Research Paper

Greening the Bottom Line: How Do Banking Sectors Implement Technology to Support Sustainable Development Goals in Innovation?

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Abstract

The urgent need to align banking practices with the Sustainable Development Goals (SDGs) has become increasingly apparent, particularly in the context of fostering industry, innovation, and infrastructure. The primary issue at hand is the insufficient integration of SDG 9 into banks' core strategies and operations, despite its critical importance for sustainable development. The novelty of this study lies in its detailed examination of the extent to which Indonesian banks support SDG 9 through their reported activities, an area that has been underexplored in previous research. This research aimed to investigate the level of support from banking industries to the Sustainable Development Goals (SDGs), with a particular focus on SDG 9: industry, innovation, and infrastructure. This study utilized a content analysis approach to collect secondary data from the sustainability reports of 44 banks listed on the Indonesia Stock Exchange between 2017 and 2020, resulting in 176 observations. In cases where sustainability reports were unavailable, annual and combined reports were used as unit analyses. The findings revealed that Indonesian banks have undertaken various activities to support SDGs, and there has been an increasing trend in disclosure from 2017 to 2020. However, the study found that a significant role of technology transformation, which should lead to innovation and support for SDG 9, was lacking. This finding suggests that SDGs are still primarily measured by external activities rather than internal activities, despite the importance of business strategy in supporting SDGs. Another significant finding was that micro, small, and medium enterprises (MSMEs) received the most support for sustainable business activity categories (SBAC). The research contributes to the literature by providing insights into the level of support for SDG 9 and SBACs. The study also underscores the importance of measuring the impact of digital banking services, which have been widely implemented, and the need for significant support for SBAs in the environmental sector.

Keywords: *Green Finance; Banks; Indonesia; Sustainability Report; Technology; Innovation; Sustainable Development Goals (SDGs)*

INTRODUCTION

The Covid-19 pandemic has caused a rise in technology in Indonesia, which has changed human behavior, including in business and daily activities. According to the latest report from Gartner (Burke, 2020), the development of technology during the COVID-19 pandemic has had a positive impact on the technology sector. However, the increase in technology usage has also brought about some challenges in terms of cybersecurity, such as the rise in cyberattacks and threats to user data privacy. Furthermore, environmental degradation caused by human activities such as the use of fossil fuels, mining, and deforestation without proper reforestation can also contribute to technology (Niculescu, 2017). Such activities lead to greenhouse gas emissions, health problems, and loss of biodiversity, which in turn affect people's ability to access food and decrease their purchasing power. The continued relevance of Covid-19 lies in its long-term effects on global health, economies, and technology adoption, making it a critical factor in shaping future strategies for sustainable development and technological integration, particularly in how the banking sector leverages technology to support Sustainable Development Goals (SDGs) in innovation.

To address these issues, sustainable development must be prioritized. Sustainable development considers the social, economic, and environmental impacts of any activity on present-

and future generations. The Millennium Development Goals (MDGs) were introduced in 2000 to support sustainable development in developing and less developed countries. However, the MDGs had several weaknesses and did not involve non-government stakeholders such as academic institutions, non-governmental organizations, and the private sector (Bennich et al., 2020; Niculescu, 2017).

The Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by the United Nations General Assembly in 2015 as part of the 2030 Agenda for Sustainable Development (Fonseca & Carvalho, 2019; Gulseven, 2020). The SDGs aim to end poverty, protect the planet, and ensure peace and prosperity for all. The goals cover a wide range of areas, including poverty, hunger, health, education, gender equality, clean water and sanitation, renewable energy, economic growth, industry, innovation, and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, and partnerships for the goals.

The SDGs are interconnected and interdependent, meaning that progress toward one goal can have a positive impact on others. Achieving these goals requires a collaborative effort from governments, civil society, the private sector, and individuals. The private sector, in particular, plays a crucial role in advancing SDGs through its business practices, investments, and innovation, especially in banking sector. Many companies are integrating SDGs into their business strategies and operations, recognizing that sustainability is essential for long-term business success and social well-being.

Digital transformation in banking sector has brought significant changes to the delivery of financial services. With the increasing adoption of digital channels, banks can now provide services around the clock, improving customer experience. Digital transformation has also enabled banks to streamline their operations and reduce costs, resulting in lower fees and interest rates for customers. Furthermore, digital infrastructure development can be a crucial enabler of economic growth, contributing to increased access to financial services in under-served communities. Digital banking services can also promote financial inclusion by enabling access to basic financial services, such as savings accounts and payment services, leading to increased productivity and entrepreneurship.

Moreover, digital technologies in banking can play a significant role in the achievement of sustainable development goals (SDGs), particularly SDG 9 (Nobrega et al., 2021; Pradhan et al., 2021). Banks can provide financing for renewable energy projects, such as solar and wind farms, which can reduce carbon emissions and promote sustainable energy practices. In addition, banks can finance infrastructure projects essential for economic development, such as transportation and communication networks. By leveraging digital tools and platforms, banks can improve their operations, provide better customer services, and contribute to the development of sustainable infrastructure (Pyka & Nocoń, 2021). The transformation of the banking sector through digital technologies presents significant opportunities for the achievement of SDG 9 and other SDGs related to poverty reduction, economic growth, and environmental sustainability. However, there is a gap in the literature on the level of support from banking industries toward achieving the SDGs, particularly through digital transformation, while some studies seek the roles of technology from only business aspectss (Halimatussadiah et al., 2018). Therefore, this research aims to fill this gap by investigating the extent to which banking industries are supporting the SDGs and how digital transformation is contributing to this support, with a particular focus on SDG 9. By doing so, this research provides insights into how digital transformation can be leveraged to achieve SDGs and the role of banking industries in this process.

LITERATURE REVIEW

Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs), established by the United Nations in 2015, comprise 17 interlinked global goals designed to achieve a better and more sustainable future for all by 2030. These goals address a broad range of global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice (Cammarano et al., 2022; Dodo et al., 2021; Hudaefi, 2020). SDG 9, in particular, focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. This goal underscores the importance of technological progress and innovation as critical drivers of economic growth and sustainable development. The implementation of SDGs requires concerted efforts from governments, businesses, civil society, and individuals to achieve significant progress across various sectors and regions (Niculescu, 2017).

Achieving the SDGs necessitates a comprehensive approach that integrates economic, social, and environmental dimensions of development. One critical challenge is to align public policies, private sector strategies, and community actions toward these goals. The role of technology and innovation is pivotal in this context, offering solutions to complex problems such as renewable energy, sustainable agriculture, and smart infrastructure. Moreover, the SDGs emphasize the need for partnerships and collaboration at all levels to mobilize resources, share knowledge, and implement best practices. This holistic approach ensures that progress in Fitri and Jauhari (2021) and Killian et al. (2019), one area supports and accelerates advancements in other areas, fostering a more sustainable and equitable world.

Banking Sector

The banking sector plays a crucial role in the global economy by providing essential financial services that facilitate economic growth and development (Riza, 2019; Vo et al., 2021). Banks act as intermediaries between savers and borrowers, offering a range of products such as loans, deposits, and investment services. In recent years, the banking industry has undergone significant transformation driven by technological advancements and regulatory changes. Digital banking, fintech innovations, and an increased focus on customer experience are reshaping the traditional banking landscape. These changes have enabled banks to operate more efficiently, offer personalized services, and expand their reach to underserved populations (Ata, 2019; Bukair & Rahman, 2015; Forte et al., 2020).

In addition to their financial intermediation role, banks have a significant impact on sustainable development (Abdullah et al., 2013; Halimatussadiah et al., 2018). By aligning their lending and investment practices with environmental, social, and governance (ESG) criteria, banks can drive positive change and contribute to the achievement of the SDGs. Sustainable finance initiatives, such as green bonds and impact investing, are becoming increasingly important as banks recognize their responsibility to support environmentally and socially responsible projects. Furthermore, regulatory frameworks and market pressures encourage banks to integrate sustainability into their core business strategies, enhancing transparency and accountability in their operations (Klimontowicz, 2019; Pyka & Nocoń, 2021).

Green Financing

Green financing refers to financial investments that support environmentally sustainable projects and initiatives. This includes funding for renewable energy projects, improvements in energy efficiency, sustainable agriculture, and conservation efforts. Green finance instruments, such as green bonds, green loans, and sustainability-linked loans, are designed to provide capital for projects with positive environmental impacts. The growth of green financing is driven by the

increasing awareness of climate change, regulatory mandates, and the rising demand for sustainable investment opportunities from both institutional and retail investors (Baicu et al., 2020; Klimontowicz, 2019).

The banking sector is at the forefront of green financing, leveraging its financial expertise and resources to support transitioning to low-carbon economies. By offering green financial products and services, banks can mitigate environmental risks and promote sustainable development. This involves assessing the environmental impact of their lending portfolios, setting sustainability targets, and engaging with clients to encourage sustainable practices (Nadiah & Rosyidi, 2020; Wibowo et al., 2019). The integration of green financing into mainstream banking operations is essential for achieving SDGs, particularly those related to climate action (SDG 13), clean energy (SDG 7), and sustainable cities and communities (SDG 11). As green financing continues to evolve, it will play a pivotal role in mobilizing the capital needed to address global environmental challenges and build a more sustainable future.

The banking sector plays a pivotal role in driving sustainable development, particularly in the context of achieving the United Nations Sustainable Development Goals (SDGs). With the increasing recognition of the environmental and social impacts of financial activities, banks are increasingly adopting sustainable practices that align with global sustainability agendas. Previous studies have shown varying levels of contribution by banks to SDGs across regions. For instance, European banks have low overall contribution to SDGs, driven primarily by bank-specific strategies that address certain goals more extensively than others (Avrampou et al., 2019). In India, the adoption of sustainable banking practices is in its early stages, with a focus on social aspects over environmental management (Kumar & Prakash, 2019). Subnational Development Banks have been found to improve the efficiency and effectiveness of SDG investments by connecting local needs to global goals (Suchodolski et al., 2022). Furthermore, banks implement diverse sustainability strategies driven by business, social, and environmental motives, with varying focus, scope, and support (Zimmermann, 2019). This study explores how Indonesian banks leverage technology to support SDG 9, which focuses on industry, innovation, and infrastructure. By examining banks' strategies, technologies, and challenges, this research provides a comprehensive understanding of their contributions to sustainable development. This study also fills a critical gap in the literature by focusing on specific technological implementations and innovations in the Indonesian banking sector, offering insights into the effectiveness of these efforts in promoting sustainable growth and development.

Table 1. Novelty of Current Research

Authors	Year	Result Overview
Anna Avrampou et al.	2019	European banks' overall contribution to SDGs is low, with bank-specific strategies driving the most extensively addressed goals.
Kishore Kumar et al.	2018	Indian banks prioritize social aspects over environmental management and green product development in the early stages of sustainable banking practices.
S. Suchodolski et al.	2021	Subnational Development Banks improve efficiency and effectiveness of SDG investments by connecting local needs to global goals.
Salome Zimmermann et al.	2019	Banks implement four distinct sustainability strategies driven by business, social, and environmental motives with varying focus, scope, and support.
Novelty of Current Research		Investigate how Indonesian banks specifically implement technology to support SDG 9, providing specific examples, addressing gaps in technology transformation and innovation, and analyzing the role of technology in enhancing support for SDGs within the Indonesian banking sector.

RESEARCH METHOD
Research Design
This study employed a qualitative descriptive method with content analysis. According to Elo and Kyngäs, (2008), content analysis is a scientific study of communication content through the systematic grouping of symbols used to decipher messages. The content analysis method was used in this study to evaluate the information in sustainability reports, annual reports, and combined reports from 2017 to 2020. This information includes banking support for the Sustainable Development Goals (SDGs) and how banks implement sustainable finance through sustainable financing based on 12 Sustainable Business Activities Categories (SBACs).

Research Variables
The variables applied in this study are conceptual variables:
1. The Sustainable Development Goals (SDGs) are an international agenda agreed upon by the government, private sector, and society to improve the welfare of the people by reducing economic disparities and protecting the planet from climate change (Asadikia et al., 2021).
2. The banking sector is a state financial institution with a role to collect funds from the public in the form of deposits or investments and channel funds to the community in the form of credit or other forms to improve people's standard of living (Halimatussadiah et al., 2018).
3. Green financing is a form of responsible financial investment through financing projects that support sustainable economic development to achieve a balance between economic, social, and environmental interests (Zheng et al., 2021).

Data Collection Procedure
Research Data
This study uses secondary data in the form of sustainability reports, annual reports, and combined reports from banking companies listed on the Indonesia Stock Exchange (IDX) for the period 2017, 2018, 2019, and 2020. The primary report used in this study is the sustainability report to search for disclosures related to support for SDGs and green financing initiatives. If the bank does not have a sustainability report, an alternative report is the annual or combined report.

Population and Sample
The population in this study is 44 banks listed on the IDX available from 2017 to 2020, comprising 176 samples for unit analyses. The sample selection is done using purposive sampling criteria, with the requirement that banks must be listed on the IDX for four consecutive years (2017-2020) to ensure homogeneity (Amidjaya & Widagdo, 2019, 2020). The unit of analysis used in this study is the sustainability report, annual report, or combined report.

Data Collection Method
The sampling was carried out by downloading reports from the bank's website, which was accessed in October 2021. Apart from content analysis, this study also conducted interview using snowball sampling with open-ended questions were conducted to complement the analysis. Interviews were employed to gather firsthand insights from key stakeholders in the banking sector, including executives and experts in sustainable finance. The interviews were conducted using a semi-structured approach, allowing for flexibility in exploring the topic while also ensuring consistency in the questions asked. The interview questions were designed to elicit information on how banks are implementing technology to support sustainable development goals and the challenges they face in doing so. The insights gained from the interviews were complemented by a content analysis of sustainability reports, annual reports, and combined reports to provide a

comprehensive understanding of how the banking sector is using technology to support sustainable development goals in innovation.

The interview questions included the following:

1. Can you describe your role and responsibilities within your organization?
2. How does a bank define and prioritize sustainable development goals (SDGs)?
3. What technologies have your bank implemented to support sustainable development goals, particularly SDG 9 (industry, innovation, and infrastructure)?
4. Can you provide specific examples of how these technologies are being used in your bank's operations?
5. How does your bank ensure that the implemented technologies align with your sustainability objectives?
6. What challenges has your bank faced in implementing technology to support SDGs?
7. How has your bank addressed these challenges?
8. Are there any specific regulatory or compliance issues that impact your bank's ability to implement sustainable technologies?

The study involved conducting interviews with five participants to gain diverse perspectives on how banks are implementing technology. The interviewees included a senior executive from a leading Indonesian bank, a sustainability officer from another major bank, an academic specializing in sustainable finance, a technology consultant with experience in the banking sector, and a representative from a regulatory body. These interviews were conducted to serve as a triangulation method, ensuring the validity and reliability of the findings derived from the content analysis of sustainability, annual, and combined reports. The semi-structured interviews provided insights into the strategies, technologies, and challenges faced by banks in supporting SDG 9, as well as external perspectives on the effectiveness and regulatory impacts of these efforts. The triangulation approach helped to offer a comprehensive understanding of how the Indonesian banking sector is leveraging technology to promote sustainable development and innovation.

Data Analysis Method

Content analysis is a data collection technique that analyzes and measures information or content into categories that have been systematically determined (Hsieh & Shannon, 2005). The data measurement process in this study involves assigning weights or scores based on the disclosure of the 17 SDGs in the annual and sustainability reports from 2017 to 2020. The weight/score given uses a dummy code expressed as the number "1" if there is information available for each of the 17 SDGs and "0" if the information is not available in the annual or sustainability reports (Braam & Peeters, 2018). Therefore, all sustainability reports, annual reports, and combined reports are analyzed using content analysis techniques to determine the level of bank support for the SDGs and green financing initiatives, with a focus on SDG 9 and the digital transformation of banking.

The data from the content analysis and interviews will be analyzed using NVivo software. NVivo is a computer-assisted qualitative data analysis software that enables researchers to organize, manage, and analyze qualitative data (Yin, 2003). NVivo is used to manage data, code data, and identify themes. The software also enables researchers to visualize data and identify relationships among different themes, which can provide deeper insights into the research questions.

FINDINGS AND DISCUSSION
Description of Data

The data collection method used in this study was through secondary data, namely, sustainability reports, which were the main reports used in this study, and annual reports as an alternative if the company does not have a sustainability report. The sample collection limit in this study was from banking listed on the Indonesia Stock Exchange from 2017 to 2020.

Based on Table 1, it can be seen that the number of samples are 44 banking companies. The data also show an increase in the number of sustainability reports published by banks each year, except from 2017 to 2018, which did not show an increase. This may be due to the new regulation on the preparation of sustainability reports in 2017 based on the Financial Services Authority (FSA) regulation No 51/POJK.03/2017, and banks were still learning about the sustainability report preparation process.

Table 1. Samples

Year	AR (Stand Alone)	SR (Stand Alone)	Combined Report (AR & SR)	Number of Sample
2017	32	12	0	44
2018	32	12	0	44
2019	23	18	3	44
2020	14	25	5	44

Disclosure of SDG Results

Figure 1 ranks SDGs from most frequently disclosed to least frequently disclosed by banks each year. Overall, from 2017 to 2020, the SDG with the least frequency of disclosure by banks was SDG 14: Life Below Water, with a score of 3.25, meaning that only three companies disclosed their support for SDG 14 each year. According to Haward and Haas, (2021) and Ntona and Morgera, (2018), SDG 14 requires special attention through the conservation and sustainable use of marine resources. This may be due to banks' lack of awareness of the need to maintain ocean biodiversity and the relatively small number of maritime activities in Indonesia. However, the government is currently working to support development in the marine sector through blue bonds. Blue bonds are debt securities issued to raise capital related specifically to the ocean to achieve a sustainable ocean economy. Companies, financial institutions, and the government are authorized to issue blue bonds as an initiative to support SDG 14 (Asadikia et al., 2021; Hudaefi, 2020).
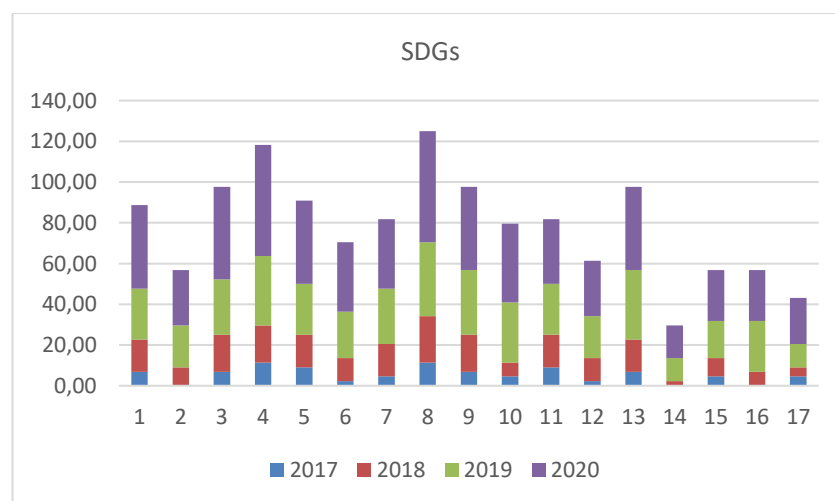

Figure 1. SDGs Disclosure

The SDG most frequently disclosed by banks was SDG 8: "Decent Work and Economic Growth," with a score of 13.75, meaning that 14 companies disclosed their support for SDG 8 each year. This may be due to banks' role as collectors and distributors of public funds, providing funding for companies and SMEs to advanced entrepreneurship in Indonesia. Banks must be present in the community to provide easy access to banking services, and through the presence of bank branches throughout Indonesia, they can have a positive impact by creating job opportunities for local communities and creating a comfortable and safe work environment in support of SDG 8.

In the context of digital transformation, banks in Indonesia have also implemented various innovations and investments to strengthen technology and digitization as a form of support for SDG 9: Industry, Innovation, and Infrastructure. Examples of innovations carried out by banks in Indonesia include digital banking services, mobile banking, and e-commerce. Banks also invest in information and communication technology infrastructure to improve business efficiency and productivity and enhance customer service (OJK, 2020).

Disclosure of the Sustainable Business Activity Category

The Sustainable Business Activity Category (SBAC) is a classification system that identifies environmentally sustainable business activities (See Figure 2). This project was developed by the Financial Services Authority of Indonesia (Otoritas Jasa Keuangan or OJK) in collaboration with the Ministry of Environment and Forestry (KLHK), the Ministry of Industry (Kemenperin), and the Ministry of Finance (Kemenkeu).
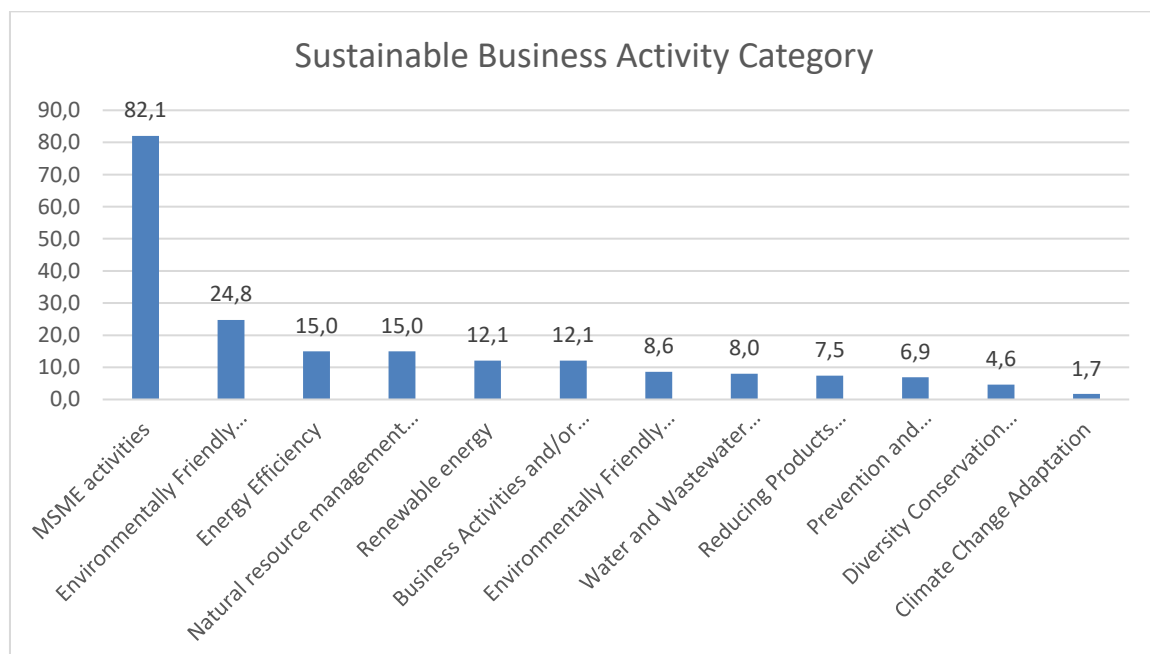

Figure 2. SBAC Disclosure

Green financing refers to the provision of financial services to businesses and projects that have a positive impact on the environment. MSMEs are a crucial sector for green financing because they have the potential to significantly reduce negative environmental impacts through sustainable business practices. According to data in Figure 4.10, the highest allocation of green financing in Indonesia is in the MSME sector, at 82.07%. This underscores the importance of supporting MSMEs in adopting sustainable business practices and promoting sustainable development goals related to green financing.

However, several obstacles still need to be addressed for MSMEs to fully utilize digital technology and green financing potential (Zheng et al., 2021). Some of these obstacles include limited access to technology and finance, a lack of understanding of the benefits of digital technology, and inadequate regulations supporting green financing. Therefore, cooperation is needed between the government, private sector, and MSME support institutions to facilitate digital transformation and green financing for MSMEs in Indonesia.

In addition, digital transformation can achieve other sustainable development goals, such as reducing socioeconomic inequality and increasing financial inclusion. In the context of financial inclusion, digital technology can improve access to financial services for people who are not served by traditional banking, such as mobile-based and crowdfunding platforms (Bukair & Abdul Rahman, 2015). However, it should be noted that digital transformation cannot be seen as a single solution to all development problems. Collaboration and cooperation among sectors and stakeholders are still needed to achieve sustainable development goals holistically (Gunawan, 2015).

Table 2. Interview results

Theme	Code	Interview Quotes
The types of Technology Used by Banks to Support Sustainable Development Goals	Green Technology	We focus on the use of green technology, such as energy management systems, to reduce the environmental impact of our banking operations
	Digital Technology	We have adopted digital technology to improve operational efficiency and reduce carbon emissions.
	Blockchain Technology	We are considering the use of blockchain technology to enhance the transparency of our supply chain and monitor the environmental impact of our business.
Factors Influencing the Success of Sustainable Technology Adoption in the Banking Sector	Organizational Factors	We need support from management and employees in adopting sustainable technology
	Policies and Organizational Culture	We have clear policies and an organizational culture that supports sustainable initiatives
	Regulation	Clear and consistent regulation is crucial for us to adopt sustainable technology
	Pressure from the society	Pressure from society and customers also influences our decisions to adopt sustainable technology.
Barriers to the Adoption of Sustainable Technology in the Banking Sector	Cost	The high initial costs of implementing sustainable technology can be a barrier for us.
	Technical Challenges	Technical challenges and limitations of sustainable technology can hinder its adoption
	Awareness and Knowledge	Lack of awareness and knowledge about sustainable technology among our employees and customers can be a barrier.
	Organizational Factors	Resistance to change and inertia in the organization can also impede the adoption of sustainable technology.
	Availability	The availability of sustainable technology solutions in the market can be limited, which makes it difficult for us to adopt them

Discussion

This research focuses on the disclosure level of sustainable development goals (SDGs) by Indonesian banks during 2017-2020 by addressing SDG 9 for innovation. Generally, the findings indicate that banks have the lowest level of disclosure in SDG 14, which aims to preserve marine

ecosystems. This is concerning because marine ecosystems play a crucial role in sustaining life on earth, and immediate attention is required to conserve and sustainably utilize its resources. The Indonesian government has taken some initiatives, including the blue bond, to promote sustainable development in the marine sector. Banks can play a crucial role in supporting such initiatives and enhancing their disclosure of SDG 14 by financing projects that promote sustainable use of marine resources. The research highlights the high level of disclosure of SDG 8 by banks in Indonesia, which is not surprising, as banks provide funding to businesses and micro-enterprises that promote economic growth and job opportunities. Banks should continue supporting SDG 8 by providing funds to businesses that promote sustainable practices and create job opportunities for local communities. Specifically, this study emphasizes the importance of digitalization in supporting SDG 9, which focuses on promoting innovation and infrastructure. Indonesian banks have invested in digital technology to enhance their efficiency, productivity, and service delivery. It is commendable that banks continue investing in digitalization to support SDG 9.

Comparing this research to previous studies on sustainable banking, the findings align with the idea that sustainable banking is an essential aspect of sustainable development (Halimatussadiah et al., 2018; Klimontowicz, 2019). Previous research has emphasized that banks can play a critical role in promoting sustainable development by incorporating environmental, social, and governance (ESG) factors into their operations, particularly to assure data security. This issue is crucial in the midst of vast technological developments. In addition, banks can support sustainable development by financing projects that promote sustainable practices and create job opportunities for local communities. The research on Indonesian banks' disclosure of SDGs is also consistent with prior studies that showed that disclosure is a crucial element in promoting sustainable banking practices (Amidjaya & Widagdo, 2020). Research suggests that banks that disclose their sustainability performance are more likely to integrate sustainability into their operations and be more committed to promoting sustainable development.

Furthermore, disclosure enhances stakeholders' trust and confidence in the bank and improves its reputation. The research's emphasis on digitalization as a means to support SDG 9 is also consistent with prior studies that highlighted the role of technology in promoting sustainable banking practices. Digitalization can enhance banks' efficiency and productivity while reducing their carbon footprint by replacing paper-based transactions with electronic transactions. In addition, digitalization can facilitate financial inclusion by providing access to banking services for underserved communities.

According to data from the Indonesia Stock Exchange, the banking industry in Indonesia has been increasing its investments in digital transformation. In 2021, several banks allocated billions of rupiahs to improve their technology infrastructure and digital banking. For instance, Bank Mandiri has allocated a budget of Rp 15 trillion for digital technology investments from 2021 to 2025. The Bank Rakyat Indonesia (BRI) has also allocated Rp 6.5 trillion for developing information technology infrastructure in 2021. Furthermore, Bank Central Asia (BCA) spent Rp 5.6 trillion on technology investments in 2021 (Marlina, 2020). Data from the Digital Bank Association of Indonesia (ABDI) in 2020 showed that the number of banking transactions through digital channels reached 10 billion, representing a 25% increase over the previous year. The value of digital banking transactions also increased by 40% to reach Rp 63.7 trillion in the same year. This indicates that digital transformation is becoming increasingly important for the banking industry in Indonesia, as more people are switching to digital banking services (Mulyasari et al., 2014).

Based on data from Bank Indonesia, in September 2021, there was an 8.5% increase in the number of banking transactions through digital banking compared with the previous year, reaching 3.6 billion with a transaction value of Rp 1,920 trillion. This increase shows that the use of digital

banking in Indonesia is increasing. In addition, fintech has become an important part of the banking industry in Indonesia, with 412 fintech companies operating in the country, of which 91% are involved in payments and remittances, as well as online loans.

However, some digital transformation technologies have not been fully adopted by banks in Indonesia. According to a report by McKinsey in 2019, only 27% of the 64 banks in Indonesia have used big data analytics in their operations, indicating that most banks are still in the early stages of utilizing this technology. On the other hand, the cloud computing market in Indonesia grew by 29.3% in 2020 to reach USD 1.5 billion, indicating that more banks are using this technology. However, the use of other technologies, such as blockchain and the Internet of Things (IoT), is still limited (Härle et al., 2018). According to a report by AT Kearney in 2020, only around 20% of banks in Indonesia use IoT in their operations, but most companies are considering using this technology.

The results of the interviews (See Table 2) revealed three important topics related to digitalization in the banking industry. The first topic highlights the significance of utilizing technology to accomplish sustainable development goals. To support sustainability, banks have adopted various types of technology, such as green, digital, and blockchain technology. Green technology helps banks reduce their environmental impact, while digital technology enhances operational efficiency and reduces carbon emissions (Wilson & Pomfret, 2014). Blockchain technology is also being explored to promote supply chain transparency and monitor business environmental impacts. The adoption of these technologies by banks demonstrates their commitment to promoting sustainable development and reducing their environmental impact.

The second topic revolves around the factors that influence the successful adoption of sustainable technology in the banking industry. Organizational factors such as management and employee support are crucial to achieving this goal. Additionally, having clear policies and an organizational culture that supports sustainable initiatives is necessary (Blomqvist et al., 2016). Consistent regulation is critical to promoting the adoption of sustainable technology by banks (Gray, 2015). Lastly, pressure from society and customers is an influential factor because they hold banks accountable for their environmental impact.

Despite the benefits of adopting sustainable technology in the banking sector, several barriers hinder its adoption. The banking sector stands to benefit from adopting sustainable technology; however, several barriers hinder its widespread adoption. Firstly, the high initial cost of implementing sustainable technology is a significant barrier because banks may not have the necessary resources to invest in expensive solutions. Secondly, technical challenges and limitations of sustainable technology can hinder its adoption because some solutions may not be fully developed or may not work efficiently. Thirdly, barrier is the lack of awareness and knowledge among employees and customers, who may not understand the benefits of sustainable technology or how to use it effectively. Fourthly, resistance to change and organizational inertia can hinder the adoption of sustainable technology, particularly if traditional methods are used for a long time. Lastly, the availability of sustainable technology solutions can be limited, which makes it challenging for banks to adopt them. To overcome these barriers, a collaborative effort from banks, governments, and stakeholders is necessary, including investing in research and development to improve efficiency and affordability, providing incentives and regulations to encourage adoption, and increasing awareness and education about the benefits of sustainable technology (Gunningham, 2020).

CONCLUSIONS

In the context of digital transformation, the banking industry in Indonesia has made various innovations and investments to strengthen technology and digitization in support of SDG 9. The industry has allocated significant budgets for digital technology investments, resulting in an

increase in the number and value of digital banking transactions. However, some digital transformation technologies, such as big data analytics, blockchain, and IoT, have not been fully adopted by banks in Indonesia. On the other hand, UMKM is an important sector for green financing, with the highest allocation of green financing being directed toward UMKM. Nevertheless, several barriers still need to be overcome to optimize UMKM's potential for digital technology and green financing. Collaboration among the government, private sector, and UMKM support institutions is needed to facilitate digital transformation and green financing for UMKM in Indonesia. Additionally, digital transformation can achieve other sustainable development goals, such as reducing social-economic inequality and improving financial inclusion. In summary, the banking industry in Indonesia has invested in various digital transformation areas, but it is still in the early stages and has not fully adopted these technologies. There is a need to accelerate the adoption of these technologies to achieve SDG 9 in the context of digital transformation.

LIMITATION & FURTHER RESEARCH

While this research provides valuable insights into the disclosure level of SDGs by Indonesian banks, particularly SDG 9, from 2017 to 2020, it has several limitations. This study focuses primarily on the disclosed sustainability data and annual and combined reports, which may not capture all relevant activities or initiatives undertaken by the banks. Additionally, the qualitative insights gathered from interviews serve as a triangulation method but are limited by the small sample size of five participants, which may not fully represent the entire banking sector. Furthermore, this research does not extensively cover the dynamic nature of technology adoption and its rapid evolution, which could influence future sustainability strategies.

Future research could address these limitations by expanding the sample size and including a broader range of banks and stakeholders to gain a more comprehensive understanding of the banking sector's efforts in supporting SDGs. Longitudinal studies can be conducted to track changes over time and assess the long-term impact of technological implementations on sustainable development. Additionally, exploring the role of emerging technologies, such as blockchain, artificial intelligence, and the Internet of Things (IoT), in promoting sustainability within the banking sector would provide deeper insights into future trends and opportunities. Collaboration with international banks and comparative studies across regions could also enrich the understanding of global best practices and innovative sustainable banking approaches.

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