, S., Andjani, S., & Irawan, M. F. (2023). Evaluation of Fintech's Impact on Financial Inclusion in Indonesia: A Case Research on the Use of Digital Payment Services. *The Management Journal of Binaniaga*, 8(2), 91–102. <https://doi.org/10.33062/mjb.v8i2.32>
- Tang, Q., Shang, H., Kong, Y., & Sun, S. (2023). Promoting the Digital Transformation of The Payment Industry Based on Blockchain Technology. *International Journal of Education and Humanities*, 11(3), 525–527. <https://doi.org/10.54097/ijeh.v11i3.15163>
- Theodore Narku Odonkor, Nnaemeka Valentine Eziamaka, & Adetola Adewale Akinsulire. (2024). Advancing Financial Inclusion and Technological Innovation Through Cutting-Edge Software Engineering. *Finance & Accounting Research Journal*, 6(8), 1320–1348. <https://doi.org/10.51594/farj.v6i8.1375>
- Toucinho, A. (2020). How Payments Drive Digital Transformation. *Journal of Payments Strategy & Systems*, 14(1), 10. <https://doi.org/10.69554/MPPO4536>
- Yu, T.-K., Lin, M.-L., & Liao, Y.-K. (2017). Understanding Factors Influencing Information Communication Technology Adoption Behavior: The Moderators of Information Literacy and Digital Skills. *Computers in Human Behavior*, 71, 196–208. <https://doi.org/10.1016/j.chb.2017.02.005>
- YUCHA, N., SETIAWAN, S., MUTTAQIIN, N., EKASARI, R., & MAULADI, K. F. (2020). Digital Payment System Analysis of Buying Decision in Indonesia. *The Journal of Asian Finance, Economics and Business*, 7(10), 323–328. <https://doi.org/10.13106/JAFEB.2020.VOL7.N10.323>
- Zhang, Y., Ma, G., Tian, Y., & Dong, Q. (2023). Nonlinear Effect of Digital Economy on Urban–Rural Consumption Gap: Evidence from a Dynamic Panel Threshold Analysis. *Sustainability*, 15(8), 6880. <https://doi.org/10.3390/su15086880>
- Zverev, A., Mandron, V. V., & Sereda, A. (2021). Functioning of the Fast Payment System in Russia. *Scientific Research and Development. Economics*, 9(4), 23–28. <https://doi.org/10.12737/2587-9111-2021-9-4-23-28>