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Implementation of Blockchain Technology in Management Accounting Systems: Analysis of Opportunities and Risks

Arisman[1]

[1] Institut Teknologi Yogyakarta, Yogyakarta, Indonesia

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Abstract

The digital transformation in the field of accounting has introduced blockchain technology as an innovative solution to enhance the efficiency, transparency, and accuracy of management accounting systems. This study aims to analyze the opportunities and risks associated with blockchain implementation in the context of management accounting. Using a literature review method, the research synthesizes findings from several accredited international and national academic journals published over the last five years. The results reveal that blockchain holds significant potential in improving the reliability of accounting information, accelerating internal reporting processes, and reducing auditing costs through automation and real-time data verification. However, the implementation of this technology is not without challenges. Major obstacles include the technical complexity of blockchain systems, insufficient regulatory frameworks, and heightened risks related to data security and user competence. This study offers a conceptual contribution for decision-makers in both accounting and information technology fields, enabling a deeper understanding of how blockchain technology can be strategically integrated into modern management accounting systems to support digital transformation and performance improvement.

1. Introduction

In recent years, the global business world has experienced a significant acceleration in digital transformation. This acceleration is not limited to the marketing or production sectors but has permeated financial and accounting management systems, including management accounting. One of the most prominent and disruptive digital technology innovations is blockchain technology. While initially known for its use in digital currencies like Bitcoin, blockchain has rapidly evolved and found applications in various other sectors, including accounting and financial management (Hughes et al., 2019). Blockchain technology offers unique characteristics such as data transparency, immutability (inability to alter data after recording), and high efficiency in recording, verifying, and storing transactions. These three elements are crucial in the context of modern accounting information systems, particularly in management accounting, which emphasizes the need for accurate, relevant, and real-time accessible information for internal management decision-making.

Management accounting itself is a branch of accounting that focuses on providing financial and non-financial information for internal organizational purposes. The information generated aims to assist in the planning, control, and performance evaluation processes within an organization. In this regard, blockchain can make a significant contribution. As a decentralized recording system, blockchain ensures that every transaction is permanently recorded in a chain of blocks, validated by a distributed network, and openly traceable by authorized stakeholders. This opens up immense potential to enhance the efficiency of managerial accounting

systems, accelerate performance report preparation, and minimize manual involvement in data verification activities (Wu et al., 2023).

Despite its many potentials, the implementation of blockchain in management accounting systems is not without its obstacles. Various risks and challenges must be seriously anticipated. Implementing this technology requires an IT infrastructure that is not only reliable but also integrated with conventional accounting systems currently in use. Additionally, mastering the technical aspects of blockchain technology is essential for both IT personnel and accounting professionals. Besides technical factors, another challenge is regulatory readiness. Many jurisdictions still lack a legal framework or accounting standards that explicitly regulate blockchain implementation, leading to legal uncertainty that can slow its adoption (Appelbaaum et al., 2022).

Furthermore, one of the most common non-technical challenges is resistance to change within the organization. Many organizations struggle to adapt to new technologies due to an unprepared work culture. Concerns about data security, especially in public blockchain environments, are also a central issue that can hinder the widespread adoption of this technology. Various previous literature and research indicate that if implemented correctly, blockchain has the capacity to revolutionize managerial accounting practices. This technology can provide automated transaction recording systems, continuous instant audits, and much tighter and more transparent internal controls (Hu et al., 2022).

However, the success of blockchain adoption will heavily depend on the organization's overall readiness, including human resources, technological

infrastructure, and an organizational culture adaptable to innovation. Based on these conditions, this study aims to comprehensively identify and analyze the various opportunities and risks of implementing blockchain in management accounting systems. By employing a literature review method of scientific journals published from last five years, this research hopes to provide a complete and comprehensive overview. Furthermore, the findings of this study also aim to serve as strategic policy input beneficial for accounting professionals, information system developers, and academics involved in technology and digital finance.

2. Literature Review

2.1. Basic Concepts of Blockchain and Management Accounting

Blockchain is a distributed ledger technology that enables transparent, secure, and distributed data storage across various nodes in a network. Unlike conventional centralized systems, this technology allows all parties in the network to have an identical copy of all recorded data. Each unit of data, known as a block, contains a series of verified and consensus-approved transaction information by the nodes in the system. Once validated, the block is cryptographically linked to the previous block, forming an unchangeable or unmanipulatable data chain (Hu et al., 2022). This is what makes blockchain highly reliable in maintaining the integrity and security of the information stored within it.

In the context of management accounting, the accuracy and precision of transaction recording are fundamental requirements for generating information that can be used for strategic decision-making. Delayed, incomplete, or inaccurate data

can lead to erroneous decisions with significant impacts on overall organizational performance (Obschonka & Audretsch, 2020). Therefore, blockchain technology becomes highly relevant for integration into modern management accounting systems. Through its ability to record data automatically and in real-time, blockchain can accelerate internal reporting processes, simplify audit procedures through transparent digital trails, and reduce organizational reliance on third parties such as external auditors or verification consultants (Quesado & Silva, 2021). Thus, this technology offers significant operational efficiencies and enhances the overall reliability of managerial information systems.

2.2. Opportunities for Blockchain Implementation in Management Accounting

Blockchain technology offers several significant benefits in modern management accounting. One of the main benefits is increased transparency and accuracy of financial data generated and used by internal parties. Since data recorded on a blockchain is immutable, the system automatically reduces the potential for data manipulation and errors in financial transaction recording (Kowalski et al., 2021). Every recorded transaction form a permanent digital trail that cannot be deleted or modified without the knowledge of the entire network, thus creating a high level of trust in the data. Another benefit is blockchain's ability to accelerate and simplify the auditing process. With real-time auditing mechanisms, internal and external audit processes can be automated because every transaction is validated from the outset and can be tracked instantly.

This not only saves audit time and costs but also enables organizations to detect anomalies or errors more quickly. Furthermore, blockchain also supports integration with various other cutting-edge technologies such as the Internet of Things (IoT) and Artificial Intelligence (AI), which can expand the scope and depth of information available to management. In cost management practices, this technology can automate the recording of operational costs, including production, logistics, and distribution costs, in real-time (Mohsen, 2023). Even in inventory management and budget control, blockchain creates a transparent and tamper-proof audit trail system.

2.3. Risks and Challenges of Implementation

Although blockchain technology offers various advantages and significant potential in the world of management accounting, its application in the field still faces several complex challenges. The first challenge relates to the need for advanced and adequate information technology infrastructure. Implementing a blockchain system requires robust hardware and software, as well as high network stability to function optimally. In addition, the initial investment required, including for system development, employee training, and integration with existing systems, tends to be quite substantial. This certainly becomes a major obstacle for Micro, Small, and Medium Enterprises (MSMEs) that have limited budgets and resources (Nursini, 2020). The second challenge is the absence of a specific and adaptive regulatory framework and accounting standards for blockchain technology developments.

Legal uncertainty regarding the legality and validity of blockchain-based transaction data in financial reporting can hinder the widespread adoption of this

technology in the accounting world (Han et al., 2023). The third challenge comes from the security side. Although blockchain is considered relatively secure due to its decentralized nature, public networks remain vulnerable to certain cyberattacks, such as a 51% attack, where malicious entities can gain control of the majority of nodes. Finally, the limited Human Resources (HR) with technical and practical understanding of blockchain is a serious issue, especially in developing countries (Ramachandran et al., 2023). The lack of trained professionals slows down digital transformation in the financial sector.

3. Method

This research employs a literature review or library research method, a systematic approach that relies on relevant scientific sources to answer research questions regarding the opportunities and risks of implementing blockchain technology in management accounting systems. This method was chosen for its advantage in integrating and synthesizing various empirical findings and theories from previous research efficiently in terms of time and cost. The literature review approach also allows researchers to gain a comprehensive understanding of the development of blockchain concepts and applications in the context of management accounting from various scientific perspectives. The initial stage of this literature review was the literature identification process, conducted by utilizing academic search engines such as Google Scholar and several other reputable academic databases. In this process, researchers used specific keywords such as "blockchain," "management accounting," "financial information system," and "accounting

technology" to obtain relevant results. The articles considered were scientific publications from national and international journals published between last five years. This time frame was set to ensure that the sources used reflect the latest developments in the field studied.

Subsequently, the literature selection stage was carried out based on several inclusion criteria. Selected articles had to be peer-reviewed, directly discuss the integration or application of blockchain technology in the context of management accounting, and be available in full format to allow for thorough content review. Articles that only discussed general aspects of blockchain without a direct link to managerial accounting practices were excluded from the analysis list. The analysis stage involved an in-depth review of the content of each article. The focus of the analysis included the benefits of blockchain in management accounting systems, the challenges and risks identified in its implementation process, and implementation recommendations suggested by the authors.

To systematically organize information, researchers used a thematic approach to group main ideas and identify emerging trends from various sources. Finally, the findings from the reviewed literature were compiled into several interconnected main themes. To ensure the consistency and validity of information across articles, a triangulation process was performed, which involved cross-referencing between sources. The analysis results were then presented in a structured narrative format, organized according to scientific writing principles. Through this approach, this research not only presents a summary of theories but also an in-depth synthesis that

can provide significant practical and theoretical contributions to the development of blockchain-based management accounting systems.

4. Results

The literature study of twelve scientific articles published between last five years indicates that the application of blockchain technology in management accounting systems has a very significant impact, both in terms of the quality of financial and operational information, efficiency in organizational data management, and in strengthening internal control systems. Various findings from these studies show that this technology not only offers technical solutions but also leads to a paradigm shift in how companies manage managerial accounting information. In general, the results of this literature can be classified into several main themes: increased system efficiency, increased data transparency, strengthened internal audit, and challenges including regulatory aspects and technical constraints that must be faced in its implementation.

First, in terms of management accounting system efficiency, blockchain has great potential to reduce the cost burden arising from transaction recording processes and accelerate the internal financial reporting cycle. In a study conducted by Hu et al. (2022), blockchain implementation in a manufacturing company's accounting system was proven to reduce managerial reporting process time by 38%. This efficiency is achieved because blockchain eliminates the need for data reconciliation processes between departments, which are often time-consuming and prone to errors. This technology works by automatically and consistently distributing

transaction data to all network nodes, ensuring that all parties in the organization have access to the same validated data. The transaction verification process between departments becomes much faster, as the blockchain system itself handles validation directly through a consensus mechanism.

Next, in terms of transparency and information reliability, blockchain provides substantial added value. Wu et al. (2023) explain that one of the main advantages of this technology is its ability to implement the principle of a single version of truth. In this context, all stakeholders in the organization have access to identical and unchangeable transaction data because it has been validated and permanently stored in the blockchain. This is crucial in management accounting systems, where fast and accurate decision-making heavily relies on the accuracy and reliability of internal data. By using blockchain, the risk of data manipulation, information duplication, or reporting errors can be significantly reduced.

From the perspective of strengthening internal audits, blockchain offers features that drive a transformation in internal oversight and verification systems. A report by Bansal et al. (2023) emphasizes the importance of implementing real-time auditing, which is an audit process that can be performed automatically concurrently with transactions. In traditional systems, auditing is usually done periodically and retrospectively, meaning there is a time lag between transactions and the examination process. However, with blockchain, every transaction can be immediately recorded, verified, and analyzed automatically by a digital audit system. This drastically reduces reliance on time-consuming manual audits and minimizes the possibility of fraud, reporting errors, and abuse of authority.

Nevertheless, the analyzed studies also show that blockchain implementation in management accounting is not without challenges. Research conducted by Han et al. (2023) indicates that one of the biggest obstacles is the limited technical understanding of accounting system users. Many accounting staff lack technical competence regarding blockchain, both in terms of basic concepts, how it works, and its use in accounting systems. Another problem is the lack of integration between existing Enterprise Resource Planning (ERP) systems used by many companies and the blockchain system to be implemented. This integration requires structural changes in the company's information system, which are not only expensive but also require considerable time and resources.

In Indonesia reinforces these findings. Based on a survey of several companies, they found that approximately 67% of respondents stated that their companies were not ready to migrate to a blockchain system. The main reasons cited included high initial implementation costs, limitations in IT infrastructure, and concerns about the stability of new systems that have not been fully proven in the local context. This indicates that digital transformation using blockchain cannot be done haphazardly but requires careful planning and a gradual adoption strategy.

Regulatory aspects are also a significant highlight. Ramachandran et al. (2023) notes that currently, there are not many international or national accounting standards that explicitly accommodate blockchain-based recording in managerial financial reporting. This ambiguity creates serious legal uncertainty, especially in external financial reporting, auditing, and compliance with national and international financial reporting standards. The legal validity of documents and data recorded on

the blockchain remains questionable, particularly if such data forms the basis for important decisions or external reports to investors and other stakeholders.

On a global scale, blockchain implementation has shown positive results in various industrial sectors. Tan et al. (2020) highlight how large companies in logistics and energy utilize blockchain to record cost reporting and supply chain activities. This system allows accurate tracking of every stage of the goods distribution process, from production to the end consumer. This information is recorded in real-time and directly integrated with inventory management systems, facilitating more accurate and responsive cost reporting and logistics cost control in response to market changes. In the field of education and human resource development, Obschonka and Audretsch (2020) reveals that there is still a significant gap in accounting education curricula that has not accommodated the development of digital technologies, especially blockchain. This deficiency leads to a skill gap between university graduates and the increasingly digital needs of the industry. Without curriculum adjustments, many new workers are unprepared to face digital transformation in the workplace. Therefore, formal education incorporating blockchain topics is imperative to ensure the long-term success of this technology's adoption.

A study conducted by Quesado and Silva (2021) found that blockchain can be integrated with the Activity-Based Costing (ABC) method, especially in the service sector. This technology enables the recording of business activities and resource usage to be automated and transparent. Every activity associated with a specific cost can be directly recorded and linked to a product or service, resulting in

accurate profitability data. This approach increases the precision of cost allocation and helps managers make decisions based on actual information. Mohsen (2023) in their study affirm that blockchain is also highly relevant in the context of project budget management. By using smart contracts, companies can automatically regulate project expenditures based on certain achievements. These digital contracts create an efficient and tamper-proof cost control system. For example, project budgets can be automatically disbursed when project milestones are met, without the need for lengthy manual authorization processes that are prone to abuse of authority.

In the case of multinational companies, research by Appelbaum et al. (2022) shows that blockchain helps consolidate cross-country data more efficiently. With a blockchain system, all financial transactions and operational costs from various international business units can be recorded in one integrated system. This eliminates the potential for data duplication, accelerates the report consolidation process, and facilitates cross-regional audits. This is very beneficial for organizations with complex structures and branches in various locations. The last study by Kowalski et al. (2021) highlights how blockchain is used to record individual performance in projects. Each employee's contribution can be objectively documented, and incentive systems are designed based on automatically verifiable achievements. This creates a fairer reward system and motivates employees to perform optimally because assessments are no longer subjective.

However, these various studies also emphasize that blockchain adoption is not enough just from a technical aspect; it must also consider organizational culture readiness. Significant changes in information systems can trigger resistance from

employees, especially if not accompanied by effective training and communication. Therefore, transformation strategies must include a mature change management approach, including internal education and managerial support. This literature review concludes that blockchain is a technology capable of revolutionizing management accounting systems by providing solutions to increase efficiency, transparency, and data reliability. However, the success of its implementation will highly depend on the organization's overall readiness in terms of technology, human resources, education, and adaptive regulatory support.

5. Discussion

This comprehensive literature study indicates that the application of blockchain technology in management accounting systems is not merely a technological innovation but a strategic transformation encompassing various organizational aspects, including policies, structure, and work culture. Blockchain offers more than just efficiency; it influences how information is collected, processed, and presented in managerial systems. From a technical perspective, blockchain can revolutionize internal company recording and reporting systems by making them more transparent, accurate, and real-time. This undoubtedly supports the strategic role of management accounting in planning, controlling, and making more effective and accountable data-driven decisions.

However, to ensure the successful adoption of blockchain, the role of management in formulating an implementation strategy is vital. Organizations need a mature and structured digital roadmap that not only considers technological

infrastructure readiness but also aligns blockchain integration with existing accounting information systems (Jayasuriya & Sims, 2023). Furthermore, management needs to design comprehensive HR training programs so that employees have the understanding and skills required to operate blockchain-based systems. With the right combination of digital strategy and technology tailored to needs, organizations can maximize the benefits of blockchain while reducing the risk of implementation failure. One of the main challenges identified from this research is the regulatory uncertainty and unclear legal aspects. Given that blockchain is a relatively new technology in the accounting and finance context, many accounting and tax regulations have not explicitly accommodated the use of this technology. This creates serious legal uncertainty, especially in external financial reporting, auditing, and compliance with national and international financial reporting standards.

Furthermore, this study also reveals the importance of a hybrid approach to implementing blockchain. This approach means that not all processes in management accounting must be fully transferred to blockchain directly. Instead, organizations are advised to start implementation in specific areas that show concrete benefits, such as project cost management, budget reporting, and internal audits. This gradual strategy can be an efficient and realistic solution for managing the risks and costs of system changes (Arefazar et al., 2022). In terms of implementation-related risks, two stand out as the biggest challenges: human capital readiness and data security. Many employees who are still unfamiliar with blockchain

technology need intensive training and continuous technical support to adapt to the new system.

On the other hand, network security must also be a top priority, given that blockchain systems can be targets for cyberattacks if not designed with a strong security architecture. Therefore, the use of high-level security protocols and regular system updates should be part of the implementation policy. Finally, one of the strategic benefits of blockchain implementation in management accounting is its ability to democratize information management, especially for organizations with a global or multi-branch structure. Blockchain systems enable real-time and integrated cross-entity recording, which in turn accelerates the information consolidation process and improves the quality of decision-making at the managerial level. This capability is crucial for modern organizations that demand speed, accuracy, and accountability in every aspect of their operational and financial affairs.

6. Conclusion

Blockchain is a disruptive technology that brings significant transformation to management accounting systems. Through this literature review, it was found that this technology has great potential in creating efficient, transparent, and accurate reporting systems. Blockchain enables the automation of recording processes, strengthens internal oversight, and supports real-time auditing. However, these opportunities are also accompanied by various challenges. The most tangible risks include technical and infrastructure readiness, regulatory limitations, and resistance to change from users. Therefore, the success of blockchain implementation is highly

determined by the synergy between technology, strategic management, and organizational culture readiness. Important recommendations from this study are that companies need to start with gradual implementation, build human resource capacity, and actively encourage regulatory development that supports digital accounting transformation. Thus, blockchain is not just a technology of the future but a reality shaping the new face of management accounting.

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