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Investigating the role of project management, financial inclusion and digital transformation as efforts to encourage the sustainability of MSMEs in the digital era

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C H R O N I C L E

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A B S T R A C T

The purpose of this study is to analyze the relationship between project management and MSME sustainability, as well as the relationship between financial inclusion and MSME sustainability, and the relationship between digital transformation and MSME sustainability. The research method commonly used to analyze the role of financial inclusion and digital transformation in efforts to encourage MSME sustainability is a quantitative approach. The independent variables in this study are financial inclusion and digital transformation. The dependent variable is MSME sustainability. The respondents in this study were 453 MSME managers selected using a simple random sampling method. The research data was obtained from an online questionnaire distributed through social media. The questionnaire contained statement items designed using a Likert scale of 1 to 7. Data analysis used structural equation modeling (SEM) partial least squares (PLS) with the help of SmartPLS software. The stages of SmartPLS analysis in this study are: Structural Model Development, namely determining the hypothesis of direct and indirect relationships between variables, validity testing (convergent/discriminant) and reliability to ensure valid indicators measure the variables, path coefficient testing to measure influence and significance, using bootstrapping to see the p-value and T-statistics, to determine how strong the role of these variables. The results of this study are project management has a positive relationship with MSME Sustainability, Financial Inclusion has a positive relationship with MSME Sustainability, and digital transformation has a positive relationship with MSME Sustainability.

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1. Introduction

MSME credit growth in 2026 is projected to grow moderately in the range of 4%--5%, driven by massive digitalization and government assistance (KUR/bansos), but faces challenges in purchasing power and a lagging agricultural sector. The main focus for MSMEs in 2026 will be digitalization (35 million units targeted), efficiency, and business model adaptation, rather than aggressive expansion. MSME credit growth is estimated at 4%--5%, which is considered realistic (Gurpreet, 2025). Credit distribution is highly dependent on the trade, agriculture, and manufacturing sectors. Key challenges in MSME sustainability project management include low green awareness/literacy, limited access to capital, and minimal technical capacity. Other obstacles include weak waste management, minimal adoption of environmentally friendly technologies, and inadequate regulations. This hinders MSMEs from transitioning to green business practices. The following are details of the problems of MSME sustainability project management, namely: The high financing gap makes it difficult for MSMEs to finance low-carbon technology or environmental certification, Lack of understanding of sustainable practices and human resources that are not ready to face the demands of the green market, Many MSMEs produce excessive waste without a good recycling or management system (Chibueze et al., 2025). The phenomenon of sustainability project management in MSMEs in Indonesia now focuses on integrating economic, social, and environmental balance to survive in the midst of competition. The main challenges are limited capital, technology, and expertise, which require the adoption of digitalization, operational efficiency, and environmentally friendly business practices. Sustainability project management is very important for MSMEs to turn environmentally/socially friendly ideas into real actions, optimize limited resources, and increase competitiveness. This helps MSMEs mitigate risks, cost efficiency, increase customer trust, and comply with sustainability standards for long-term growth. Project management helps MSMEs with limited resources (funds, labor) to manage budgets effectively, avoid

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waste, and streamline operations. With a project management approach, MSMEs do not only pursue short-term profits, but ensure business sustainability in the future.

Financial inclusion is a condition in which all levels of society have easy, safe, and affordable access to a variety of formal financial services, such as savings, credit, and insurance, according to their needs. This phenomenon is driven by digitalization and fintech, aimed at improving economic welfare and reducing inequality, although it has the potential to strengthen the dominance of large banks. In Indonesia, the level of financial inclusion has increased significantly, reaching 76.2% in 2019 and continues to be promoted by the Financial Services Authority (OJK) through various services such as digital banking (Gurpreet, 2025). Financial technology (fintech) mediates financial inclusion, making it easier for MSMEs and communities in remote areas to access capital without having to visit a branch office. Financial inclusion helps people manage financial risks, save for the future, and increase economic participation, which directly contributes to the sustainable development goals (SDGs). Although aimed at increasing access, financial inclusion risks strengthening the dominance of large banks over small banks. There are still physical access barriers, especially for Islamic financial products in remote areas, and the need for financial literacy education to avoid fraud. With increased financial inclusion, it is hoped that the community will be more financially empowered and the wheels of the economy will turn more evenly (Chibueze et al., 2025). The sustainability challenges facing MSMEs in Indonesia are generally rooted in limited capital, low digital/managerial literacy, and the difficulty of adapting to environmentally friendly business practices. Fierce competition, limited access to green financing, and a lack of standard certification hinder competitiveness and long-term growth. Mentoring programs, increased financial/digital literacy, incentives for green practices, and collaboration between the government and the private sector are needed to support MSMEs to become more competitive. The sustainability of MSMEs (Small and Medium Enterprises) is now shifting from mere survival to implementing business practices that balance profit, social impact, and environmental sustainability (ESG). MSMEs are encouraged to adopt technology, legality, and environmentally friendly practices to address challenges related to capital, digital literacy, and regulation (Mahato & Jha, 2023). MSMEs are beginning to pay attention to environmental impacts, such as waste reduction and the use of responsible raw materials, to meet consumer and international market trends. Utilizing technology for operational efficiency and expanding market reach is key to sustainability. However, its adoption is not yet evenly distributed, especially in remote areas. Having official permits (PIRT, Halal, BPOM) is crucial to increase consumer trust and access to modern markets. The ability to manage finances and access to financing are classic challenges, where SMEs often lack collateral for loans. SMEs are required to continue to innovate and not only rely on trending products for business longevity. The main challenges faced include regulatory complexity, minimal understanding of sustainability reporting, and technological limitations. The government and various parties continue to encourage SMEs to become key actors in Indonesia's green transition (Gunawan, 2025).

The main problems of financial inclusion in Indonesia include low financial literacy, limited physical access in remote areas, uneven digital infrastructure, and lack of trust in formal financial institutions. These obstacles make it difficult for rural communities and MSMEs to access banking services, insurance, and investment products. People often do not understand financial products, especially non-bank sectors such as capital markets or insurance, which are considered complicated and risky (Judijanto et al., 2025). The geographical conditions of the Indonesian archipelago make it difficult for banks to physically reach rural areas, supported by uneven internet connections for digital services. Cases of investment fraud, illegal fintech, and problematic insurance make people wary and prefer cash transactions. The cost of financial services is considered expensive and administrative requirements (such as official documentation) make it difficult for lower-middle economic groups. The focus of some people is still limited to saving money, rather than using financial products for protection (insurance) or asset development (investment). This inequality of access hinders economic growth, increases financial risks for vulnerable households, and limits the development of MSMEs. The Indonesian government continues to strive to improve financial literacy and inclusion through digitalization and education to reach underserved communities (Fersi et al., 2023). Financial inclusion is access and use of banking/fintech services in general have a positive impact on the sustainability of MSMEs, facilitating capital, and efficiency of digital transactions (such as QRIS). However, the main obstacles include high bank requirements, low financial literacy, limited access to capital, and inadequate management. The Main Problem of Financial Inclusion and MSME Sustainability is that MSMEs often have difficulty meeting administrative and collateral requirements of banks, making it difficult for them to obtain official financing. Lack of understanding of financial products prevents MSMEs from maximizing the use of financial institution services for business growth. Despite the existence of fintech and QRIS, adoption in remote areas is still low, hampering operational efficiency. Lack of financial and business management capabilities makes it difficult for MSMEs to survive in the long term (Agustin & Ibrahim, 2024).

Key challenges in digital transformation include employee cultural resistance to change, a shortage of skilled talent, and the difficulty of integrating legacy systems with new technologies. Other challenges include high cybersecurity risks, budget constraints, and the inability to adapt quickly. Key challenges in digital transformation include: Employees are often reluctant or unprepared for changes in digital work patterns. Lack of competent experts in digital technology, AI, and data analytics. Technical difficulties in integrating modern technology with legacy system infrastructure. Increased risk of cyberattacks (phishing, ransomware) and threats to data privacy. High initial implementation costs and difficulty measuring Return on Investment (Cahyawati et al., 2023). Lack of leadership support or a lack of strategic vision for change. Frequently suggested solutions include skills training, investment in data security, structured change management, and selecting technologies that align with business needs. Digital transformation is the adoption of digital technologies (AI, IoT, cloud) to transform business models, increase efficiency, and create new value for customers. This phenomenon encompasses the digitization of processes,

operations, and organizational culture, driven by the need for agility, speed, and a more personalized customer experience across various sectors (Gutu et al., 2025).

Digital transformation is not just about digitizing processes, but rather about transforming the way organizations operate and deliver value. The phenomenon of digital transformation in Small and Medium Enterprises (SMEs/MSMEs) is the adoption of digital technologies, such as e-commerce, social media, and cloud-based financial systems, to improve efficiency, productivity, and market reach. This is a necessity to survive and adapt to changes in consumer behavior, which has an impact on increasing sales and local economic growth. The use of social media and e-commerce platforms (Tokopedia, Shopee, etc.) to reach a wider market. The implementation of cloud-based financial recording applications and management systems. The transition from conventional methods to faster and more efficient digital solutions (Rupeika-Apoga & Petrovska, 2022). Digitally active MSMEs can increase sales by up to 30%. Faster and more systematic business processes. The ability to penetrate national and international markets. Digital transformation is currently not just a trend, but a sustainability strategy for MSMEs to remain competitive in the digital era. Digital transformation in SMEs/MSMEs is often hampered by major problems: lack of digital literacy, limited capital, employee resistance, and fear of data security risks. Lack of understanding of how to use technology, uneven digital infrastructure, and intense online competition also hinder optimal technology adoption. Business actors lack understanding of how to optimize technology, as well as a lack of skilled human resources. The cost of technology investment (infrastructure, software) is often considered expensive. Employees are often reluctant to switch from conventional (paper-based) work methods to digital systems. SMEs are vulnerable to cyber threats (phishing, ransomware) and often ignore customer data protection. Rapidly obsolete technology makes it difficult for SMEs to adapt quickly compared to large competitors. Limited internet access, especially for SMEs outside large cities (Shamim & Ahmad, 2025).

Digital transformation and financial inclusion in SMEs/MSMEs in Indonesia aim to improve performance through access to capital and operational efficiency. The main challenges include limited digital/financial literacy, unstructured financial management, lack of capital, and uneven infrastructure in remote areas (Alifah & Hidayat, 2026). The following are important points related to problems and digital transformation in SMEs: The low ability of business actors to operate digital technology and understand formal financial services. Cash flow and transaction recording is still done manually, not yet integrated with digital systems. Lack of funds to invest in technology and uneven internet access, especially in remote areas (Chibueze, 2024). Difficulty in adapting to changes in consumer behavior that prefer all-digital transactions. Digitalization makes it easier for SMEs to get access to financing (fintech) and minimize financial risks. The use of digital tools, e-commerce, and social media helps expand the market and increase sales by 30-50%. Digital tools help with real-time financial recording and inventory management, increasing transparency. Despite the challenges, digital transformation provides great opportunities for SMEs to move up a class, increase efficiency, and survive in tight market competition (Mahesh et al., 2022).

The novelty of financial inclusion and digital transformation research in SMEs lies in the integration of financial technology (fintech) adoption, digital literacy, and digital ecosystems to improve business performance and sustainability. The focus of this novelty often includes the collaboration model of enablers (government, technology providers, finance) and the use of digital platforms to bridge the gap in access to capital. It not only examines the impact, but also how digital technology (such as e-commerce and fintech applications) facilitates financial inclusion in real terms in the daily operations of SMEs. It emphasizes the collaborative role of four main actors, government, technology providers, financial institutions, and business consultants, in accelerating digital transformation and financial inclusion. It examines how the combination of financial inclusion and digital transformation drives long-term business sustainability, not just a short-term increase in profits. It highlights the importance of digital and financial literacy levels simultaneously as determinants of financial technology adoption by SMEs. This novelty shifts from conventional research that only looks at access to banks to research that looks at the adoption of technology-based digital services (digital-based financial services).

2. Literature Review

2.1 Project management

Project management is the systematic application of knowledge, skills, tools, and techniques to project activities to achieve specific objectives within established time and budget constraints (Hans & Sastry, 2025). It encompasses the entire process from initiation, planning, execution, monitoring, to project closure. Project management is crucial in industries such as technology, construction, and healthcare to ensure project effectiveness and success. Project management according to experts is defined as the application of knowledge, skills, tools, and techniques to project activities to meet requirements, with the aim of achieving specific goals (cost, quality, time) through structured planning, organizing, and controlling resources. It is a systematic approach to managing unique and temporary tasks efficiently (Martínez-Peláez et al., 2023). Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements, which is achieved through the process of initiation, planning, execution, controlling, and closing. The activity of planning, organizing, leading, and controlling company resources to achieve certain short-term goals, especially those related to cost, time, and quality. Project management is the planning, organizing, monitoring, and controlling of all aspects of a project, as well as motivating all parties involved to achieve project objectives in a safe, efficient, and effective manner. Project management is the planning, organizing, directing, and controlling of company resources for relatively short-term goals built to accomplish

specific objectives and goals (Luo et al., 2022). The main objective of project management is to plan, execute, and oversee a project to ensure it is completed on time, within budget, and achieves the desired quality (scope & quality). This involves managing resources efficiently, mitigating risks, and maximizing team collaboration to meet stakeholder expectations. The main benefits of project management are increasing efficiency, ensuring timely and on-budget completion, and improving the quality of the final result through structured planning and oversight. It helps manage risks, coordinate resources, and improve team collaboration, so that business objectives are achieved effectively (Okafor et al., 2022).

2.2 Financial Inclusion

Financial inclusion is a condition in which all levels of society have easy, safe, and affordable access to a variety of formal financial products and services, such as savings, credit, insurance, and investments, according to their needs and capabilities. This aims to improve welfare, equalize economic growth, and reduce poverty (Martínez-Peláez et al., 2023). Financial inclusion differs from financial literacy; financial inclusion focuses on access and availability, while financial literacy focuses on the public's understanding and knowledge of these financial services. Financial inclusion provides significant benefits in improving public welfare through easy access to formal banking/financial services, reducing poverty, and encouraging stable economic growth. It helps people manage their finances, save, invest, and obtain business capital. The following are the main benefits of financial inclusion: Reducing poverty, social inequality, and dependence on loan sharks (shadow banking). Making it easier for rural and low-income communities to access savings, insurance, and credit products. Financial education helps people manage their money and plan for the future (education, retirement, housing) (Murwenie et al., 2025). Facilitating access to capital for small and medium-sized businesses to grow, which increases productivity. Encourage public participation in the formal financial system, which contributes to national economic stability. Accelerate and facilitate financial transactions, which reduce economic costs. Financial inclusion enables all levels of society to engage in productive economic activities, which ultimately accelerates sustainable economic growth. Financial inclusion according to experts and financial institutions is an effort to provide easy, affordable, and equitable access to various formal financial services (banking, insurance, investment, digital) for all levels of society, especially vulnerable and unbankable groups, according to their needs and abilities to improve welfare and reduce poverty. Examples of financial inclusion include various formal financial services that are easily accessible to all levels of society, such as bank accounts, digital wallets (e-wallets) such as GoPay/OVO, People's Business Credit (KUR), micro-insurance, and online mutual fund investments (Malladi et al., 2021). This aims to provide easy access to banking and payments, especially for the unbanked.

The following is a complete example of the implementation of financial inclusion in Indonesia. The use of mobile banking and internet banking that allows people to save and make transactions without having to go to a bank office. The use of applications such as GoPay, OVO, Dana, and LinkAja for shopping payments, bills, and transfers. Bank agent programs that help people in remote areas access banking services. People's Business Credit (KUR) and Micro Credit from banks or fintech peer-to-peer lending for small business capital (Gao et al., 2023). Investment platforms that allow people to invest in stocks or mutual funds with small capital, as well as purchasing gold at Pegadaian. Insurance products with affordable premiums specifically designed for low-income communities. Special savings accounts for students with easy conditions to get used to saving from an early age. Financial inclusion is also supported by government programs and financial literacy to increase public understanding of financial products (Nastiti et al., 2025).

2.3 Digital transformation

Digital transformation is the process of integrating digital technology into all aspects of a business or organization, fundamentally changing the way it operates and delivers value to customers. This involves shifting culture, operations, and business models from manual to digital processes to improve efficiency, productivity, and competitiveness (Almuraqab et al., 2024). It utilizes modern technologies such as cloud computing, artificial intelligence (AI), the Internet of Things (IoT), and data analytics. It requires organizations to continually challenge the status quo, experiment, and embrace failure. It also requires changing business approaches to be more customer-experience-centric. Examples include digital banking (mobile banking), e-commerce, the use of CRM systems, and operational automation in industry (Matroji, 2025). In short, it's not simply adopting new technology, but redesigning the way business is conducted to be relevant in the digital era. According to experts, digital transformation is the integration of digital technology into all aspects of a business, fundamentally changing the way it operates and delivers value to customers. It's not just about adopting technology, but rather changing culture, organizational structure, and business processes to continuously innovate, adapt, and survive in a competitive digital environment.

Digital transformation is a fundamental reimagining of how organizations operate to create value through the continuous application of technology on a large scale (Kurniawati et al., 2022). Digital transformation is a business strategy initiative that integrates digital technology into all aspects of an organization to modernize processes, products, and operations, in order to meet customer expectations. Digital transformation is a change built on a foundation of digital technology that brings unique changes in operations, business processes, and value creation (Kurniadi et al., 2024). Digital transformation is a sociocultural process that adapts companies to new organizational forms and the skills needed to remain relevant in the digital era. Digital transformation is a new development in the use of digital artifacts, systems, and symbols in and around the organization.

Indicators of digital transformation are measured through the quality of technological infrastructure, technology adoption by economic actors, operational efficiency, improved customer experience, and digital organizational culture. The main keys include data integration (such as One Data Indonesia), increasing HR capabilities, the use of collaboration tools, and business model innovation (Zulaekha, 2026). Digital transformation is the process of integrating digital technology into all aspects of a business or organization, which fundamentally changes the way it operates and delivers value to customers. This involves shifting culture, operations, and business models from manual to digital processes to improve efficiency, productivity, and competitiveness.

Digital transformation provides key benefits in the form of increased operational efficiency, reduced costs, and enhanced customer experience through automation and real-time data analysis (Hermawan et al., 2022). This process increases employee productivity, strengthens data security, and drives innovation and company competitiveness in the digital age. The following details the key benefits of digital transformation: Automating manual processes with technologies such as AI and robotics reduces human error and accelerates workflows. Digitization, such as the use of cloud computing, reduces the cost of physical infrastructure, data storage, and other operational costs. Access to centralized, real-time data enables management to make faster and more accurate strategic decisions. The use of CRM, chatbots, and mobile applications facilitates interactions and provides more personalized and faster services (Febriansyah et al., 2024). Digital transformation enables more secure, centralized data storage and protection from cyber risks. Digital transformation is not only applicable to large companies but also increases professionalism and accessibility for MSMEs and government agencies.

2.4 SME Sustainability

SME (Small and Medium Enterprise) sustainability is the ability of a business to survive, grow, and operate in the long term by integrating economic performance, social responsibility, and environmental sustainability (ESG). This includes adapting to market changes, efficient resource use, and ethical practices to achieve sustainable growth. SME sustainability is not only about profit, but also about balancing economic (profit), social (people), and environmental (planet) aspects (Azzahra et al., 2025). The primary focus is the ability to survive and thrive from generation to generation or over the long term. Sustainable SMEs must be able to adapt to rapid change, including adopting digital technology and environmentally friendly practices to meet global consumer demands.

Achieving sustainability involves initiatives such as the use of renewable energy, waste management, and resource efficiency. Sustainable SMEs contribute to economic stability, create jobs, and increase incomes in local communities (Al-Shami et al., 2024). The main challenges currently faced are the low understanding of the concept of sustainability and limited capital to implement greener practices. According to experts, the sustainability of MSMEs is the ability of a business to survive, grow, and exist in the long term by balancing economic, social, and environmental performance (Triple Bottom Line). This includes effective resource management, continuous innovation, technology adoption, and the use of digital and financial literacy. Business sustainability is the process of maintaining operations, meeting long-term financial obligations, and managing limited resources effectively and efficiently (Al-Okaily et al., 2023). Sustainable MSMEs do not only focus on profit, but also on positive impacts on the environment (planet) and society (people). In short, the sustainability of MSMEs is measured by their ability to continue operating, growing, and having a positive impact, not just surviving for a while.

Sustainability of MSMEs is a form of success of MSMEs in maintaining their business by utilizing all available resources. Both in the form of human resources or capital resources owned to run Micro, Small, and Medium Enterprises (Thathsarani & Jianguo, 2022). Sustainability of Small and Medium Enterprises (SMEs) provides significant benefits in the form of increased operational efficiency and cost savings through better resource management (Permana et al., 2024). In addition, sustainable practices strengthen brand reputation, increase competitiveness, attract environmentally conscious consumers, and facilitate access to financing (investors). The implementation of environmentally friendly practices, such as energy efficiency and waste reduction, helps reduce operational costs in the long term (Okafor et al., 2022). Consumers are increasingly aware of environmental issues, so that SMEs that apply sustainability principles (ESG) will be more trusted, increase customer loyalty, and competitiveness in the market. Financial institutions and investors are more interested in providing funding to SMEs that are committed to sustainability and have good risk management (Okafor et al., 2022). Sustainable practices help mitigate environmental and social risks, ensuring more stable business continuity amidst changes in the business environment. Complying with increasingly stringent government regulations regarding the environment and encouraging creativity in creating environmentally friendly products. By implementing sustainability principles, SMEs not only help preserve nature, but also ensure healthier and more durable economic growth.

2.5 Integrating Digital Technology, Islamic Economics, and Cross-Country Financial Inclusion for MSME Sustainability

Recent scholarship emphasizes that digital technology adoption is no longer optional but a fundamental driver of MSME sustainability. Datta (2024) argues that digital tools strengthen the resilience of MSMEs by enabling real-time data access, reducing transaction costs, and improving supply chain transparency, which collectively support long-term business continuity in emerging economies. Complementing this view, Putri (2024) examines digital transformation and financial inclusion from an Islamic economics perspective, highlighting that Sharia-compliant digital financial services can enhance MSME

sustainability without compromising ethical principles such as risk-sharing and prohibition of interest (riba). This is particularly relevant for Muslim-majority countries like Indonesia, where religious adherence influences financial behavior. Furthermore, Haryadi et al. (2025) provide cross-country evidence from Indonesia and Malaysia showing that financial inclusion, financial literacy, and financial behavior significantly affect MSME financial performance, with financial technology adoption acting as a moderating variable that strengthens these relationships. Their findings suggest that technology adoption amplifies the positive effects of inclusion and literacy, making digital transformation a catalyst for sustainable MSME growth across borders. Together, these studies reinforce that digital transformation and financial inclusion are not isolated strategies but interconnected enablers that, when aligned with local economic, cultural, and regulatory contexts, substantially improve MSME resilience and long-term viability in the digital era.

3. Method

The research method commonly used to analyze the role of financial inclusion and digital transformation in promoting MSME sustainability is a quantitative approach. The independent variables in this study are financial inclusion and digital transformation. The dependent variable is MSME sustainability. Respondents were 453 MSME managers selected using a simple random sampling method. Data were obtained from an online questionnaire distributed through social media. The questionnaire contained items designed using a Likert scale of 1 to 7. Data analysis used structural equation modeling (SEM) with partial least squares (PLS) using SmartPLS software.

The stages of the SmartPLS analysis in this study are:

1. Structural Model Development: Determining hypotheses of direct and indirect relationships between variables.
2. Measurement Model Analysis (Outer Model): Validity (convergent/discriminant) and reliability tests to ensure indicators validly measure the variables.
3. Structural Model Analysis (Inner Model): Path coefficient test to measure influence and significance.
4. Hypothesis Testing: Using bootstrapping to see the p-value and T-statistics, determine the strength of the role of the variables.Hipotesis penelitian ini adalah:

The hypotheses of this research are:

H_1: *Project management has a positive relationship with MSME sustainability.*
H_2: *Financial inclusion has a positive relationship with MSME sustainability.*
H_3: *Digital transformation has a positive relationship with MSME sustainability.*

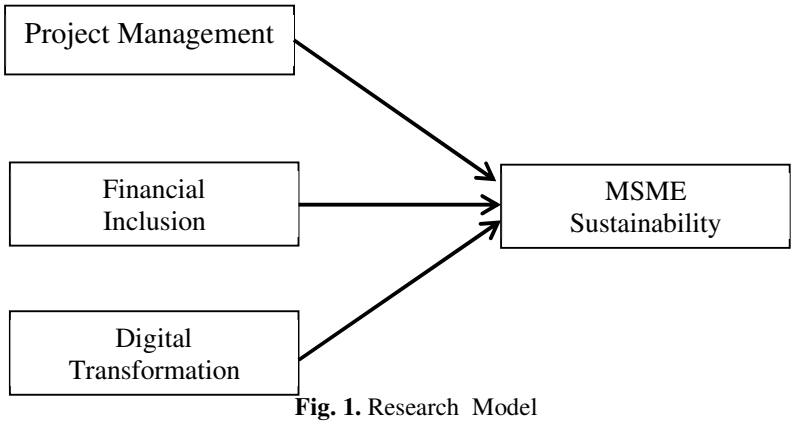

Fig. 1. Research Model

4. Result and Discussion

4.1 Structural Model Development

The primary purpose of developing a Partial Least Squares (PLS-SEM) structural model is to predict complex causal relationships between latent variables (constructs) and to test theories in exploratory research or theory development. PLS-SEM excels in predicting the influence of exogenous variables on endogenous variables, especially when sample sizes are small, data are non-normal, and the model involves many formative indicators. The PLS-SEM model for this study is shown in Fig. 2.

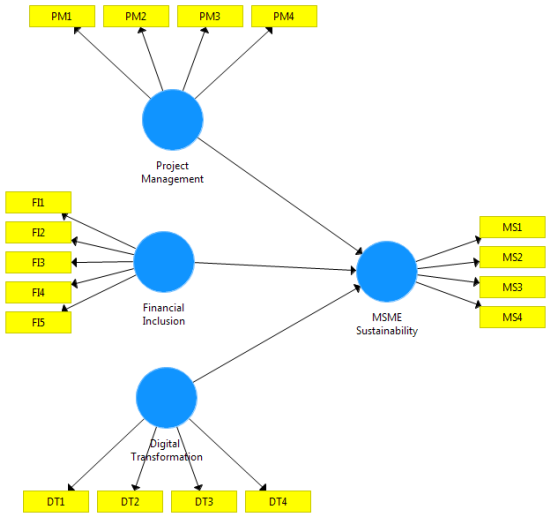

Fig. 2. PLS-SEM structural model

4.2 Measurement Model Analysis (Outer Model)

This test examines validity (convergent/discriminant) and reliability to ensure that indicators validly measure their variables. Validity and reliability tests in SmartPLS (outer model evaluation) ensure that indicators accurately and consistently measure constructs. The steps include checking outer loadings (>0.70), Average Variance Extracted (AVE >0.50) for validity, and Composite Reliability and Cronbach's Alpha (>0.70) for reliability using the PLS Algorithm menu. The ideal loading factor for each indicator on its latent variable is >0.70. However, a value of 0.50-0.60 is still acceptable for initial research.

4.3 Convergen Validity

The convergent validity test was conducted to ensure that the indicators consistently represent their respective latent constructs. This assessment was evaluated using loading factor values and the Average Variance Extracted (AVE). Indicators are considered valid when they exhibit a strong correlation with the construct being measured. The results of the convergent validity assessment, including loading factor ranges and AVE values for all constructs in this study, are presented in Fig. 3 below.Based on the figure, all constructs in this study exhibit loading factor values above the recommended minimum threshold and Average Variance Extracted (AVE) values exceeding 0.50. These results indicate that the indicators used are able to consistently represent their respective latent constructs. Accordingly, the measurement model meets the criteria for convergent validity and is suitable for further evaluation of the structural model.

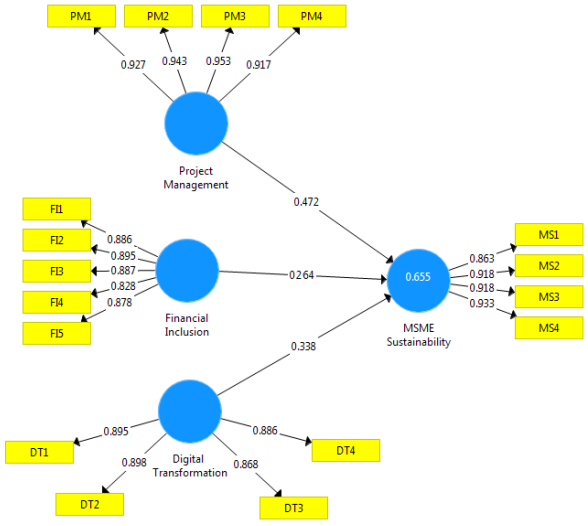

Fig. 3. Validity Test

The loading factor values for all indicators on their latent variables in Figure 3 are >0.70, making them acceptable for initial research.

4.4 Discriminant Validity

The discriminant validity test was conducted to ensure that each construct in the research model exhibits sufficient empirical distinctiveness from other constructs. The evaluation was carried out using the cross-loading approach and the heterotrait–monotrait ratio (HTMT). The cross-loading analysis shows that each indicator has the highest loading value on its associated construct compared to other constructs. This pattern indicates that all indicators are able to consistently distinguish their respective constructs; therefore, the discriminant validity criterion based on cross-loadings is satisfied.Furthermore, discriminant validity was also assessed using the HTMT approach to provide additional confirmation. The HTMT values among constructs are presented in Table 1 below.

Table 1
Heterotrait–Monotrait Ratio (HTMT) Results

Construct	***PM***	***FI***	***DT***	***MS***
PM	—			
FI	0,772	—		
DT	0,844	0,728	—	
MS	0,817	0,715	0,869	—

Based on Table 1 , all HTMT values are below the recommended threshold of 0.90 as suggested by Hair et al. (2019). The highest value appears in the relationship between the ecosystem of digital banking and strategy execution; however, it remains within the acceptable range. Accordingly, all constructs in the research model demonstrate adequate discriminant validity and are suitable for further structural model analysis.

Table 2
Reliability Test

Variables	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha
Project management	0.62	0.712	0.708
Financial inclusion	0.55	0.716	0.12
Digital transformation	0.51	0.719	0.723
MSME sustainability	0.52	0.709	0.719

The test results obtained average variance extracted (AVE >0.50), Composite Reliability, and Cronbach's Alpha (>0.70), indicating that the latent variables can explain more than half of the variance in their indicators, indicating good or high reliability.

4.5 Q Square (Predictive Relevance)

The Q-square (Q^2) value is used to assess the predictive relevance of the structural model by evaluating the model's ability to predict endogenous constructs. The Q^2 values are obtained through the blindfolding procedure, where Q^2 values above zero indicate that the model has adequate predictive relevance. The results of the Q-square analysis are presented in Table 7 below.

Table 3
Hasil *Q Square*

Variable	***Q^2***
MSME sustainability	0,376

Based on Table 3, all endogenous constructs exhibit Q^2 values greater than zero, indicating that the model has good predictive relevance. These findings confirm that the developed structural model is appropriate for analyzing inter-variable relationships and for conducting further hypothesis testing.

4.6 Hypothesis Testing

This test uses bootstrapping to examine the p-value and T-statistics, determining the strength of the variables' roles. The hypothesis testing criteria in SmartPLS (SEM-PLS) are primarily based on bootstrapping results, with the following main criteria: a T-statistic > 1.96 (for a 5% significance level) and a P-value < 0.05. If these two criteria are met, the hypothesis is accepted (significant effect); otherwise, the hypothesis is rejected.

Table 4
Hypothesis Testing

Hypothesis	T-value	P-value	Conclusion
Project management → MSME sustainability	4.048	0.000	Supported
Financial inclusion → MSME sustainability	4.561	0.000	Supported
Digital transformation → MSME sustainability	3.831	0.000	Supported

The results of the hypothesis testing in SmartPLS are determined through bootstrapping by examining the T-statistic (> 1.96) and P-values (< 0.05) in the Path Coefficients. A P-value less than 0.05 indicates significant influence. This result indicates an influence between the latent variables in the research model.

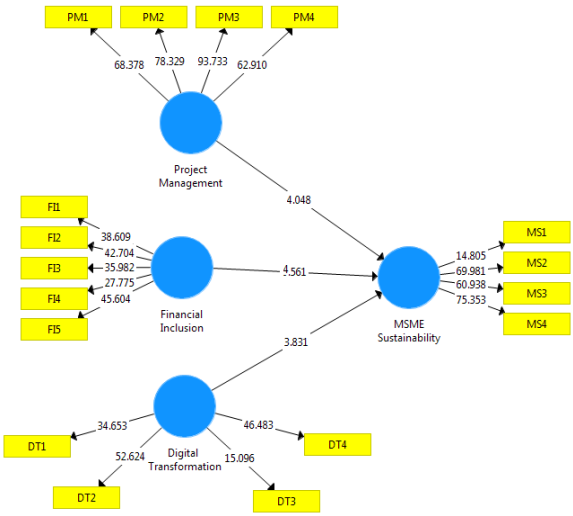

Fig. 4. Hypothesis Testing

4.7 The Relationship Between Project Management and MSME Sustainability

Project management plays a crucial role in MSME sustainability by transforming ideas into systematic plans, optimizing resources (cost, time), and minimizing risks. This helps MSMEs adopt the Triple Bottom Line principle (Profit, People, Planet) for long-term competitiveness. Project management ensures that MSME operations not only pursue profit but also balance social (People) and environmental (Planet) impacts. Project management effectively manages limited resources, avoids wasted time and costs, and improves operational efficiency. Project management transforms big ideas or dreams into small, measurable steps, thus facilitating the achievement of long-term goals. Project management identifies potential problems early before they become fatal, facilitating informed decision-making. Project management ensures consistent product/service quality, which increases customer trust and competitiveness in the global market.

Project management facilitates the implementation of environmentally friendly methods or new technologies that support sustainability. With good project management, MSMEs can be more resilient in facing business challenges and grow sustainably. Sustainability project management in MSMEs, which integrates economic, social, and environmental aspects (the Triple Bottom Line), significantly improves competitiveness, operational efficiency, and brand reputation. This implementation drives product innovation, reduces waste, and helps MSMEs adapt to climate change and more stringent market requirements. MSMEs that implement sustainable practices (e.g., energy efficiency, waste reduction) tend to be more efficient, cost-effective, and more competitive in the market. Good environmental and social management improves brand image, which in turn attracts more customers and builds stakeholder trust. Structured project management helps MSMEs better manage resources, reduce production waste, and optimize raw material use. MSMEs that focus on sustainability often have easier access to capital (e.g., green bonds) and encourage innovation in products and business processes. The implementation of sustainability risk management helps MSMEs withstand economic uncertainty and increasingly stringent environmental impacts. Although there are challenges such as limited funds and expertise, the implementation of an integrated management system (such as a Management Information System) can help MSMEs overcome these obstacles and transform into greener and more sustainable businesses.

Project management plays a crucial role in the sustainability of MSMEs by integrating environmental, social, and economic principles (the Triple Bottom Line) into business strategy. This structured approach improves operational efficiency, innovation, and long-term competitiveness, enabling MSMEs to survive the competition and support green transformation through better planning and execution. Project management helps MSMEs not only pursue profits but also take responsibility for their social impact (people) and environmental sustainability (planet). The effective use of project management, including management information systems, minimizes waste, optimizes inventory, and reduces costs, contributing to economic and environmental sustainability. Project management techniques enhance employee skills and competencies, creating a more productive and innovative work environment. Project management strategies, such as planning and project management, help MSMEs recover and remain competitive after a pandemic or economic crisis.

Good project management facilitates the adoption of information technology (ICT) for more environmentally friendly marketing and operations. Thus, project management is not simply a task management tool but a strategic tool to ensure

MSMEs remain viable, relevant, and grow sustainably. Good project management helps MSMEs manage resources, improve operational efficiency, and reduce waste, which have a direct impact on sustainability. Adopting sustainability practices through project management, such as the use of environmentally friendly raw materials, improves brand image and competitiveness in the market. A structured approach to projects helps identify risks, comply with regulations, and avoid potential legal issues, which are crucial for the long-term resilience of MSMEs. Targeted project management encourages MSMEs to continuously innovate and adapt to technological changes, ensuring sustainable growth. MSME sustainability is achieved when project management focuses not only on (economic) profits, but also on social responsibility and environmental impact. Overall, project management is an important tool for MSMEs to transform from mere survival to growing, innovative, and sustainable businesses.

4.8 The Relationship Between Financial Inclusion and MSME Sustainability

Financial inclusion has a positive and significant relationship with MSME sustainability. Easier access to formal financial services (banking, credit, and digital) improves capital, financial management, and business performance. Optimal use of financial services reduces capital barriers, encourages innovation, and increases MSME competitiveness to ensure their survival (Babajide et al., 2020). The following are key points on the relationship between financial inclusion and MSME sustainability: Financial inclusion makes it easier for MSMEs to access capital and formal financial services, which has a direct impact on improving business performance and sustainability. The use of digital financial services (fintech) helps MSMEs record transactions more accurately and reduces the risk of errors, thus making business management more efficient (Dwijayanti et al., 2022). Financial inclusion helps address the main obstacles faced by MSMEs, namely limited capital and high interest rates in the informal sector. Good financial access enables MSMEs to innovate, improve employee welfare, and expand their businesses sustainably. Improving financial literacy, coupled with financial inclusion, is crucial to ensuring optimal use of formal financial services (such as banks or fintech), enabling MSMEs not only to survive but also to grow (Gao et al., 2023).

Financial inclusion plays a crucial role in ensuring the sustainability of MSMEs by providing access to banking services, affordable capital, and digital transactions, which improve financial management and productivity. This access enables MSMEs to overcome capital constraints, develop their businesses, and increase their competitiveness for long-term survival (Priyandono et al., 2025). Financial inclusion facilitates MSMEs' access to credit, loans, and affordable capital, which are crucial for business operations and development. Access to formal financial services helps entrepreneurs manage their finances, such as using the banking system for transactions, managing savings, and conducting insurance. With adequate financial services, MSMEs can be more efficient and increase productivity, which directly impacts business growth.

Increasing access to digital services (fintech) simplifies transactions and expands market reach, strengthening business sustainability in the digital era (Ayem & Prasetyaningtyas, 2025). The results of the study show that financial inclusion has a positive and significant impact on the sustainability of MSMEs, where access to financial services strengthens the competitiveness and resilience of MSMEs. For maximum financial inclusion, a combination with financial literacy (understanding of financial products) is needed to ensure effective and efficient use of services (Anggara & Nuraeni, 2025). Thus, financial inclusion is not only about providing access to banks, but also providing tools for MSMEs to grow, survive, and adapt in the business environment. Financial inclusion has a significant positive impact on the sustainability of MSMEs by facilitating access to capital, banking services, and financial technology (fintech) (Mahato & Jha, 2023). This access improves operational efficiency, financial management, and business performance, which ultimately ensures long-term business continuity. Making it easier for MSMEs to obtain affordable financing for business development, overcomes the constraints of limited capital. Affordable financial services simplify financial management, which increases the productivity and performance of MSMEs (Agustin & Ibrahim, 2024). The use of fintech and digital banking services reduces the risk of transaction errors and facilitates remote transactions. With better financial management, MSMEs are more able to survive, especially in crisis situations. Although it has a positive impact, the effectiveness of financial inclusion also depends on the level of financial literacy of MSME actors and the availability of supporting infrastructure (Gurpreet, 2025). The Impact and Benefits of Financial Inclusion for MSMEs are Overcoming capital constraints, enabling MSMEs to grow and cover operational needs. Digital financial services facilitate the circulation of money through mobile banking and QRIS, making operations more efficient. Financial literacy and inclusion help MSME actors manage economic risks and plan for business sustainability. MSMEs that have access to banking or financial institutions tend to have better performance, guaranteed sustainability, and are able to survive in difficult times. Financial inclusion will be more effective if accompanied by a good understanding of financial management (literacy) (Gutu et al., 2025). There are still obstacles in the form of complicated bank requirements and limited access for some MSMEs. Effective financial inclusion, including access to formal and digital financial institutions, is an important element in encouraging sustainable MSMEs, not only from an economic but also social and environmental perspective.

4.9 The Relationship Between Digital Transformation and MSME Sustainability

Digital transformation is a crucial factor determining the sustainability of MSMEs in the modern era, by increasing operational efficiency, expanding market access internationally, and optimizing financial management. The adoption of technologies such as social media, e-commerce, and cloud systems enables MSMEs to survive crises, increase competitiveness, and accelerate

economic growth (Gutu et al., 2025). Digitalization enables MSMEs to expand their reach to domestic and international markets, increase turnover, and create new business opportunities. The use of digital technologies (e.g., cloud systems and automation) helps reduce operational costs, save time, and minimize the risk of human error in administration and marketing. Financial digitization (e.g., digital payments and app-based record-keeping) makes it easier for MSMEs to access financing, increase transparency, and strengthen cash flow management (Permana et al., 2024). Technology enables MSMEs to continue operating (such as during the pandemic) through online business models, which maintain business continuity. Successful transformation requires increased digital literacy, adequate infrastructure, and collaboration with the government or private sector to overcome technical skills limitations. Overall, digital transformation is not just a trend, but an essential strategy to ensure the sustainability, resilience, and growth of MSMEs (Hermawan et al., 2022).

Digital transformation significantly improves the sustainability of MSMEs by expanding market reach, optimizing operational efficiency through cost savings, and strengthening competitiveness. The adoption of e-commerce, social media, and fintech platforms enables improved performance, better access to financing, and faster adaptation to changing consumer behavior (Malladi et al., 2021). Digital platforms enable MSMEs to transcend local geographic boundaries, reaching a wider, even international, consumer base. Digitizing business processes, such as the use of digital cashier systems and inventory management, reduces operational costs and human error, thereby increasing productivity (Alifah & Hidayat, 2026). MSMEs that adopt technology adapt and innovate more quickly, making them more competitive. Financial digitalization (fintech) makes it easier for MSMEs to access capital and increases financial transparency. Technology helps MSMEs balance economic, social, and environmental aspects, ensuring business continuity in the digital era. Despite its positive impact, digital transformation also faces challenges such as low digital literacy, uneven infrastructure, and limited capital. Therefore, synergy is needed between the government, private sector and MSMEs for education and infrastructure provision (Almuraqab et al., 2024).

Digital transformation is a crucial factor for the sustainability of MSMEs, acting as a driver of operational efficiency, market expansion, and business resilience (Azzahra et al., 2025). Through the adoption of e-commerce, social media, and digital payments, MSMEs can reduce costs, accelerate transactions, and survive amidst crises or changes in the business environment. Digitalization reduces manual processes, thereby saving time and minimizing errors, which ultimately leads to operational cost savings. The use of social media and e-commerce platforms allows MSMEs to reach a wider audience without geographical boundaries (Al-Shami et al., 2024). Financial digitalization simplifies transaction recording, increases transparency, and facilitates access to financing institutions. Digitalization encourages innovation in more market-oriented business models, increasing the competitiveness of MSMEs at the local and global levels. Although beneficial, challenges such as low digital literacy and limited infrastructure require the support of a collaborative digital ecosystem. Digital transformation plays a crucial role in the sustainability of MSMEs by increasing operational efficiency, expanding market reach, and encouraging business model innovation (Babajide et al., 2020). Through e-commerce, digital marketing, and digital payments, MSMEs can survive crises, increase turnover, and adapt to the needs of modern consumers, ultimately strengthening their competitiveness and economic contribution. Digital technologies such as stock management (inventory) and accounting applications minimize human error, save time, and reduce costs, which increases productivity (Thathsarani & Jianguo, 2022). The use of e-commerce and social media allows MSMEs to reach global consumers without large physical investments, expanding market share beyond local geographic boundaries. Digitalization has proven crucial, especially post-pandemic, by helping MSMEs continue to operate through online sales methods and digital payment services such as QRIS (Azzahra et al., 2025). Financial digitalization facilitates access to working capital and provides real-time data for better business decision-making (Al-Shami et al., 2024). Digital transformation encourages MSMEs to innovate in business models (e.g., subscription services) and adapt to market trends, thus becoming more competitive.

5. Research Implications

The implications of sustainability project management for MSMEs include adopting the Triple Bottom Line concept to enhance competitiveness, operational efficiency, and long-term resilience. This impacts human resource quality, digital technology adoption, waste management, and access to capital. MSMEs that integrate sustainability focus not only on profits but also on social and environmental impact, which enhances their image and position in the global market. The implementation of management information systems (MIS) and the 5Ps strategic approach (position, plan, perspective, project, prepare) reduces operational costs, optimizes inventory, and accelerates decision-making. Sustainability-focused project management helps MSMEs adapt to environmental risks and social change, and ensures business continuity (sustainable business). Good financial management through structured financial statements makes it easier for MSMEs to obtain loans, which is crucial for expansion and sustainability. Improving human resource quality and adopting TBL enhances technical skills and awareness of social responsibility and environmental sustainability. Overall, the integration of project management and sustainability transforms traditional MSMEs into more adaptive, efficient, and environmentally friendly businesses. Digital transformation significantly improves the sustainability of MSMEs by expanding market reach, increasing operational efficiency through automation, and enhancing competitiveness through the adoption of technologies such as e-commerce and social media. The implication is that MSMEs can survive in the modern era, increase revenue, and adapt more quickly to market changes. Digital platforms (Shopee, Tokopedia, etc.) enable MSMEs to transcend geographical boundaries, reach a wider consumer base, and significantly increase turnover. The adoption of technologies such as financial recording and stock management applications reduces operational costs, improves accuracy, and allows business actors to focus more

on innovation. Digitalization makes MSMEs more responsive to customer preferences, builds loyalty through direct interactions on social media, and increases their ability to compete with large companies. Although crucial, digital transformation is hampered by low digital literacy and limited infrastructure. Training and inclusive policies are needed from the government and the private sector to ensure long-term sustainability. Overall, digital transformation is no longer an option, but a necessity for MSMEs to achieve sustainable growth.

6. Conclusion

Effective project management is directly proportional to the sustainability of MSMEs, as it enables strategic planning, resource efficiency, and risk mitigation that supports a balance between economic, social, and environmental aspects. This implementation increases competitiveness, encourages innovation, and ensures long-term business continuity. Financial inclusion and digital transformation are two synergistic pillars crucial for MSME sustainability. Digitalization facilitates access to formal financial services (fintech, cashless payments), improves operational efficiency, and expands markets. The synergy between the two promotes data transparency, simplifies financing, and strengthens competitiveness, making MSMEs more resilient and thriving in the digital economy era. Digital transformation, such as fintech and financial recording applications, makes it easier for MSMEs to obtain financing (access to financial inclusion) without complicated physical collateral. The use of digital technology reduces operational costs and human error in managing daily transactions, which has a direct impact on business sustainability. Digitalization through e-commerce and social media allows MSMEs to reach a wider market (marketing efficiency), increase revenue, and increase business scale. The integration of these two aspects creates a more professional, agile, and data-driven business ecosystem, so that MSMEs are able to adapt to market changes. The success of this relationship requires increased digital and financial literacy and support for internet infrastructure to be evenly distributed to the regions, supported by the government and the private sector. Overall, digital transformation is a key tool for financial inclusion, which ultimately enables MSMEs to grow sustainably and contribute more to the national economy.

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