

IMPLEMENTATION OF MANAGEMENT INFORMATION SYSTEMS IN A STATE-OWNED MINING COMPANY: AN ANALYSIS OF PT ANTAM TBK

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Abstract: This study aims to analyze the implementation of Management Information Systems (MIS) in a state-owned mining company, with a case study of PT Aneka Tambang Tbk. The mining industry is characterized by complex operations that require integrated and accurate information to support managerial decision-making. This research adopts a qualitative descriptive approach using secondary data derived from ANTAM's 2024 Annual Report and recent academic literature. The results indicate that Management Information Systems plays a strategic role in supporting operational efficiency, financial performance monitoring, sustainability management, and corporate governance. The findings demonstrate that Management Information Systems contributes to improved decision-making quality and organizational performance in state-owned mining enterprises. This study provides academic and practical insights into Management Information Systems implementation within capital-intensive and sustainability-driven industries. This study contributes to the literature on Management Information Systems implementation in capital-intensive state-owned enterprises by providing empirical insights from the mining industry.

Keywords: Management Information Systems, Mining Industry, Sustainability, State-Owned Enterprise

Abstrak: Penelitian ini bertujuan untuk menganalisis implementasi Sistem Informasi Manajemen (SIM) di perusahaan pertambangan milik negara, dengan studi kasus PT Aneka Tambang Tbk. Industri pertambangan dicirikan oleh operasi yang kompleks yang membutuhkan informasi terintegrasi dan akurat untuk mendukung pengambilan keputusan manajerial. Penelitian ini mengadopsi pendekatan deskriptif kualitatif menggunakan data sekunder yang diperoleh dari Laporan Tahunan ANTAM 2024 dan literatur akademik Sistem Informasi Manajemen terkini. Hasil penelitian menunjukkan bahwa SIM memainkan peran strategis dalam mendukung efisiensi operasional, pemantauan kinerja keuangan, manajemen keberlanjutan, dan tata kelola perusahaan. Temuan menunjukkan bahwa SIM berkontribusi pada peningkatan kualitas pengambilan keputusan dan kinerja organisasi di perusahaan pertambangan milik negara. Studi ini memberikan wawasan akadeManagement Information Systems dan praktis tentang implementasi SIM dalam industri padat modal dan berorientasi pada keberlanjutan. Studi ini berkontribusi pada literatur tentang implementasi SIM di perusahaan milik negara padat modal dengan memberikan wawasan empiris dari industri pertambangan.

Kata Kunci: Sistem Informasi Manajemen, Industri Pertambangan, Keberlanjutan, Perusahaan Milik Negara

INTRODUCTION

The rapid advancement of information technology has fundamentally transformed how organizations manage information, coordinate operations, and formulate strategic decisions. In this context, Management Information Systems (MIS) have become a critical organizational infrastructure that enables the integration of operational, financial, and environmental data to support managerial planning, control, and decision-making processes (Laudon & Laudon, 2020; Dwivedi et al., 2021; Thordsen & Bick, 2023). The role of Management Information Systems is particularly significant in capital-intensive and complex industries, where timely and accurate information is essential to maintain efficiency and competitiveness.

The mining industry represents one of the most complex industrial sectors due to its extensive value chain, which spans exploration, extraction, processing, refining, and marketing activities. Each stage generates large volumes of heterogeneous data that must be processed, coordinated, and



monitored across geographically dispersed locations. Without integrated information systems, mining companies face challenges such as fragmented decision-making, inefficient resource allocation, and increased operational risks (Zhironkina & Zhironkin, 2023; Barata & Kayser, 2024). Digitalization in the mining sector has also reshaped the spatial and organizational structure of mining activities, influencing how firms manage information, labor, and technology across regions (Storey, 2025).

In recent years, the mining sector has also experienced increasing pressure to adopt sustainable business practices. Environmental regulations, stakeholder expectations, and global sustainability agendas have compelled mining companies to improve transparency in environmental performance, eManagement Information Systems management, and post-mining land rehabilitation. Digital information systems play a crucial role in supporting sustainability reporting, environmental monitoring, and compliance with environmental, social, and governance (ESG) standards (Pan et al., 2022). Consequently, Management Information Systems is no longer viewed solely as a technical support system, but as a strategic enabler of sustainable and responsible mining operations.

As a state-owned mining enterprise, PT Aneka Tambang Tbk operates in a particularly demanding institutional environment. In addition to achieving financial performance targets, state-owned enterprises are required to ensure accountability, transparency, and alignment with national development objectives. PT ANTAM Tbk manages multiple core commodities, including nickel, gold, precious metals refining, and bauxite-alumina processing, across several regions in Indonesia. In 2024, the company recorded its highest revenue in history, reaching IDR 69.19 trillion, with a net profit of IDR 3.85 trillion, reflecting strong operational and managerial performance (PT ANTAM, 2024).

Despite the growing strategic importance of Management Information Systems in the mining sector, existing empirical studies have predominantly focused on manufacturing and service industries, while research on Management Information Systems implementation in mining companies—particularly state-owned enterprises in emerging economies—remains limited. Moreover, prior studies often emphasize operational efficiency or financial performance, with relatively less attention given to the role of Management Information Systems in supporting sustainability governance and corporate accountability.

Addressing this research gap, the present study examines the implementation of Management Information Systems at PT ANTAM Tbk. This study aims to analyze how Management Information Systems supports operational efficiency, financial performance monitoring, sustainability management, and corporate governance within a state-owned mining enterprise. By providing empirical insights from the Indonesian mining context, this research contributes to the Management Information Systems literature and offers practical implications for managers and policymakers in capital-intensive and sustainability-driven industries.

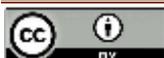
THEORETICAL REVIEW

Management Information Systems

Management Information Systems (MIS) are computer-based systems designed to collect, process, store, and disseminate information to support planning, control, and decision-making within organizations (Behl et al., 2019). Management Information Systems plays a critical role in transforming raw data into meaningful information that can be utilized by managers at different organizational levels, particularly in complex and data-intensive industries.

Management Information Systems integrates data from various functional areas such as operations, finance, human resources, and sustainability management, thereby enabling a holistic view of organizational performance. Through system integration, Management Information Systems reduces information silos and supports coordination across departments, which is essential for effective managerial control and strategic alignment (Laudon & Laudon, 2020).

The effectiveness of Management Information Systems is commonly assessed through several key dimensions. First, information quality refers to the accuracy, relevance, and reliability of information generated by the system. High-quality information enables managers to make informed decisions and reduces uncertainty in organizational processes. Second, system integration reflects the ability of Management Information Systems to connect data across functional units and geographic locations, ensuring consistency and comparability of information. Third, timeliness of reporting relates



to the speed at which information is delivered to decision-makers, which is particularly important in dynamic and high-risk environments. Fourth, decision-support capability highlights the extent to which Management Information Systems provides analytical tools, summaries, and performance indicators that assist managers in evaluating alternatives and formulating strategic actions (Laudon & Laudon, 2020).

From a strategic perspective, Management Information Systems is increasingly viewed as an organizational infrastructure rather than a purely technical system. Management Information Systems supports not only operational efficiency but also strategic planning, performance monitoring, and organizational learning. Prior studies suggest that effective Management Information Systems implementation enhances managerial responsiveness to environmental changes and improves an organization's ability to adapt to market volatility and regulatory pressures (Bharadwaj et al., 2013).

In capital-intensive industries such as mining, the role of Management Information Systems becomes even more critical due to the complexity of operations, geographical dispersion of activities, and high levels of operational risk. Management Information Systems enables centralized monitoring of production, cost structures, and resource utilization, thereby supporting efficiency and risk management. Moreover, as sustainability considerations become increasingly integrated into corporate strategies, Management Information Systems provides the digital foundation for monitoring environmental performance, compliance, and reporting obligations (Pan et al., 2022).

In summary, Management Information Systems serves as a key managerial and strategic tool that facilitates organizational integration, enhances decision-making quality, and supports sustainable business practices. This conceptualization provides the theoretical foundation for analyzing Management Information Systems implementation within state-owned mining enterprises, such as PT ANTAM Tbk, where operational complexity, public accountability, and sustainability demands converge.

Management Information Systems and Operational Efficiency

Operational efficiency refers to an organization's ability to utilize resources optimally in order to achieve desired outputs while minimizing waste, cost, and time. In competitive and capital-intensive industries, operational efficiency is a critical determinant of organizational performance and sustainability. Information systems play a central role in enhancing efficiency by improving the flow, accuracy, and accessibility of operational data.

Previous studies indicate that integrated information systems, such as Enterprise Resource Planning (ERP) and Management Information Systems (MIS), significantly contribute to operational efficiency. These systems reduce process redundancy, enhance data accuracy, and accelerate decision-making processes by providing real-time and standardized information across organizational units (Kouriaty et al., 2022). By integrating operational data within a unified system, organizations can improve coordination and reduce delays caused by fragmented information flows.

In the mining sector, the importance of Management Information Systems in supporting operational efficiency is even more pronounced due to the complexity of operations and geographical dispersion of mining sites. Management Information Systems supports key operational functions such as production planning, inventory control, cost management, and performance monitoring across multiple locations (Chatterjee et al., 2025). Through centralized information systems, managers can monitor production outputs, track material flows, and identify operational bottlenecks more effectively.

Furthermore, digital transformation initiatives under the Mining 4.0 framework have strengthened the role of Management Information Systems in achieving operational excellence. Mining 4.0 emphasizes the integration of digital technologies, automation, and data analytics into mining operations to enhance productivity, safety, and efficiency (Zhironkin & Taran, 2023). Within this framework, Management Information Systems serves as a foundational platform that connects operational data with managerial decision-making, enabling more responsive and adaptive operational control.

Overall, the literature suggests that Management Information Systems enhances operational efficiency by improving data integration, transparency, and responsiveness. This theoretical perspective provides a basis for examining how Management Information Systems implementation supports operational performance in state-owned mining enterprises, where efficiency improvements



are essential to maintaining competitiveness and fulfilling public accountability mandates. Recent studies also emphasize that digital transformation in the mining industry requires the integration of information systems with organizational processes to address interdependencies between technological, operational, and managerial challenges (Pakdel et al., 2025). According to the (Stefán, 2023), digital transformation frameworks in the mining and metals industry highlight the strategic role of integrated information systems in improving productivity, safety, and sustainability.

Management Information Systems, Sustainability, and Corporate Governance

Recent literature highlights the increasingly important role of information systems in supporting environmental, social, and governance (ESG) performance. As organizations face growing pressure to demonstrate sustainable and responsible business practices, Management Information Systems (MIS) provide the digital infrastructure necessary to collect, process, and report sustainability-related information in a systematic and transparent manner.

Management Information Systems enables organizations to monitor key sustainability indicators, including greenhouse gas emissions, energy consumption, occupational health and safety performance, and community development initiatives. By integrating sustainability data into organizational information systems, Management Information Systems enhances the accuracy and reliability of ESG reporting and supports evidence-based decision-making (Feroz et al., 2021). This capability is particularly relevant in environmentally sensitive industries such as mining, where sustainability performance is closely scrutinized by regulators, investors, and local communities.

In mining companies, digital information systems facilitate compliance with sustainability standards and regulatory requirements by enabling continuous monitoring and documentation of environmental and social impacts. Management Information Systems supports transparent reporting processes and helps organizations align operational activities with national and international sustainability frameworks (Pan et al., 2022). Through integrated data management, Management Information Systems reduces the risk of non-compliance and enhances organizational credibility.

Beyond sustainability performance, Management Information Systems also plays a critical role in strengthening corporate governance. Effective governance requires accurate information, robust internal controls, and transparent accountability mechanisms. Management Information Systems supports corporate governance by enhancing internal control systems, improving risk management processes, and ensuring traceability of organizational data (Mubarak & Fianty, 2023). In this regard, Management Information Systems contributes to the reduction of information asymmetry and supports managerial oversight. Information systems also support compliance with occupational health and safety standards, such as ISO 45001, by enabling systematic documentation, monitoring, and reporting of workplace safety performance (International Organization for Standardization, 2020).

Therefore, Management Information Systems is increasingly viewed not only as an operational support system but as a strategic asset that underpins sustainable and responsible business operations. By integrating ESG performance management with corporate governance structures, Management Information Systems enables organizations—particularly state-owned enterprises—to balance economic performance with social and environmental responsibilities. In the context of state-owned enterprises, digital information systems are recognized as key instruments for enhancing transparency, accountability, and governance quality (OECD, 2021).

RESEARCH METHOD

This study employs a qualitative descriptive research approach. The research focuses on analyzing Management Information Systems implementation at PT ANTAM Tbk using secondary data sources. A qualitative descriptive approach was selected to allow an in-depth analysis of Management Information Systems implementation using publicly available corporate data.

Data Sources

Data were obtained from PT ANTAM Tbk Annual Report 2024 and Academic journals related to Management Information Systems, digital transformation, mining industry, and sustainability published between 2020–2025

Data Analysis Technique

The analysis was conducted by examining how Management Information Systems



supports:

1. Operational performance
2. Financial performance monitoring
3. Sustainability and environmental management
4. Corporate governance practices

The findings were interpreted descriptively and linked to relevant theoretical frameworks from the literature.

RESULTS AND DISCUSSION RESULTS

Management Information Systems in Operational Performance

The results indicate that PT Aneka Tambang Tbk utilizes integrated Management Information Systems to support operational performance across exploration, mining, processing, and marketing activities. Management Information Systems enables real-time data consolidation from multiple production sites and business units

Table 1. Operational Performance Indicators of PT ANTAM Tbk (2024)

No	Operational Indicator	Unit	2024 Performance
1	Gold Sales	Tons	43.78
2	Gold Production	Tons	1.02
3	Ferronickel Production	TNi	20,103
4	Nickel Ore Production	Million wmt	9.94
5	Main Mining Locations	–	Southeast Sulawesi, North Maluku, Papua

Source: PT ANTAM Tbk Annual Report 2024

The integration of production data through Management Information Systems allows management to monitor output performance, identify operational bottlenecks, and coordinate activities across geographically dispersed mining areas. This finding supports previous studies emphasizing the role of information systems in enhancing operational efficiency in mining industries (Chatterjee et al., 2025).

Management Information Systems in Financial Performance Monitoring

In addition to operational and financial aspects, Management Information Systems contributes significantly to sustainability and environmental management. ANTAM utilizes information systems to monitor Management Information Systems, environmental investments, and land rehabilitation activities.

Table 2. Financial Performance Indicators of PT ANTAM Tbk (2024)

No	Financial Indicator	Unit	2024 Value
1	Net Sales	IDR Trillion	69.19
2	EBITDA	IDR Trillion	6.73
3	Net Profit	IDR Trillion	3.85
4	Capital Expenditure	IDR Trillion	5.42

Source: PT ANTAM Tbk Annual Report 2024

The availability of integrated financial data enables management to evaluate profitability, cost efficiency, and capital allocation decisions more effectively. This result is consistent with prior research indicating that Management Information Systems and ERP systems enhance financial control and performance evaluation (Kouriati et al., 2022; Laudon & Laudon, 2020).

Management Information Systems In Sustainability Management

The results indicate that Management Information Systems plays a critical role in sustainability management. ANTAM reported a reduction of 53,000 tons of CO₂e Management Information Systems and environmental investment of IDR 158.33 billion in 2024 (PT ANTAM Tbk, 2024). Management Information Systems supports the collection and reporting of environmental performance data, ensuring transparency and regulatory compliance.

Table 3. Sustainability Performance Indicators of PT ANTAM Tbk (2024)

No	Sustainability Indicator	Unit	2024 Performance
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1	CO ₂ e EManagement Information Systemssion Reduction	Tons	53,000
2	Environmental Investment	IDR Billion	158.33
3	Trees Planted	Trees	190,813
4	Post-mining Land Rehabilitation	–	Ongoing

Source: PT ANTAM Tbk Annual Report 2024

The use of Management Information Systems in sustainability management enhances transparency, regulatory compliance, and accountability. This finding aligns with studies highlighting the role of digital information systems in supporting ESG performance and sustainable business practices (Feroz et al., 2021; Pan et al., 2022).

DISCUSSION

Management Information Systems as an Enabler of Organizational Integration

From an organizational perspective, the implementation of Management Information Systems at PT ANTAM Tbk reflects the need for integrated coordination across geographically dispersed and functionally diverse operations. In complex industries such as mining, fragmented information flows may lead to delayed decisions and increased operational risk. Management Information Systems mitigates these challenges by providing a unified platform that aligns operational activities with managerial oversight.

This finding supports the theoretical argument that Management Information Systems enhances organizational integration by enabling standardized data structures and centralized information access (Laudon & Laudon, 2020). Within the Mining 4.0 framework, Management Information Systems acts as a backbone that connects digital technologies with managerial processes, ensuring coherence between operational execution and strategic objectives (Zhironkina & Zhironkin, 2023).

Management Information Systems and Strategic Financial Control

Beyond operational integration, Management Information Systems plays a critical role in strengthening strategic financial control. In state-owned enterprises, financial management is not solely driven by profitability objectives but also by accountability to public stakeholders. Management Information Systems facilitates transparent financial consolidation, enabling management to align resource allocation decisions with organizational priorities.

Consistent with (Kouriati et al., 2022), integrated Management Information Systems and ERP systems reduce information asymmetry and enhance the reliability of financial reporting. This strengthens managerial control mechanisms and supports compliance with regulatory and governance standards. In this sense, Management Information Systems contributes to both economic efficiency and institutional legitimacy.

Management Information Systems As A Foundation for Sustainability Governance

An important contribution of this study lies in highlighting Management Information Systems as an enabling infrastructure for sustainability governance. Environmental and social responsibilities in mining operations require continuous monitoring, documentation, and reporting. Management Information Systems provides the digital architecture needed to transform sustainability commitments into measurable and manageable processes.

This interpretation aligns with (Pan et al., 2022), who argue that digital sustainability depends on the capability of information systems to integrate environmental performance indicators into managerial decision-making. Similarly, (Feroz et al., 2021) emphasize that digital transformation enhances sustainability outcomes by improving transparency and accountability. Thus, Management Information Systems serves as a bridge between sustainability strategy and operational execution.

Management Information Systems And Governance in State-Owned Enterprises

In the context of state-owned enterprises, Management Information Systems assumes an additional governance role. Unlike private firms, SOEs must balance commercial performance with public accountability and policy objectives. Management Information Systems strengthens internal control systems by enabling traceability of data, standardized reporting, and effective risk management.



This finding supports the view of Mubarak & Fianty, (2023), who highlight the importance of IT governance frameworks in enhancing accountability within mining companies. Furthermore, OECD (2021) underscores digital transformation as a key driver for modernizing governance structures in SOEs. Management Information Systems therefore functions not only as a management tool but also as an institutional mechanism that supports good corporate governance.

Theoretical Contributions

Theoretically, this study extends Management Information Systems literature in three important ways. First, it enriches empirical understanding of Management Information Systems implementation in the mining sector, which has received relatively limited attention compared to manufacturing and service industries. Second, it demonstrates that Management Information Systems contributes to sustainability governance, not just operational and financial efficiency. Third, it provides insights into Management Information Systems implementation within a state-owned enterprise in an emerging economy, offering a contextual perspective that is underrepresented in existing studies.

These contributions suggest that future Management Information Systems research should adopt a broader conceptualization of Management Information Systems as a strategic governance infrastructure rather than a purely technical system.

Managerial Implications

From a managerial standpoint, the findings imply that mining companies should view Management Information Systems as a long-term strategic investment. Integrating operational, financial, and sustainability data within a single system enhances decision quality, accountability, and stakeholder trust. For state-owned enterprises, leveraging Management Information Systems as a governance and transparency tool is particularly critical in maintaining public legitimacy and regulatory compliance.

CONCLUSION

This study concludes that Management Information Systems play a vital role in supporting operational efficiency, financial performance, sustainability management, and corporate governance at PT ANTAM Tbk. Management Information Systems enables integrated data management, improves decision-making quality, and supports sustainable mining practices. The findings highlight the strategic importance of Management Information Systems in state-owned mining enterprises operating in complex and dynamic environments. This study is limited to secondary data from a single company, which may restrict the generalizability of the findings. Future research may extend this study by adopting quantitative methods or comparative analysis across multiple mining companies.

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