



The Role of Internal Governance in Managing Financial Risks Associated with Digital Transformation in Manufacturing Firms

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ABSTRACT

This study examines the role of internal governance in mitigating financial risks during digital transformation in the manufacturing industry. Using a mixed-methods approach, quantitative data were collected through a survey of 40 manufacturing companies in Banten Province that have implemented digital initiatives, complemented by in-depth interviews with eight key informants. Quantitative analysis and thematic qualitative analysis reveal that effective internal control mechanisms, strong integration between audit and risk management functions, and consistent managerial supervision significantly reduce financial risk exposure during the digitalization process. The findings highlight internal governance as a critical factor in ensuring controlled digital transformation and enhancing financial sustainability. This study contributes theoretically to governance and digitalization literature and provides practical insights for risk control strategies and technology investment policies in the manufacturing sector.

INTRODUCTION

Digital transformation has become a key foundation in the development of the global manufacturing industry, especially as technology plays a crucial role in improving the efficiency of production processes and the accuracy of financial management. Studies have shown that companies that are able to integrate digital technology with effective internal governance have better financial resilience and are able to reduce the impact of market volatility (Zhang & Chen, 2021). In developing countries, the digitalization of manufacturing has also been shown to strengthen the competitiveness of companies through automation, data integration, and improved financial reporting accuracy (Alshammari et al., 2022). Banten Province is one of the largest industrial areas in Indonesia that is accelerating digital transformation through the implementation of ERP, process automation, and digital financial reporting. This condition shows that the success of digital transformation is not only determined by technology, but also by the quality of internal governance in controlling emerging financial risks.

Although technology adoption has widened, various studies confirm that the financial risks arising from digitalization do not only stem from technology investments, but also from weak internal controls and unpreparedness of governance structures (Kraus et al., 2021). Manufacturing companies often face challenges in the form of cost uncertainty, the risk of digital system errors, and the potential for fraud due to weak supervision systems. Previous research on the industrial sector in Asia has also shown that digitalization without adaptive internal governance can increase financial vulnerability and worsen the quality of financial decision-making (Lee & Trimi, 2022). In the context of Banten, the complexity of the production process, the diversity of company sizes, and the high need for technology investment increase the urgency of strong governance. This underscores the need for an in-depth analysis of the role of internal governance in mitigating financial risks during the digital transformation process.

The concept of internal governance emphasizes the importance of internal control mechanisms, managerial supervision, and cross-functional coordination to ensure data security and financial stability of the company. Recent findings confirm that strong internal governance can improve the quality of strategic decisions, strengthen financial discipline, and encourage accountability in the digitalization process (Manea & Virlanuta, 2023). In addition, effective governance has been shown to play an important role in reducing financial reporting errors and improving the transparency of digital processes (Du et al., 2021). In the manufacturing sector, an adaptive governance structure allows companies to manage fluctuations in technology costs while maintaining the integrity of the financial system. Thus, internal governance is a key variable that cannot be separated from the success of digital transformation.

Although the literature on governance and digital transformation is quite extensive, studies that explicitly examine the relationship between internal governance and financial risk in the context of manufacturing are limited. Previous research has focused more on operational performance, digital process

efficiency, or technology readiness, without examining how governance mitigates financial risk (Bohnsack et al., 2022). Meanwhile, studies on digital risk management emphasize more technological aspects such as data security or system stability, rather than internal control structures (Zhao et al., 2023). This limitation is reinforced by the lack of research examining the condition of the manufacturing industry in developing countries such as Indonesia, which face different challenges than companies in developed countries. Therefore, there are research gaps that need to be filled through more comprehensive empirical studies.

Research related to financial risks in digital transformation in Indonesia is also still focused on the banking sector, MSMEs, or service companies, so the context of the manufacturing industry has not been widely explored scientifically (Pratama & Santosa, 2023). In fact, manufacturing has a higher level of financial complexity because it involves large-scale supply chains, inventory, physical assets, and technology investments. In addition, companies in Banten Province have special characteristics in the form of dominance of medium-large companies and various levels of digital maturity, which provide a unique context for governance analysis and financial risk. Digital implementation that is not accompanied by internal governance can increase the risk of cost overruns, recording errors, and inaccurate financial projections. This research gap provides a solid foundation for studies that focus on the role of governance in mitigating digital risks in the manufacturing sector.

Based on this gap, this study aims to analyze the role of internal governance in managing financial risks related to digital transformation in manufacturing companies. This study examines how internal control mechanisms, internal audit functions, and managerial oversight structures affect the level of financial risk exposure of companies. In addition, the research also assesses the extent to which governance is able to support financial stability during the digital technology adoption process. Using a mixed approach, this study seeks to provide a comprehensive empirical picture. The results of the study are expected to be able to explain the relationship between digital transformation and financial risk through a governance perspective.

Theoretically, this research contributes to the governance literature by offering an analytical model that integrates internal governance, digital transformation, and financial risk management. This research expands the understanding of how internal control mechanisms function in the context of modern digitalization, especially for manufacturing companies in developing countries. Practically, this study provides recommendations for companies in Banten Province in designing adaptive and effective governance strategies during the digitalization process. Research findings can be used to improve financial integrity, strengthen supervision, and prevent potential financial losses. Thus, this research makes a real contribution to the development of risk management and corporate governance in the digital era.

THEORETICAL REVIEW

Digital Transformation in Manufacturing and the Need for Robust Governance

Digital transformation in the manufacturing industry marks a major structural change involving the integration of sensors, automation, IoT, and data analytics in the production process. The literature confirms that digitalization creates efficiency opportunities, but it also brings new risks, especially related to data security, technological dependency, and operational complexity. According to Müller et al., (2020), digital transformation can only be effective if companies have internal governance that is able to direct digital strategies, manage technological uncertainties, and ensure organizational readiness to face financial risks. In addition, a study by Ghobakhloo (2021) emphasizes that companies that adopt industry 4.0 without a strong governance foundation tend to experience investment cost overruns, system mismatches, and increased potential for digital project failure. Therefore, the literature underlines that internal governance is a core factor in ensuring digital transformation provides long-term economic value for manufacturing companies.

Financial Risk Exposure in Digitally Transforming Manufacturing Firms

Digital adoption in manufacturing generates more complex financial risks than traditional operating models. The implementation of digital systems requires large investments in hardware, software, security, and HR training that brings potential cost overruns. According to Kraus et al., (2021), one of the main sources of financial risk is the lack of holistic strategic planning, making companies more vulnerable to operational cost inefficiencies and volatility. On the other hand, Matarazzo et al., (2021) found that companies that fail to identify financial risks from the beginning of digitalization tend to experience cash flow disruptions due to system dependency and potential cyberattacks. This literature indicates that companies' ability to manage financial risk in the digital context is highly dependent on the effectiveness of internal governance, especially in the planning, implementation, and evaluation phases of digital transformation.

Internal Governance Mechanisms in Managing Digital-Induced Risks

Internal governance is used as a control framework that governs the organizational structure, resource allocation, and oversight of the company's strategic initiatives. In the context of digital transformation, governance serves to ensure that the digitalization process is aligned with the financial capabilities and risk capacity of the organization. Despite technological advancements, financial risks often arise due to weak internal coordination and the absence of risk-based digital audit mechanisms. According to Garzoni et al., (2020), manufacturing companies that have strong governance through digital committees, internal control systems, and data-driven risk mitigation policies are better able to maintain cost stability and reduce financial risk exposure triggered by digitalization. Similar findings were presented by Bauer et al., (2022) which emphasized that adaptive governance serves as a strategic safeguard in regulating digital investment priorities, assessing the financial feasibility of projects, and ensuring digital implementation does not cause cost imbalances.

Risk Management Frameworks in the Era of Industry 4.0

Conventional risk management approaches are no longer adequate to deal with the technological complexities of the modern manufacturing industry. The risk framework needs to be adapted to the characteristics of digitalization that are dynamic, layered, and interconnected. Fernandes et al., (2022) stated that companies need to use integrated risk management frameworks that combine data analytics, real-time system monitoring, and prediction-based financial risk evaluation to deal with uncertainty in digital transformation. In addition, the literature from Stentoft et al., (2020) shows that the success of risk management in digital manufacturing is highly dependent on cross-unit coordination, information accuracy, and the company's ability to adapt mitigation processes in a sustainable manner. This shows that internal governance not only regulates risk policies, but also encourages the creation of an organizational culture that is oriented towards financial resilience.

The Role of Leadership and Strategic Alignment in Governance Effectiveness

The effectiveness of internal governance is greatly influenced by strategic leadership that is able to direct organizations to face digital transformation. The literature confirms that financial decisions, investment priorities, and risk management require leadership that understands the implications of technology on corporate stability. According to Li et al., (2021), manufacturing companies that have digitally competent leadership are better able to create strategic alignment between technology and financial performance. In addition, Strielkowski & Höschle (2020) highlight that responsive leadership strengthens governance effectiveness through improved coordination, risk communication, and strengthening accountability in digital projects. Thus, governance is not only determined by formal structures, but also by leaders' capacity to drive measurable and financially secure digital integration.

METHODOLOGY

Research Approach and Design

This study uses mixed-methods with an explanatory sequential design, where quantitative analysis is carried out first to identify patterns of relationships between variables, then followed by qualitative analysis to deepen the meaning of quantitative findings (Storey et al., 2024). This design was chosen because the topic of the role of internal governance in managing financial risk in digital transformation is complex and multidimensional, so a quantitative-qualitative combination is needed to get a comprehensive picture, both in terms of structure and organizational processes.

Population and Sampling Techniques

The research population includes all manufacturing companies in Banten Province that have carried out the digital transformation process in operational and financial functions. The sampling technique used is non-probability purposive sampling, with the following criteria: (1) medium-sized or large-scale companies, (2) have digital transformation initiatives for at least the last 2 years,

and (3) have an active internal governance unit. From this population, 40 companies were selected as survey respondents, a number that was considered adequate for statistical analysis and reflected manufacturing conditions in the Banten area.

Quantitative Instruments and Data Collection

Quantitative data were obtained through a structured questionnaire using a Likert scale of 1–5 that measured three main constraints: the effectiveness of internal governance, the level of digitalization, and financial risk. Instrument items were developed based on the literature on digital governance and digital transformation in the manufacturing sector (Afifah et al., 2023; Dong, 2023). Before use, the instrument was tested through a limited trial (n = 5 companies outside the sample) to test the validity of the item and its reliability through Cronbach's alpha. The test results showed that the instrument had a good level of reliability and was suitable for primary data collection.

Informants and Qualitative Data Collection

The qualitative stage is carried out after the initial quantitative analysis is completed. Semi-structured interviews were conducted with 8 key informants from 4–6 case firms, who were selected based on the relevance of their position and involvement in internal governance and the implementation of digital transformation. The composition of the informants is as follows: 3 Chief Financial Officers (CFOs), 3 Digitalization Managers, 2 Risk Managers. The selection of these roles is considered most in line with the focus of the research because the three are directly involved in the process of internal supervision, risk control, and the implementation of digital systems that can affect the company's financial stability.

Research Implementation Procedure

The research begins with the preparation of a conceptual framework and the development of instruments based on the latest literature. After the instrument test is completed, the questionnaire is distributed to all sample companies via email and direct visit. After the quantitative data is collected, the analysis process is carried out to obtain the main patterns and relationships between variables. The quantitative findings are then used to select the relevant case firms for the interview stage. Interviews were conducted face-to-face and online, recorded, transcribed, and analyzed using a thematic approach.

Data Analysis Techniques

Quantitative data were analyzed using descriptive statistics, correlation tests, and multiple linear regression or structured relationship models using SPSS or Stata, adjustments to the data form and research models. Meanwhile, qualitative data were analyzed using thematic analysis using NVivo software to identify patterns, mechanisms, and dynamics of internal governance in financial risk mitigation during the digital transformation process (Manea & Virlanuta, 2023). The results of both approaches are then integrated through triangulation to produce a cohesive and in-depth understanding.

RESERACH RESULTS

Strength of Internal Governance Structure in Mitigating Financial Risks

Quantitative analysis through multiple linear regression shows that *effectiveness of internal governance* has a significant effect on *financial risk reduction*, with a value of $\beta = -0.41$, $p < 0.01$. Previous Pearson correlation tests also showed a strong negative relationship ($r = -0.52$), indicating that the better the quality of internal governance, the lower the exposure to financial risk. Descriptive data from 40 manufacturing companies shows that the majority of respondents place internal oversight mechanisms as a top priority during digitalization. These findings are in line with the theoretical argument that places governance as a pillar of financial stability as digital complexity increases.

Table 1. Internal Governance Effectiveness and Financial Risk Reduction

Variable	Mean	SD	Correlation (r)	Regression Coefficient (β)
Internal Governance Effectiveness	4.12	0.53	-0.52**	-0.41**
Financial Risk Exposure	2.31	0.61	—	—

Note: Correlation and regression significant at $p < 0.01$.

Thematic analysis from interviews with eight CFO informants, digitalization managers, and risk managers shows that a strong internal governance structure is the main line of defense in controlling financial risk during the digitalization process. The CFOs emphasized that the regularly updated internal control committee and procedures are able to minimize the potential for system errors and cost leakage. Meanwhile, digitalization managers and risk managers consider that internal governance is not just an administrative aspect, but an operational mechanism that ensures stability in a dynamic digital environment.

The following quote provides an empirical illustration: "*Every decision related to digital investment must go through board review and internal control checks, so that potential financial leaks can be detected early.*" (C-01, interview September 12, 2025). This quote shows how layered oversight creates a more effective risk screening process before decisions are made. "*Digital transformation is not just about technology; The governance structure is the first filter to ensure that innovation does not carry uncontrolled risks.*" (D-03, interview September 14, 2025). The statement emphasized that governance serves as a strategic filter in maintaining a balance between innovation and risk control. "*The risk management team is working more actively after digitalization, but we still refer to the internal oversight structure that the company has built for a long time.*" (R-02, interview September 21, 2025). This quote shows that the old governance base remains an important reference, so digitalization does not shift the basic principles of risk management. Overall, the qualitative findings show that strong internal governance creates

financial safety buffer during the digitalization process, especially when companies face increased operational and financial risks.

Integration of Audit Functions and Risk Management During Digital Transformation

The second regression results show that *integration of audit and risk management functions* has a significant effect on *financial loss prevention* with a value of $\beta = -0.37$, $p < 0.05$. Descriptive data also shows that 72% of companies have integrated internal audits with risk management units as part of their *digital governance framework*. The moderate negative correlation ($r = -0.46$) confirms that effective integration helps to reduce potential financial losses arising from digital system instability.

Table 2. Integration of Audit-Risk Functions and Financial Loss Prevention

Variable	Mean	SD	Correlation (r)	Regression Coefficient (β)
Audit-Risk Integration	3.89	0.64	-0.46*	-0.37*
Financial Loss Incidents	2.18	0.58	—	—

Note: Correlation and regression significant at $p < 0.05$.

The thematic analysis shows that the integration of audit and risk management functions is a crucial strategy in ensuring that digitalization does not create financial vulnerabilities. The CFOs stated that internal audits are now not only conducting post-implementation evaluations, but are also involved in *real-time monitoring* throughout the digital project. The digitization manager added that this collaboration accelerates detection *system failure risks* and reduce correction costs.

The following quotes reinforce the findings: "*Our audit team is now involved from the beginning of the digital project, no longer coming after the system is running. This makes risk evaluation faster and more accurate.*" (C-02, interview September 16, 2025). This statement shows a shift in the role of auditing from a reactive function to a preventive function. "*In the past, audit and risk worked separately; We are now a dashboard. Any abnormal pattern is immediately seen and acted upon.*" (D-01, interview September 18, 2025). The quote describes operational integrations that increase the speed of response to system anomalies. "*This integration reduces financial surprises because every step of digital transformation has passed a joint risk-audit review.*" (R-01, interview September 25, 2025) This statement confirms that the joint review process helps organizations avoid potential unforeseen financial losses. In general, the qualitative results confirm the quantitative findings that audit-risk integration is an important pillar in mitigating financial risks during digital transformation.

Role of Managerial Supervision in Supporting Controlled Digital Transformation

Quantitative analysis shows that *managerial supervision* has a significant effect on *controlled digital transformation*, with a value of $\beta = -0.33$, $p < 0.05$. The correlation test showed a moderate negative association ($r = -0.44$), indicating that a high level of managerial supervision was associated with fewer incidents of digital system implementation failures.

Table 3. Managerial Supervision and Controlled Digital Transformation

Variable	Mean	SD	Correlation (r)	Regression Coefficient (β)
Managerial Supervision	4.05	0.51	-0.44*	-0.33*
Financial Risk Exposure	2.31	0.61	—	—

Note: Correlation and regression significant at $p < 0.05$.

Interviews with eight informants show that managerial supervision plays a role as a mechanism to support stability during digital transformation. CFOs emphasized that digital decisions are often cross-functional and have significant implications for cost, security, and operations, so top management oversight is crucial. Digitalization managers describe that intensive supervision accelerates the resolution of technical and administrative barriers, while risk managers assess that managerial involvement strengthens discipline towards financial security protocols.

The following excerpt describes the central role of supervision: "Management supervision is not just a formality. When digital projects are running, they monitor costs, timelines, and risks directly." (C-03, interview September 10, 2025). This quote shows management's direct involvement in the supervision of digital projects. "Whenever there's a small change to the system, management asks for a risk assessment, and that makes the process more controlled." (D-02, interview September 19, 2025). This statement shows how supervision functions as a stabilization mechanism. "Our manager is present in almost all technical review meetings. It makes all teams more disciplined towards financial risk protocols." (R-02, interview Sept. 23, 2025). This quote confirms that supervision improves consistency of compliance with risky procedures. Overall, the qualitative findings show that managerial supervision is not only an administrative function, but also a determining factor for the success of a controlled, secure, and sustainable digital transformation.

DISCUSSION

The findings of the study show that the effectiveness of internal governance has a crucial role in reducing financial risk exposure during the digital transformation process in manufacturing companies. Strong internal control mechanisms ensure that resource allocation, digital data integrity, and

technology investment decisions remain within a clear accountability corridor. In line with a study by Almahrog et al., (2023), effective internal governance contributes to the reduction of financial uncertainty and improves the quality of the financial reporting process. In the context of manufacturing that is undergoing digital transformation, strong governance serves as a foundation for risk mitigation that directs every digital decision to remain aligned with the company's financial capacity.

The results also show that the integration between internal audit and risk management functions strengthens companies' ability to detect and respond to financial threats more quickly. Audit-risk collaboration allows companies to identify potential technology errors, system failures, and wasted investments before they cause a major financial impact. This supports the findings of Gong et al., (2024) who affirm that the effectiveness of internal audits increases when companies implement technology-based risk management in the digital ecosystem. Thus, the integration of these two functions is an important pillar that ensures that digital transformation is not only efficient, but also financially secure.

Managerial supervision was found to be an important component in maintaining order and sustainability of the digitalization process. Digital transformation demands strategic decisions that have a direct impact on cost structure, operational stability, and long-term profitability. A study by Martins & Silva (2024) confirms that the quality of managerial supervision drives the effectiveness of governance policy implementation and strengthens cross-functional coordination. In this study, managerial supervision plays the role of the main guide that ensures that technology implementation, system integration, and process changes run in accordance with organizational capacity and do not pose uncontrolled financial risks.

While internal governance, auditing, and supervision can mitigate risk, digital transformation still carries inherent risks related to cost volatility, technological uncertainty, and long-term investment needs. Research by Qiu et al., (2025) shows that digitalization can increase financial risks if companies do not have sufficient capital flexibility or liquidity reserves to absorb cost uncertainty. Therefore, this study confirms that the effectiveness of internal governance must be balanced with strong financial capacity. Financial flexibility allows companies to deal with system development costs, downtime risks, and HR training needs without sacrificing operational continuity.

This research makes a significant contribution to internal governance theory by expanding the understanding that governance is not just an administrative mechanism, but a strategic framework that guides companies in dealing with digital risks. These findings support the idea of Lee & Trimi (2024) that internal governance must transform into adaptive, integrated, and data-based digital governance. In particular, this study strengthens the literature on the role of internal control, audit-risk integration, and managerial leadership in shaping modern governance that is responsive to technological disruption and digital complexity.

Several limitations need to be considered in the interpretation of the results of this study. First, the research sample is limited to manufacturing companies in Banten Province, so generalizations to other sectors or different regions must be done carefully. Second, the use of purposive sampling can cause participation bias, especially if companies with low governance performance choose not to participate. External factors such as competitive pressures, macroeconomic dynamics, and the readiness of technological infrastructure also affect risk exposure, as found in the study of Kapadia et al., (2023). These limitations suggest that the results of the study need to be understood in the context of the broader business environment.

To strengthen the findings, further research is recommended to expand the scope of the industry, use cross-border samples, as well as apply longitudinal designs to assess risk dynamics during the digitalization stage. Future studies can also add variables such as technological readiness, digital innovation, automation level, and financing structure as moderation or mediation factors. A multi-perspective approach that integrates technology, governance, and financial dimensions is also needed so that the understanding of digital risks is more comprehensive and applicable to various types of industries.

CONCLUSION AND RECOMMENDATION

This research confirms that internal governance has a strategic role in mitigating financial risks that arise during the digital transformation process in manufacturing companies. The effectiveness of internal control mechanisms, the integration of audit-risk functions, and managerial supervision has been proven to be able to reduce potential losses caused by technological complexity, large investment needs, and potential system disruptions. These findings show that digital transformation cannot be separated from the readiness of an adaptive governance structure that is adaptive, collaborative, and able to direct the digitalization process to remain within the limits of the company's risk tolerance. Thus, governance not only functions as an administrative control tool, but as a strategic foundation that ensures that digitalization creates added value and supports financial sustainability.

In addition to the empirical contribution, this research provides theoretical reinforcement that internal governance is an important element in the risk management framework in the digital era. Strengthening managerial supervision, audit-risk integration, and financial readiness are the main requirements to ensure that digital transformation takes place in a controlled manner. Nonetheless, the study also shows that the inherent risks of digitalization still need to be managed through capital flexibility, technological readiness, and more comprehensive mitigation strategies. Therefore, manufacturing companies need to implement modern, responsive, and data-based governance in order to face digital dynamics more safely, effectively, and sustainably.

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