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The Impact of Digitalization on the Effectiveness of Financial Management in the Era of Industry 4.0 Transformation

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Abstract

Digital transformation has become a key element in improving the effectiveness of financial management, especially in the Industry 4.0 era. This study aims to explore the impact of digitalization on efficiency, transparency, risk management, and financial inclusion. Using the literature study method, this study analyzed the findings of 10 scientific articles selected based on their relevance and credibility. The results show that digitalization significantly improves operational efficiency by accelerating financial processes through automation and cloud-based technologies. In addition, transparency is increased with the use of blockchain technology that ensures data integrity. Digitalization also strengthens risk management through artificial intelligence-based analytics, which enable early detection of potential financial threats. At the level of inclusion, digitalization provides wider access to finance for people in remote areas and supports the growth of SMEs. This research provides practical contributions for industry players in utilizing digital technology to increase competitiveness, as well as for policymakers in designing regulations that encourage innovation and data security.

INTRODUCTION

Digital transformation has become one of the main pillars in the Industry 4.0 era, where information and communication technology plays a central role in various sectors, including financial management. The digitalization process allows companies and institutions to improve operational efficiency through the use of technologies such as blockchain, big data, and artificial intelligence (AI) (Safari et al., 2024; Sunarsi, 2020). With this development, financial management now does not only rely on manual systems, but shifts towards automation that offers transparency and speed in decision-making (Agusta, 2023).

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Digitalization is the process of transforming from analog to digital systems, which includes the integration of digital technology in various aspects of life, such as education, business, government, and community services. In the past five years, digitalization has become a major focus in many countries to improve efficiency and productivity. For example, the implementation of technologies such as the Internet of Things (IoT) has helped improve operational efficiency in the industrial and business sectors (Oktafianto et al., 2024). In the field of education, digitalization is also used to improve the evaluation system, which can reduce manual errors and improve the accuracy of assessment.

In addition, digitalization brings significant benefits in financial management and economic inclusion, as seen from the development of digital payment technology such as QRIS. This allows for wider access to finance even for rural communities (Islami et al., 2025). In the public sector, digitalization also helps accelerate village government administration services and supports more transparent and efficient development management. With technological advancements that continue to develop, digitalization is a strategic step to overcome the challenges of globalization and increase competitiveness in the modern era.

Digitalization in financial management provides a great opportunity to improve traditional systems that are often inefficient and prone to human error (Widjajanti et al., 2025). For example, the application of technologies such as the Internet of Things (IoT) in the financial system allows companies to monitor the flow of funds in real-time, thereby improving financial accuracy and supervision (Islam & Hasanah, 2025). In this context, digitalization serves not only as an efficiency tool but also as a competitive strategy to remain relevant in the global market.

However, digitalization also brings challenges, such as the need for adequate digital infrastructure, technological literacy among users, and cybersecurity risks (Ndruru et al., 2025). In many cases, reliance on digital technologies can lead to vulnerability to cyberattacks, which can significantly harm a company's finances (Ramadhani et al., 2025). Therefore, risk management is an important aspect in the adoption of digitalization in the financial sector (Muchlis, 2025).

In Indonesia, digital transformation is starting to penetrate into various sectors, including small and medium enterprises (MSMEs). Digitalization not only supports financial management but also expands financial inclusion for people who were previously underserved by traditional banking services (Sari et al., 2025). The application of digitalization shows that there is a significant relationship between technology adoption and sustainable economic growth (Saputra & Putra, 2025).

This research is important to understand the extent to which digitalization can have a positive impact on the effectiveness of financial management, especially in the context of an industry that continues to develop in the era of Industry 4.0 transformation. With this analysis, the results of the research are expected to provide strategic guidance for industry players to utilize digital technology optimally, as well as mitigate challenges that may arise (Widyawan et al., 2025).

Previous research has examined many benefits of digitalization, such as increased operational efficiency and transparency in financial management. A study conducted by Qomariyah and Idrus (2025) shows that the application of digital technology in village government administration increases transparency and efficiency in budget management (Qomariyah & Idrus, 2025). Meanwhile, research by Marliadi and Nirwana (2025) revealed that digitalization helps MSMEs in improving their financial reporting systems. However, there is still a research gap in the context of integrating digitalization with risk management strategies in the era of Industry 4.0 (Nirwana et al., 2025).

This research aims to explore the impact of digitalization on the effectiveness of financial management in the era of Industry 4.0 transformation, with a focus on operational efficiency,

transparency, risk management, and financial inclusion. This research is expected to make a practical contribution to industry players and policymakers to develop effective digitalization strategies.

METHOD

This study uses a qualitative approach with the type of literature study research (library research). The literature study was chosen because it is appropriate to explore and analyze data sourced from various relevant scientific literature, including journal articles, books, reports, and other official documents, related to digitalization and the effectiveness of financial management in the era of Industry 4.0 transformation. This approach allows researchers to explore theoretical concepts and empirical findings from previous research, thus providing a strong foundation for understanding the phenomenon being studied (Zed, 2018).

The data sources in this study consist of secondary data taken from scientific publications in the last five years (2018–2023), such as reputable international journals, conference proceedings, and policy reports published by official institutions. The literature used was selected based on its relevance and credibility to the research topic, especially those that discuss aspects of digitalization, financial management, and Industry 4.0. The reviewed references include journals available in academic databases such as Google Scholar, Springer, and Elsevier, which are relevant to the context of the research (Creswell, 2014).

The data collection technique in this study was carried out by the documentation method, where data was obtained through the collection, identification, and selection of relevant literature. Each article and document is analyzed to find relevant theoretical patterns and support the focus of the research. This process involves a systematic review using keywords such as "digitalization", "financial management", and "Industry 4.0" to ensure adequate literature coverage (Ridwan et al., 2021).

Data analysis is carried out through the content analysis method, where researchers examine the content of various data sources in depth to find themes, categories, and relationships between concepts. The analysis process includes three main stages: data reduction, data presentation, and conclusion drawn. Data reduction is carried out by filtering relevant information from the literature, while data presentation is carried out by compiling findings in the form of descriptive narratives. Conclusions are drawn based on the synthesis of key findings relevant to the research objectives (Huberman, 2017). This approach ensures that research yields in-depth and structured insights into the impact of digitalization on the effectiveness of financial management.

RESULT AND DISCUSSION

The following are the findings from literature research related to the impact of digitalization on the effectiveness of financial management in the era of Industry 4.0 transformation. This table lists 10 articles that have been filtered based on relevance and quality to support this study.

Table 1. Literature Review

No	Author	Title	Findings
1	A. Collins, A. Ahsun, A. Okunola	Assessing the Readiness of SMEs for Industry 4.0 Adoption in Manufacturing	Digitalization helps improve the readiness of SMEs in the manufacturing sector
2	M. Nazari, M. Ansari	Bibliometric Analysis and Future Research Path in Sustainable Business Model Innovation	Sustainable business models leverage digitalization for financial efficiency

3	H. Jangid, D.P. Bal, B. Debata	Digitalisation and Economic Growth in G-20 Countries: A Panel ARDL Analysis	Digitalization has a significant positive impact on economic growth
4	F.T. Dwihaikal, R. Rukmini	Efektivitas Aplikasi SAKTI Dalam Digitalisasi Pelaporan Bendahara Pengeluaran di KPPN Surakarta	Digitalization improves the efficiency of government financial reporting
5	S.A. Shahran	Perindustrian Keempat (IR 4.0): Challenges for Leadership and Management of Technical Institutions	Challenges of implementing digitalization in the management of technical education institutions
6	M. Bougrine, M. Guechati	Supply Chain Integrée à l'Heure de l'Industrie 4.0	Supply chain digitalization strengthens company competitiveness
7	S. Amerieska, A. Kusnawati	Risk Stewardship of Sindhung Warih Value in Sustainable Village Enterprises	Digitalization increases transparency of financial management in villages
8	X. Liu, Z. Zuo, J. Han	Is Digital-Green Synergy the Future of Carbon Emission Performance?	Synergy of digitalization and green finance to improve economic sustainability
9	A. Vasudevan	Cyber Security: A Customer Perspective on Emerging Technologies	Challenges of digital security in the application of financial technology
10	S. Zhamburbayeva, G.A. Ilyassova	The realization of the “Concept of digital transformation, development of the information and communication technologies and cybersecurity industry for 2023–2029” by implementing blockchain in the technologies of the Republic of Kazakhstan and the prob	The application of digital transformation in overcoming digital security challenges

In the context of research on the impact of digitalization on the effectiveness of financial management in the era of Industry 4.0 transformation, a number of findings from 10 selected articles provide an in-depth overview of how digitalization has become a key element in improving efficiency, transparency, and competitiveness in various sectors.

The first article written by Collins, Ahsun, and Okunola (2025) discusses the readiness of Small and Medium Enterprises (SMEs) to adopt digital technologies in the manufacturing sector in the context of Industry 4.0. This study shows that digitalization has a major impact in preparing SMEs to remain competitive amid global pressures. By leveraging digital technologies such as automation and the Internet of Things (IoT), SMEs can reduce operational costs and increase efficiency, ultimately contributing to better financial management (Collins et al., 2025).

Nazari and Ansari (2024), in their article, highlight the importance of sustainable business model innovation driven by digitalization. This study examines how digital transformation can accelerate a company's financial efficiency, both through cost reduction and increased operational flexibility. With a bibliometric approach, this study identifies key trends in business innovation that utilize digitalization to create sustainable added value, especially in the era of Industry 4.0 (Nazari et al., 2024).

Jangid, Bal, and Debata (2024) highlight the impact of digitalization on economic growth in G-20 countries through the analysis of the ARDL Panel. This article finds that digitalization has a significant positive impact on the economic growth of both developed and developing countries. In

the context of financial management, the adoption of digital technologies allows for better integration between fiscal policy and budget management, ultimately increasing economic stability at the macro level (Jangid et al., 2024).

Dwihaikal and Rukmini (2025) offer an interesting perspective on the implementation of the Agency-Level Financial Application System (SAKTI) application in government financial management. This study shows that the digitization of financial reporting in government agencies, such as KPPN Surakarta, has reduced the time needed for the reporting process, improved accuracy, and reduced the risk of human error. These results confirm that digitalization plays a role as a catalyst in increasing transparency and accountability in government budget management (Dwihaikal & Rukmini, 2025).

An article written by Shahran (2024) highlights the challenges faced by technical education institutions in adopting digitalization in the Industry 4.0 era. The authors identify that although digitalization can improve the efficiency of institutional management, many institutions face obstacles in terms of digital literacy and infrastructure. This article is relevant in the context of financial management because it reflects the need for a large initial investment to achieve the long-term benefits of digital transformation (Shahran, 2024).

Bougrine and Guechati (2024) focus on the digitalization of supply chains in the manufacturing sector. This article explains that digitalization not only improves operational efficiency but also strengthens the competitiveness of companies in the face of a dynamic global market. With more integrated logistics management, companies can optimize the flow of goods and information, thus having a direct impact on the efficiency of financial management (BOUGRINE et al., 2024).

Amerieska and Kusnawati (2025) in their research examine digitalization at the local level, especially in the management of Village-Owned Enterprises (BUMDes). This research highlights that digitalization increases transparency and efficiency in village financial management, thereby enabling sustainable development at the community level. This article shows that the benefits of digitalization are not limited to large sectors but also include small sectors that play an important role in local development (Amerieska et al., 2025).

The study of Liu, Zuo, and Han (2025) highlights the synergy between digitalization and green finance in supporting economic sustainability. This article underlines that the implementation of digitalization integrated with green finance practices, such as carbon emission management, can create a more efficient and environmentally friendly economic model. This research is relevant in the context of globalization where the pressure on sustainability is increasing (Liu et al., 2025).

Vasudevan (2024) discusses the challenges that arise in cybersecurity as a result of increasing digitalization in the financial sector. This article shows that although digitalization offers many advantages, cybersecurity threats remain one of the main obstacles. Therefore, security risk management is an integral part of a digital-based financial management strategy (Vasudevan, 2024).

Finally, Zhamburbayeva and Ilyassova (2024) highlight the importance of digital transformation in public policy, especially in the field of digital security. This article describes how digitalization can be used to improve the efficiency of tax collection and public financial management, but also emphasizes the importance of developing infrastructure and regulations to support its implementation (Zhamburbayeva & Ilyassova, 2024).

From the overall findings, it is clear that digitalization not only has a direct impact on the effectiveness of financial management, but also affects various other aspects, such as transparency, efficiency, competitiveness, sustainability, and security. This research makes an important contribution in understanding the complexity and benefits of digitalization in the era of Industry 4.0 transformation.

Discussion

The Impact of Digitalization on the Effectiveness of Financial Management

Digitalization has brought fundamental changes in financial management in various industrial sectors, especially in the era of Industry 4.0 transformation. The application of digital technologies such as artificial intelligence (AI), big data analytics, and blockchain has increased effectiveness in financial processes, from operational efficiency to risk management. This impact can be analyzed through four main aspects: operational efficiency, transparency, risk management, and financial inclusion.

1. Operational Efficiency

   Digitalization encourages operational efficiency through the automation of financial processes that were previously manual and time-consuming. Technology-based financial management systems such as enterprise resource planning (ERP) and cloud-based accounting allow companies to accelerate transaction recording, reporting, and financial analysis. For example, automation of bank reconciliation and cash flow management processes can reduce human error by up to 50% and speed up the processing time of financial statements from weekly to daily. Thus, companies can allocate human resources for strategic tasks, such as planning and decision-making. Digitalization also enables the use of AI for predictive analytics, which helps companies plan their finances more accurately based on historical patterns and market trends.

2. Transparency

   One of the main benefits of digitalization is increased transparency in financial management. Blockchain technology, for example, allows for immutable ledger transactions, thereby increasing accountability and reducing opportunities for manipulation of financial data. In the context of the company, this system supports faster and more reliable financial audits because all transactions can be verified in real-time. In addition, digital platforms also make it easier for stakeholders to access the company's financial information, including financial reports, expenses, and revenue. With increased transparency, trust between management, investors, and regulators can be strengthened, ultimately driving financial stability and company growth.

3. Risk Management

   Digitalization contributes significantly to financial risk management through analytical capabilities and early detection of potential threats. Artificial intelligence-based systems allow companies to identify financial risks such as cash leakage, fraud, or liquidity declines long before they escalate. For example, machine learning-based algorithms can detect suspicious transaction patterns that have the potential to become financial security threats, so companies can take mitigation steps early. Additionally, real-time monitoring technology allows for more responsive decision-making to market changes, such as interest rate fluctuations or currency exchange rate volatility. Digitalization also supports the management of external risks, such as regulatory compliance risks, with automated systems that ensure companies always comply with applicable financial legal standards.

4. Financial Inclusion

   Digitalization has expanded access to financial services for previously hard-to-reach groups, such as small and medium-sized enterprises (SMEs) or individuals in remote areas. With the advent of mobile-based financial applications, SMEs can now access loans, make digital payments, and better manage their finances. Fintech also plays an important role in creating financial inclusion, for example by providing digital-based microfinance services specifically designed for people who do not have access to conventional banking. At the macro level, enhanced

financial inclusion through digitalization can support economic growth, reduce income inequality, and promote more equitable development.

Practical Contribution to Industry Players

For industry players, the digitization of financial management provides an opportunity to increase competitiveness through efficiency optimization and risk mitigation. One practical step that can be taken is to invest in digital infrastructure such as ERP systems or cloud accounting to speed up the financial operational process. In addition, training human resources in using modern financial technology is the key to successful digitalization adoption. Industry players also need to leverage data analytics to understand market trends, analyze profitability, and design financial strategies that are adaptive to change.

Practical Contribution for Policy Makers

For policymakers, the digitalization of financial management provides an opportunity to create a regulatory framework that supports transparent and inclusive financial transformation. The government can develop incentive policies for companies that adopt digital technologies, such as tax breaks for investment in digital infrastructure. In addition, governments need to ensure that existing regulations encourage innovation, but still maintain consumer protection and data security. Digital financial literacy education is also important to ensure that the public and business actors understand the benefits and how to utilize financial technology optimally.

CONCLUSION

Digitalization has been shown to have a significant positive impact on financial management in various industrial sectors. Through automation and cloud-based technologies, companies can speed up financial processes and improve operational efficiency. Blockchain technology, which offers high transparency and accountability, is a solution in increasing trust between stakeholders. Additionally, artificial intelligence-based analytics allow for early detection of financial risks, such as fraud or cash leaks, allowing for early mitigation. Digitalization also contributes to increasing financial inclusion, especially for people who previously had difficulty accessing banking services.

However, digitalization also presents challenges, such as the need for large initial investments, the need for digital literacy among users, and cybersecurity risks. Therefore, collaborative efforts are needed between the government, industry players, and academics to overcome these challenges. Regulations that support innovation, incentives for companies that adopt digital technology, and digital financial literacy training are strategic steps that need to be prioritized.

As a suggestion, companies are expected to be more proactive in integrating digital technologies into their financial systems, while also investing in human resource training to optimize their use. For policymakers, the development of adaptive regulations and protecting data security must be a top priority, so that an inclusive and secure digital ecosystem can be created. Further research is needed to explore the impact of digitalization on a larger scale and across sectors.

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