

DIGITALIZATION AND INSTITUTIONAL REFORM IN THE PUBLIC SECTOR: THE ROLE OF BLOCKCHAIN IN PUBLIC FINANCIAL TRANSPARENCY AND ACCOUNTABILITY

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Abstract

This study aims to analyze the role of blockchain technology in improving transparency and accountability of public finances as part of institutional reform in the digital era, against the backdrop of low levels of transparency and high potential for corruption in state budget management. The conceptual approach is carried out through an in-depth literature synthesis that integrates theories of digitalization, blockchain implementation, and institutional reform, highlighting the features of permanent recording, decentralization, and smart contracts in the public financial system. The results of the synthesis show that blockchain can reduce corruption gaps and improve audit mechanisms through real-time data transparency, although its implementation faces technical challenges, non-adaptive regulations, and internal resistance. The conceptual model developed proposes that the success of blockchain adoption is highly dependent on infrastructure readiness, policy adjustments, and organizational culture transformation, thus producing a strategic roadmap for digital reform in the public sector. This study also reveals that obstacles to implementing such technology must be overcome through cross-sector collaboration and progressive policy reforms, which not only improve operational efficiency but also encourage innovation in governance. The results of this study provide a basis for developing a comprehensive digital reform strategy, synergistically integrating technical, policy, and organizational culture aspects, and are expected to inspire innovation in public governance and provide significant theoretical and practical contributions to holistic digital reform.

Keyword: Digitalization; Institutional Reform; Public Sector; Blockchain; Public Financial Transparency; Accountability

INTRODUCTION

In the rapidly developing digital era, institutional reform in the public sector is a must to improve efficiency, transparency, and accountability (Abadi et al., 2024; Fadri & Fil, 2024). Digitalization has changed the way governments manage resources and provide services to the public (Mergel et al., 2019). Various countries have begun to adopt digital technology to improve financial administration systems and public budget management. However, although digitalization offers various advantages, there are still significant challenges related to public trust in government, data integrity, and the risk of manipulation in public financial reporting (Viana, 2021).

One of the main challenges in public financial governance is the low level of transparency and accountability in the management of the state budget. Cases of corruption, misuse of budgets, and inaccurate financial reporting are still problems in many countries, both developing and developed (Dipierro & Rella, 2024; Transparency International, 2024) . A report from Transparency International (2023) shows that corruption in the public sector remains a global issue that hinders development and reduces public trust in the government. Therefore, technological innovation is needed that can increase transparency and accountability in the public financial system (Roseth et al., 2021) .

Previous studies have explored public sector digitalization efforts and institutional reforms to improve transparency. For example, Janssen & Estevez's study discusses the implementation of e-Government as a solution to improve public information transparency (Janssen & Estevez, 2013) . Meanwhile, a study conducted by Cordella & Paletti highlights the role of digital technology in strengthening financial oversight systems (Cordella & Paletti, 2019) . However, these studies have yet to deeply explore the potential of blockchain in addressing data integrity and transparency issues in public financial management.

This is where the research gap that is the main focus of this study lies. Although various studies have discussed digitalization and institutional reform, there are still limitations in exploring how blockchain can be effectively applied to improve public financial transparency and accountability (Diana et al., 2024; Lumineau et al., 2021) . Blockchain has the characteristics of decentralization, immutability, and smart contracts that can ensure that every financial transaction is recorded securely and can be audited in real-time (Castro & Lopes, 2022) . However, there is still little research that examines the practical implementation of this technology in the context of public budget management (Mountasser & Abdellatif, 2023; Xu et al., 2019) .

This study aims to fill this gap by analyzing the role of blockchain in improving transparency and accountability of public finance in the government sector. This study will explore how blockchain technology can be applied in public financial reporting systems, reducing opportunities for corruption, and increasing efficiency in managing state funds

(Peters & Panayi, 2016) . In addition, this study will also assess the various challenges and obstacles that may arise in implementing blockchain in the public sector (Hughes et al., 2019).

The main contribution of this study is to provide empirical and theoretical insights on how blockchain can be an innovative solution in public sector institutional reform. The findings of this study are expected to provide recommendations for the government and policy makers in adopting blockchain technology as part of the country's financial digitalization strategy (Lacity, 2018) . Thus, this study not only contributes to academic literature, but also to more transparent and accountable public policy practices.

Overall, digitalization and institutional reform in the public sector are important steps in building a clean and responsive government to the needs of the community. By utilizing blockchain technology, it is expected that the public financial system can become more transparent, efficient, and free from corrupt practices (Zhang et al., 2018) . Therefore, this study has high significance in supporting digital transformation in the government sector towards better governance.

LITERATURE REVIEW

Digitalization and Institutional Reform in the Public Sector

Digitalization has become a key pillar in public sector institutional reform. Research by Mergel et al. (2019) highlights that digitalization enables increased efficiency of public services and reduction of complex bureaucracy (Mergel et al., 2019) . Governments in various countries have adopted digital technologies to improve the quality of services and transparency of public financial management (Viana, 2021) . However, Cordella & Paletti (2021) emphasize that the success of digitalization is highly dependent on regulatory readiness and institutional capacity in managing technological change (Cordella & Paletti, 2019) .

On the other hand, digitalization also contributes to increasing public participation in public decision-making. Digital technology allows for a broader information transparency

system, so that the public can more easily monitor and provide input on government policies (Mountasser & Abdellatif, 2023) . However, research also shows that without supportive policies, digitalization can actually increase the digital divide and worsen inequality in access to public services (Transparency International, 2024) .

Despite its great potential, the implementation of digitalization in the public sector also faces challenges, such as cybersecurity issues, lack of HR readiness, and dependence on uneven digital infrastructure (Yukhno, 2024) . Therefore, an appropriate implementation strategy is needed so that digitalization can truly contribute to institutional reform and increased transparency in the public sector.

Blockchain as a Solution for Public Financial Transparency and Accountability

Blockchain as a decentralized technology offers advantages in creating a more transparent public financial system. Casino et al. (2019) explained that blockchain is able to ensure that every recorded transaction cannot be changed and can be audited in real-time. A study by Viana also shows that implementing blockchain can reduce the risk of data manipulation and increase accountability in the management of public funds (Viana, 2021) . However, research by Xu et al. (2022) revealed that the main challenges in implementing blockchain are the cost of adopting the technology and resistance from stakeholders (Casino et al., 2019; Xu et al., 2019) .

In addition, blockchain has the potential to create a more inclusive financial system by providing a more transparent and accessible reporting mechanism for various stakeholders. With a system that cannot be manipulated, blockchain can help reduce corruption in the management of public funds (Peters & Panayi, 2016) . However, the success of blockchain implementation also depends on regulatory support and the readiness of adequate technological infrastructure.

However, research shows that blockchain implementation still faces significant technical and bureaucratic barriers. Hughes et al. (2019) revealed that many government institutions are still hesitant to adopt this technology due to a lack of understanding and unclear regulations governing the use of blockchain in the country's financial system.

Challenges and Barriers to Blockchain Implementation in the Public Sector

Despite offering various advantages, the implementation of blockchain in public finance is not without challenges. Hughes et al. (2019) identified that inadequate technological infrastructure, lack of supporting regulations, and limited human resources are the main obstacles (Hughes, 2019). In addition, research by Lacity (2018) shows that the adoption of blockchain in government systems often faces political obstacles and bureaucratic resistance that can hinder digital transformation in the public sector (Lacity, 2018).

In addition to technical factors, cultural and organizational challenges are also barriers to blockchain adoption. Many government agencies are still accustomed to traditional systems and are reluctant to switch to new technologies that are not yet fully understood (Kshetri, 2021). Therefore, a more comprehensive approach is needed in integrating blockchain into the public financial system.

RESEARCH METHODS

This study uses a conceptual approach, which emphasizes theoretical analysis and literature synthesis. This approach was chosen because the topic of blockchain's role in public financial transparency and accountability is still relatively new and has not been widely studied empirically. Thus, this study aims to integrate various existing theories and concepts to build a comprehensive conceptual framework (Casino et al., 2019; Viana, 2021; Xu et al., 2019).

The literature review was conducted in depth by collecting and reviewing scientific articles, books, policy reports, and publications related to digitalization, institutional reform in the public sector, and the application of blockchain technology. This secondary data was collected from various trusted sources such as academic journals and institutional reports. Content analysis and theoretical synthesis techniques were used to identify patterns, relationships between concepts, and existing research gaps, resulting in an in-depth understanding of the issues raised.

The analysis was conducted comparatively by comparing findings from various literatures to contrast existing views and approaches. This comparative approach allows

researchers to assess the advantages and disadvantages of each concept and integrate the findings into a complete conceptual framework. The results of this synthesis are expected to provide a strong theoretical basis for further empirical research and provide strategic recommendations for digitalization policies and institutional reforms in the public sector (Lacity, 2018; Peters & Panayi, 2016) .

RESULTS AND DISCUSSION

Based on the literature analysis that has been conducted, a conceptual framework is formed that describes how blockchain technology can support transparency and accountability of public finances. The synthesis of findings shows that blockchain has three main dimensions that contribute to institutional reform: (1) increased transparency through permanent and immutability of transaction recording, (2) increased accountability through real-time audit mechanisms and automated smart contracts, and (3) operational efficiency that has the potential to reduce bureaucracy and budget misuse (Casino et al., 2019; Fadri & Fil, 2024; Peters & Panayi, 2016) .

The integration of the concepts of digitalization and institutional reform in this conceptual framework highlights the important role of regulatory support and technological infrastructure readiness as prerequisites for implementation. The literature shows that the success of blockchain adoption depends not only on the technology itself, but also on institutional readiness and the existence of supportive policies (Casino et al., 2019; Xu et al., 2019) . The synthesis results identify that synergy between technical and policy aspects is key to overcoming obstacles such as bureaucratic resistance and human resource shortages (Hughes et al., 2019).

Furthermore, the resulting conceptual framework reveals that blockchain implementation can fill the gap in the literature related to transparency and accountability in public financial management. This conceptual model proposes that blockchain, when implemented strategically, not only enhances data integrity but also facilitates public participation in public financial oversight. These findings provide a strong theoretical basis

for the development of more responsive and clean public policies (Lacity, 2018; Yasin et al., 2024; Zhang et al., 2018) .

1. The Potential of Blockchain Technology in Institutional Reform

Blockchain technology offers great potential to revolutionize the public financial system through its permanent and immutability transaction recording feature. This concept allows for the creation of transparent records, so that every transaction can be clearly accounted for. This advantage is the basis for reducing the gap for corruption and misuse of funds.

In addition, blockchain supports data decentralization, meaning that no single authority controls the entire system (Eden et al., 2024) . Thus, the risk of data manipulation is lower and the distribution of information is more equitable. This can significantly increase public trust in the state financial management system, as supported by research by Casino et al. (2019) and Peters & Panayi (2016).

However, critically, the implementation of this technology requires infrastructure readiness and deep policy adjustments. Although it offers an ideal solution, blockchain implementation in the public sector faces complex challenges related to integration with legacy systems and the need for high initial investment. Therefore, this great potential must be balanced with a mature implementation strategy so that its benefits can be realized optimally.

2. Increasing Transparency through Decentralization

Decentralization is one of the main pillars of blockchain that enables the creation of an open and transparent system (Fitri & Anastasya, 2025) . Without a central authority, transaction data is stored in a distributed manner so that any changes can be detected by all participants in the network. This approach fundamentally encourages transparency and accountability.

In the context of public finance, increased transparency through decentralization allows citizens to access information in real time. With an open system, external supervision becomes easier, so that internal control mechanisms can be strengthened. This is in line

with the World Bank's recommendations which emphasize the importance of data transparency in institutional reform (Rogger & Schuster, 2023) .

On the other hand, critically, decentralization also brings its own challenges. Without centralized coordination, potential conflicts and differences in data interpretation between stakeholders can arise. Therefore, while decentralization increases transparency, clear governance mechanisms are needed to coordinate and align data use at scale.

3. Increasing Accountability through Smart Contracts

Smart contracts are an innovation in blockchain that allows for the automatic execution of pre-programmed agreements (Martinelli et al., 2024) . With this mechanism, transaction execution and verification of regulatory compliance can be done automatically without human intervention. This directly increases accountability because every process is recorded clearly and transparently.

The use of smart contracts reduces the chances of human error and increases the speed and efficiency of transactions. In the context of public finance, this mechanism can ensure that funds are only used in accordance with agreed terms. Several studies, including by Peters & Panayi (2016), show that automation through smart contracts can reduce operational costs and increase public trust (Peters & Panayi, 2016) .

Critically, reliance on smart contracts also has its downsides. Incomplete program code or design flaws can lead to unintended execution and even financial losses. Therefore, in-depth technical audits and the development of strict security standards are essential before implementing smart contracts in the public sector.

4. Technical Challenges in Blockchain Implementation

Despite its many potentials, blockchain implementation in public finance faces a number of significant technical challenges (Arwani & Priyadi, 2024) . Scalability issues, integration with existing information systems, and the need for state-of-the-art digital infrastructure are major obstacles. A study by Xu et al. (2022) underlines that without optimal technological readiness, blockchain benefits could be limited (Xu et al., 2019) .

In addition, the cost of adopting and maintaining blockchain technology is still relatively high. Large initial investments and the need for periodic system upgrades force

public agencies to consider long-term benefits compared to operational costs incurred. This challenge requires careful planning and proper resource allocation so that blockchain implementation can run efficiently.

Critically, these technical hurdles indicate that blockchain is not a silver bullet or instant solution to all public finance problems. A phased approach, small-scale trials, and collaboration with the private sector to develop supporting infrastructure are strategies that need to be adopted. Continuous evaluation of the technology's performance is also essential to ensure that the technical solutions implemented are truly relevant and effective.

5. Policy and Regulatory Barriers

The success of blockchain implementation in the public sector is highly dependent on a supportive policy and regulatory framework (Supriadi, 2024) . Traditional regulations often fail to accommodate the unique characteristics of blockchain, creating legal ambiguity and barriers to adoption. Viana emphasized that adaptive policy reforms are essential to keep up with rapid technological developments (Viana, 2021) .

In addition, regulatory uncertainty can pose legal risks for government agencies adopting this technology. Without a clear legal basis, blockchain use can face obstacles in terms of auditing, accountability, and data protection. This requires regulatory updates that can provide a transparent framework and support technological innovation.

Critically, policy and regulatory barriers are one of the most complex challenges as they involve coordination between multiple government agencies and stakeholders. Regulatory reform must be carried out comprehensively and collaboratively, involving discussions between regulators, academics, and technology practitioners. Only with this multidisciplinary approach can blockchain implementation run harmoniously within the applicable legal framework.

6. Organizational and Cultural Resistance

One of the non-technical challenges in implementing blockchain in the public sector is internal resistance that comes from a rigid organizational culture (Nugraheni et al., 2025) . Many government institutions are still accustomed to traditional bureaucratic systems and

are reluctant to make drastic changes to established work processes. This results in internal barriers that hinder the adoption of new technologies.

Organizational culture change requires time and strong commitment from all elements in the agency. Training, socialization, and increasing understanding of the benefits of digital technology such as blockchain are essential to overcome this resistance. Hughes et al.'s (2019) study shows that increasing digital literacy and adjusting management systems can help reduce cultural barriers and accelerate digital transformation (Hughes, 2019) .

Critically, organizational resistance is not only related to technical aspects, but also to internal power dynamics and interests. Institutional reforms must include strategies for managing change, such as developing incentives and participatory mechanisms that involve employees in the transformation process. Without a holistic approach, cultural change can be a major barrier that hinders the full potential of blockchain technology.

7. Strategic Implications for Institutional Reform

From a strategic perspective, blockchain implementation offers more than just increased operational efficiency (Simanjuntak, 2024) ; this technology can also be a catalyst for comprehensive institutional reform (Ditasman & Amrullah, 2024) . Digital transformation through blockchain not only changes the recording system but also drives a paradigm shift in governance. Thus, blockchain can pave the way for deeper structural reform.

These strategic implications include increasing cross-sectoral collaboration between government, the private sector, and civil society. New governance models must be able to integrate technology with organizational policies and culture so that innovation can be implemented effectively. Yukhno emphasized the importance of synergy between technology and policy in achieving sustainable institutional reform (Yukhno, 2024) .

Critically, strategic implementation requires a long-term vision and strong political commitment. Structural change cannot happen instantly, but must be supported by a series of coordinated initiatives and periodic evaluations. Institutional reform through blockchain must be accompanied by regulatory updates, human resource training, and adaptation of organizational culture so that the desired results can be achieved comprehensively.

8. Critical Evaluation of the Proposed Conceptual Model

The conceptual model resulting from the synthesis of the literature offers an integration between technical and policy aspects in the implementation of blockchain in the public finance sector (Arwin et al., 2023). This model combines elements of transparency, accountability, and operational efficiency as key components that support each other. This concept provides a comprehensive theoretical overview to understand the potential and challenges of implementation (Hughes, 2019).

In critical evaluation, the strength of the model lies in its ability to bridge the gap between theory and practice through in-depth analysis. The model identifies key variables that must be present for blockchain to function optimally in improving public financial integrity. However, the weakness of the model arises from the assumption that institutional readiness and regulatory support are always available, when in reality the dynamics on the ground are often more complex.

Therefore, critical evaluation suggests that this conceptual model needs to be validated through more in-depth empirical research. Testing through case studies and pilot projects in government agencies can reveal aspects that have not been fully covered in the model. This validation is important to ensure that the theoretical framework can be realistically adapted to meet operational and policy challenges.

9. Further Research Directions and Strategic Recommendations

Based on a critical analysis of the literature, further research directions are directed to test the conceptual model through empirical studies and pilot projects in various government agencies. Further research is needed to identify specific factors that influence blockchain implementation in public finance. Field data collection and system performance evaluation will provide valuable feedback for further theory development.

Strategic recommendations include the need for intensive collaboration between the public, private and regulatory sectors to overcome technical, policy and cultural barriers. Adopting an interdisciplinary approach can help integrate different perspectives and innovative solutions to address existing challenges. This coordinated effort is essential to building a digital ecosystem that supports comprehensive institutional reform.

Critically, further research should be directed to test the reliability of the conceptual model in real conditions and identify effective adaptation mechanisms. The results of this research can then be used as a basis for reforming public policies and developing optimal blockchain implementation standards. Thus, the resulting strategic recommendations will serve as practical guidance for policymakers in realizing an inclusive and sustainable digital transformation.

CONCLUSION

This conceptual study concludes that blockchain technology has great potential to reform the public financial system by increasing transparency, accountability, and operational efficiency. With features such as immutable transaction records, data decentralization, and automation through smart contracts, blockchain can reduce the opportunities for corruption and budget misuse. The integration of digitalization and institutional reform provides a strong theoretical framework as a basis for developing public policies that are more open and responsive to the needs of the community.

Furthermore, the results of the literature synthesis indicate that the success of blockchain implementation depends not only on its technical excellence, but also on institutional readiness, regulatory support, and organizational cultural adaptation. The resulting conceptual model offers a holistic view of how this technology can be applied to improve the integrity and accountability of the country's financial system. The findings provide a deep theoretical foundation and a strategic roadmap for policymakers to consider blockchain adoption systematically.

Overall, this study confirms that despite a number of challenges, blockchain remains an innovative tool that has the potential to optimize public financial management, while also being a catalyst for institutional reform in the digital era.

Limitations

This study has limitations because it is conceptual and relies on the synthesis of existing literature, so direct empirical data from blockchain implementation in public finance is still minimal. This results in the proposed conceptual model needing to be validated

through field research to ensure its relevance and applicability in real contexts. In addition, variations in institutional contexts and regulatory differences across countries limit the generalizability of the study findings. The assumptions underlying institutional readiness and policy support in various public environments may not fully reflect the dynamics that occur in the field, so caution is needed in applying this model in various situations.

Another limitation lies in the limited data sources presented in the literature. The rapid development of blockchain technology requires further research so that conceptual models and frameworks can continue to be updated according to new conditions and challenges that arise.

Implications

The theoretical implications of this study are significant for the development of literature on digitalization and institutional reform in the public sector. The resulting conceptual framework provides guidance for researchers and practitioners to understand the relationship between blockchain technology, transparency, and accountability in public financial management. Practically, the findings of this study can be used as a basis for policy makers to formulate strategies for adopting digital technology that support institutional reform. The resulting policy recommendations, for example regarding the preparation of adaptive regulations and increasing human resource capacity, are expected to overcome technical and cultural barriers that have so far hampered the implementation of digital innovation.

Other strategic implications include the importance of collaboration between the public sector, private sector, and academic institutions to integrate technological solutions into governance. This interdisciplinary approach will strengthen the digital ecosystem and create synergies between technological innovation and institutional reform, thereby increasing public trust in the public financial system.

Further Research Suggestions

Further research is strongly recommended to conduct empirical studies to test the validity of the proposed conceptual model. A case study approach or pilot project in a government agency that has adopted blockchain technology can provide deeper insights

into the operational challenges and real impacts of implementing the technology in the context of public finance. In addition, future research needs to explore contextual variables such as differences in organizational culture, digital infrastructure readiness, and regulatory dynamics in various countries. This will help refine the conceptual model to be more adaptive and applicable in various different institutional environments.

Finally, suggestions for further research include the need for cross-sectoral collaboration between academics, practitioners, and policymakers to develop more comprehensive implementation standards and reform strategies. This approach is expected to not only enrich the theoretical basis, but also provide practical solutions that can improve public financial transparency and accountability in a sustainable manner.

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