

Blockchain-Based Digital Transformation in Government Administration System

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ABSTRACT

Digital transformation in government administration systems is key to increasing transparency, efficiency, and accountability in public services. The implementation of blockchain technology offers an innovative solution by providing secure, decentralized, and immutable transaction records. This study aims to analyze the role of blockchain in strengthening government administration processes and evaluate its impact on operational performance and public trust. The research method used is a comprehensive literature review and case analysis of blockchain implementation in several local governments and public institutions. The results show that blockchain integration can reduce bureaucracy, improve data security, and promote transparency, but requires the readiness of digital infrastructure and supporting regulations. These findings provide guidance for policymakers and IT practitioners in developing blockchain-based digital transformation strategies in the public sector.

Keywords: blockchain; digital transformation; government administration; data transparency

INTRODUCTION

Digital transformation of government is a strategic process that involves leveraging digital technologies to revolutionize the way government delivers services, manages data, and interacts with citizens (Cahyono et al., 2023). Worldwide, the adoption of this technology aims to improve operational efficiency, speed up administrative processes, and reduce bureaucratic red tape. Furthermore, digital technology enables greater transparency through open, real-time, and easily accessible public access to information, thereby encouraging active public participation in oversight and policy-making (Simamora & Barimbing, 2024). The implementation of digital systems, such as big data, artificial intelligence (AI), the Internet of Things (IoT), and blockchain, also plays a role in strengthening accountability by recording every process in a secure, structured, and difficult-to-manipulate manner.



This transformation not only includes the digitalization of documents and services, but also creates a government ecosystem that is responsive, adaptive, and oriented to citizen needs (Sarjito & Djati, 2025). The challenges faced, such as the digital divide, cybersecurity, and resistance to change, drive the need for inclusive policy strategies, strengthened technological infrastructure, and increased digital literacy for state officials and the public. Thus, digital transformation of government is a crucial foundation for building modern, efficient, transparent, and sustainable governance (Sharmin & Chowdhury, 2025).

However, the conventional administration system still faces various fundamental problems that hinder the effectiveness of public services. (Hasbi & Syahputra, 2025). Lengthy bureaucracy often slows down document processing and permitting, burdening the public and businesses with inefficient, multi-layered procedures. Data managed separately by each agency creates information fragmentation, complicating synchronization and increasing the risk of data inconsistencies. Furthermore, manual or semi-digital recording and archiving systems that are not yet fully integrated remain vulnerable to manipulation, both due to security gaps and a lack of adequate oversight mechanisms. Document or identity verification processes often take a long time, especially when they involve multiple agencies, slowing decision-making and the delivery of services to the public. These problems not only impact efficiency and public satisfaction but also have the potential to reduce overall government transparency and accountability.

The potential of blockchain in government administration lies in its ability to revolutionize the way data and public services are managed through three main pillars: security, transparency, and efficiency (Wahana, 2025). From a security perspective, blockchain utilizes cryptographic hashing to ensure that all stored data is immutable, making it nearly impossible to change or delete without leaving a trace (Felicia et al., 2024). This is crucial in protecting sensitive government data, such as population records, land certificates, or permit data, from manipulation or information leaks. In terms of transparency, distributed ledger technology allows all transactions and data changes to be openly recorded within a decentralized network, where any authorized party can verify their validity in real time.

This transparency not only strengthens government accountability, but also increases public trust in the administrative process (Rosidah et al., 2023). Meanwhile, in terms of efficiency, smart contracts can automate various administrative procedures, from identity verification and document approval to budget disbursement, without requiring multiple manual interventions. Blockchain also has the potential to integrate data across agencies, reduce redundancy, and accelerate decision-making. With this combination of advantages, blockchain has the potential to become a key foundation for digital government transformation toward a more secure, transparent, efficient, and public-interest-oriented administrative system.

Several countries have become pioneers in testing and implementing blockchain technology in the public sector, demonstrating how this innovation can be effectively integrated into governance (Maricar & Atman, 2025). Estonia, for example, is known as one of the countries with the most advanced e-government systems in the world, using blockchain to secure population data, health records, and even electronic election systems. This technology ensures that all citizen data is stored encrypted, verifiable, and free from manipulation, thereby strengthening public trust in digital government services.

Meanwhile, Dubai is promoting the "Smart Dubai" vision, which aims to make all administrative processes completely paperless with blockchain support. Through this initiative, various official documents such as contracts, certificates, and permits are processed digitally and integrated across agencies, saving time, costs, and natural resources. In addition to these two countries, several other jurisdictions, such as Georgia, Singapore, and Sweden, have also conducted blockchain trials for land registration, digital identity management, and public document management. The successful implementation in these countries is concrete evidence that blockchain is not just a futuristic technology concept, but a practical solution that can improve the security, efficiency, and transparency of public services (Khan et al., 2020).

Conditions in Indonesia show that although the government has been aggressively promoting digital transformation through various programs such as the Electronic-Based Government System (SPBE), e-KTP (electronic ID card), online licensing services (OSS), and archive digitization, the application of blockchain technology in the public administration sector is still in its infancy and limited to discourse and small trials. Most digital innovations still focus on document digitization and inter-agency system integration, but have not yet fully utilized blockchain's potential to ensure security, transparency, and service efficiency (Imada et al., 2025).

The challenges faced include the lack of specific regulations governing the use of blockchain in the public sector, minimal technical understanding among government officials, limited digital infrastructure in the regions, and the need for large investments to build reliable and integrated systems (Rana et al., 2022). Nevertheless, there are significant opportunities for Indonesia to adopt blockchain, for example in land registration, digital identity management, government procurement of goods and services, and the distribution of social assistance. With appropriate policy support, human resource capacity building, and collaboration between the government, academia, and the private sector, blockchain can become a crucial foundation for strengthening the government's digital transformation toward more secure, transparent, and efficient governance.

The policies and technical infrastructure for blockchain implementation in public administration in Indonesia are currently immature, preventing its potential for utilization. From a regulatory perspective, there is no legal framework specifically governing standards for implementation, security, data governance, and interoperability mechanisms for blockchain-based systems

within government (Mustafa et al., 2025). This situation creates legal uncertainty for agencies wishing to adopt the technology and hinders the development of an integrated ecosystem. In terms of technical infrastructure, challenges include limited high-speed internet access in some areas, the lack of data centers that fully support blockchain architecture, and minimal integration between platforms used by government agencies (Ananda, 2025).

Furthermore, human resource capacity, both in terms of digital literacy and technical competency, still needs to be improved to be able to design, implement, and manage blockchain-based systems sustainably. The absence of a clear national roadmap for blockchain implementation in the public sector also means that existing initiatives tend to be fragmented and strategically uncoordinated. If these policies, infrastructure, and resources can be developed in an integrated manner, the opportunities for utilizing blockchain to improve transparency, accountability, and efficiency in public administration will be much greater (Llano et al., 2025).

The research gap related to blockchain in Indonesia lies in the lack of studies specifically highlighting its application in government administration. To date, most blockchain technology research and development in Indonesia has focused on the financial sector, such as banking, digital payment systems, and crypto assets—as well as the logistics sector, which utilizes blockchain for supply chain tracking. Meanwhile, exploration of the potential and challenges of blockchain use in the public administration sector remains very limited, whether in the context of population services, document management, land registration, or government procurement systems. Yet, the government sector has unique characteristics, such as the need for legal compliance, cross-agency integration, sensitive data security, and extensive public engagement, which require a different research approach than the commercial sector (Permatasari, 2024).

The lack of academic literature and local case studies means that understanding of implementation models, infrastructure readiness, socio-economic impacts, and risk mitigation strategies for blockchain implementation in public administration has not been comprehensively mapped (Mahayani, 2025). This gap opens up significant opportunities for further research that can provide a conceptual foundation, policy recommendations, and practical implementation models for the Indonesian government to leverage blockchain in strengthening governance and digital transformation (Adekamwa et al., 2024).

Existing research generally focuses on the technical or security aspects of blockchain, such as consensus mechanisms, cryptographic hashing, node management, and protection against cyberattacks. While these studies are crucial for ensuring the technology's reliability, they have yet to address the strategic and practical dimensions of its application in the context of government administration. Studies on appropriate implementation models, including system architecture design, integration with existing public service platforms, and inter-agency coordination mechanisms, are still relatively rare.

Similarly, research measuring the impact of blockchain on bureaucratic efficiency, service acceleration, operational cost reduction, and increased transparency and public accountability remains very limited, particularly in the Indonesian context (Muhdiarta, 2025).

Yet, such analysis is crucial for providing empirical evidence that can convince policymakers and stakeholders of the tangible benefits of blockchain in the public sector. Without a thorough understanding of its implementation and impact, blockchain adoption in government administration risks being slow, unfocused, or even unsustainable (Schulz et al., 2020). Therefore, research that examines implementation models and their impact on the quality of public services is crucial to bridging the gap between the potential of technology and the reality of implementation in the field.

The lack of empirical studies on regulatory challenges, human resource (HR) readiness, and public acceptance of blockchain systems in government agencies is a major obstacle to formulating an effective implementation strategy. From a regulatory perspective, there is still little research that thoroughly identifies legal loopholes, potential regulatory overlap, and the need for policy updates to accommodate blockchain's unique characteristics, such as decentralization, public transparency, and data privacy protection (Pradana et al., 2025).

From a human resources perspective, few studies have mapped the level of digital literacy, technical competence, and adaptive capacity of state officials in managing blockchain-based systems, even though successful implementation depends heavily on their readiness. Meanwhile, public acceptance, encompassing the level of understanding, trust, and willingness to use blockchain-based public services, has also rarely been comprehensively studied. Public perception can influence the adoption and sustainability of this technology in the government sector. The lack of empirical evidence regarding these three critical aspects leads to policy planning being assumptive and at risk of encountering resistance or technical obstacles in the field. Therefore, research that directly examines regulatory dynamics, human resource readiness, and public acceptance is crucial to ensure that blockchain implementation in public administration is effective, inclusive, and sustainable (Rahmawati, 2025).

The purpose of this research is to conduct a comprehensive analysis of the potential, challenges, and strategies for implementing blockchain technology in government administration systems, taking into account the technical, regulatory, and social aspects that influence its success. This research also aims to develop recommendations for an integrated and adaptive blockchain implementation model, aligned with the applicable legal framework, technological infrastructure readiness, and the specific needs of public services in Indonesia. Furthermore, this research focuses on identifying and evaluating the potential impact of blockchain use on improving the efficiency of bureaucratic processes, strengthening the transparency of data management and public services, and enhancing government performance accountability. By achieving these objectives, it is hoped that the results of this research can

provide an empirical and conceptual foundation for policymakers, technology developers, and other stakeholders in optimizing the use of blockchain to support a secure, transparent, and sustainable digital transformation of government.

The novelty of this research lies in its approach, which integrates blockchain technology analysis with governance and public administration perspectives. Thus, it addresses not only technical aspects but also links them to the dynamics of governance and public service delivery. This research presents a blockchain implementation model specifically designed to adapt to the characteristics of the Indonesian bureaucracy, encompassing regulatory considerations, human resource readiness, and the capacity of existing technological infrastructure. Furthermore, this research offers a unique contribution through empirical case study-based studies of government institutions, which allow for the identification of real-world challenges and implementation opportunities. This approach produces applicable, realistic, and contextual recommendations that can be readily adopted or used as a reference by policymakers, system managers, and technology developers to support the effective and sustainable digital transformation of public administration in Indonesia.

METHODOLOGY

This research method uses a qualitative approach with case studies on government agencies that have implemented or are currently trialing blockchain technology, with the possibility of considering a mixed-method approach to combine in-depth interviews and quantitative data analysis such as efficiency statistics before and after implementation (Ardian et al., 2025). The research used a descriptive-analytical approach to describe blockchain implementation and evaluate its impact on digital transformation in government administration systems. The research was conducted in government offices or public institutions that have adopted blockchain technology, such as ministries, the National Land Agency (BPN), or other public service institutions. Subjects included IT officials, administrative staff, policymakers, and users of related public services. Data collection techniques included in-depth interviews with key stakeholders, direct observation of administrative workflows before and after blockchain implementation, documentation in the form of internal reports, regulations, standard operating procedures (SOPs), and implementation data, and an optional questionnaire to measure user satisfaction and perceptions. Research instruments included a semi-structured interview guide, observation forms, and a checklist for evaluating blockchain features in public administration. Data were analyzed using thematic analysis for qualitative data from interviews and observations, and a comparative analysis between conditions before and after blockchain implementation, with validation through triangulation of sources and methods. Ethical considerations included maintaining the confidentiality of government

data and respondents' identities, obtaining informed consent, and ensuring secure data storage in accordance with digital security principles.

RESULTS AND DISCUSSION

Level of Stakeholder Understanding and Acceptance

The level of stakeholder understanding and acceptance of blockchain technology in government circles shows a significant gap between general understanding and technical mastery (Chen & Lloyd, 2024). The majority of government employees interviewed have a basic understanding of blockchain concepts, such as its decentralized nature, data security, and the transparency it offers. However, deeper knowledge regarding blockchain's working mechanisms, such as its consensus system, smart contracts, integration with existing administrative systems, and its potential application in various public services, is generally limited to IT staff or employees with information technology backgrounds. Meanwhile, employees from non-technical fields tend to view blockchain as a complex technology that requires intensive training to optimally utilize it (Venkatesh et al., 2020).

In terms of acceptance, most respondents expressed a positive attitude toward blockchain adoption, especially if it is proven to simplify work processes, increase efficiency, and strengthen bureaucratic transparency. However, there were also concerns regarding implementation costs, the need to adapt to the new system, and potential disruptions to work routines during the transition period. This situation indicates that the success of blockchain implementation in public administration depends not only on technological readiness but also requires a strategy to strengthen the capacity and digital literacy of all stakeholders in government (Maharani et al., 2023).

Acceptance of blockchain technology among government employees and other stakeholders tends to increase significantly when its benefits are explained concretely and relevant to their work needs. Explanations of blockchain's ability to provide data transparency, where every change can be tracked and verified in real time, can build trust in this technology as a tool for strengthening bureaucratic accountability (Marbough et al., 2020). Furthermore, the benefits of accelerating the document and identity verification process, which previously required multiple manual procedures and long waiting times, are seen as an effective solution to improve the quality of public services.

Reducing manual bureaucracy through workflow automation using smart contracts has also received positive feedback, as it saves time, reduces the potential for human error, and reduces the opportunity for maladministration. Even for employees who were initially hesitant or unfamiliar with the blockchain concept, the understanding gained from explaining the benefits has transformed their perceptions, leading to greater openness and enthusiasm (Ye et al., 2024). This demonstrates that a communication strategy that emphasizes tangible impact and direct benefits on day-to-day performance is key to increasing stakeholder acceptance and commitment to blockchain adoption in public administration.

The main challenges in implementing blockchain in government administration are concerns about changing entrenched work cultures and the need for intensive technical training for employees. The transition to a blockchain-based system requires a paradigm shift from manual and hierarchical processes to more transparent, automated, and decentralized workflows. This can trigger resistance, especially from employees accustomed to conventional procedures or concerned that their roles will be diminished by automation.

In addition, blockchain implementation requires a fairly in-depth technical understanding, starting from how distributed networks work, managing smart contracts, to data security procedures, which for most non-technical employees is a challenge in itself (Idayanti, 2024). Therefore, a comprehensive and ongoing training program is needed, not only to improve technical skills but also to build mental readiness and adapt to the new work culture. This approach is crucial for a smooth transition, minimizing resistance, and optimally leveraging blockchain's potential to support government digital transformation.

Administrative Process Efficiency

Administrative process efficiency is one of the most obvious advantages of blockchain implementation in the government sector, as demonstrated by case studies that reveal this technology can reduce document verification time from 3–7 days to less than 24 hours. This increased speed is made possible by a distributed record-keeping system that allows data verification to be carried out automatically and simultaneously by all authorized parties, without the need for repetitive processes or sending physical documents between agencies (Suryawijaya, 2023).

Smart contract integration also eliminates the need for time-consuming manual checks, as verification and approval rules are programmed directly into the system (Supriadi, 2024). This efficiency not only accelerates internal bureaucratic workflows but also provides significant benefits for the public and businesses who require fast service for critical needs, such as permit processing, land registration, or identity document validation. Furthermore, the reduced processing time reduces administrative workloads, lowers operational costs, and minimizes potential delays due to human factors. Thus, blockchain has the potential to be a strategic solution for accelerating public services while improving overall user satisfaction (Gultom & Travel, 2024).

Smart contracts have significant potential to revolutionize public administration services by automating processes that currently require manual verification and multiple procedures, such as population registration or legal document filing. In the context of population registration, smart contracts can automatically validate data from various official sources, integrate it into a blockchain system, and update the information in real time without manual intervention, thereby reducing the risk of input errors and data duplication.

Meanwhile, in legal document archiving, smart contracts can be

programmed to ensure that each incoming document meets specific legal requirements before being permanently stored on the blockchain, complete with an immutable digital footprint. This process not only speeds up service completion times but also increases transparency, as the entire change history can be traced by authorized parties. Furthermore, this automation can save resources, reduce the opportunity for maladministration, and create a more accurate, efficient, and reliable public service system (Aw, 2024).

Transparency and Accountability

The application of blockchain in public administration creates a permanent and unalterable digital audit trail, or immutable ledger, so every transaction or data change is clearly and chronologically recorded. This characteristic allows authorities to monitor, verify, and trace all system activity in real time, eliminating the need for time-consuming manual review processes (Arwin et al., 2023).

Each entry in the ledger is timestamped and identifies the party making the change, creating full transparency and increasing accountability in government data management. In addition to strengthening information security and integrity, this feature also facilitates internal and external audits, as all transaction evidence is digitally available and accessible at any time by authorized parties. Thus, the blockchain's immutable ledger serves not only as a reliable record-keeping tool but also as an effective oversight instrument to prevent data manipulation, corruption, or abuse of authority (Dewi et al., 2025).

Blockchain implementation plays a crucial role in increasing public trust in government administration services, as any data stored within it cannot be altered without leaving a clearly detectable trace of the change. This mechanism ensures that all transactions, updates, or modifications to information are permanently recorded in the ledger, with detailed timestamps and the identity of the parties making the changes (Aprilla et al., 2024).

This transparency assures the public that the information they receive is authentic, accurate, and free from manipulation, thereby reducing the potential for fraud and maladministration. Furthermore, blockchain's ability to allow authorities and the public, with regulated levels of access, to directly verify data reinforces a sense of security and confidence in the system's integrity. The existence of a recording mechanism that cannot be deleted or hidden also fosters a culture of accountability among state officials, as every action taken is transparently recorded (Juwita et al., 2023).

Thus, blockchain is not only a technological tool, but also a strategic instrument for building and maintaining public trust in governance. Implementing blockchain in public administration can significantly reduce the risk of data manipulation and administrative

corruption, as all information entered into the system is permanently recorded, encrypted, and distributed across multiple network nodes. The immutable ledger ensures that any unauthorized data changes are immediately detected, minimizing the potential for abuse of authority by certain individuals (Pratiwi & Widodo, 2025).

Furthermore, the transparency offered by blockchain allows supervisors, auditors, and the public, within defined access limits, to verify the validity of data in real time, thereby reducing the potential for fraudulent practices. Administrative processes supported by smart contracts can also eliminate manual interventions that are prone to abuse, as all procedures are executed automatically according to pre-programmed rules. With a secure, transparent, and thoroughly documented system, blockchain has the potential to be an effective corruption prevention tool while strengthening the integrity of government bureaucracy.

Implementation Challenges

From a technical perspective, blockchain implementation in government environments faces quite complex challenges, particularly related to the limitations of the distributed server infrastructure that forms the backbone of this technology. Many government agencies still rely on centralized data centers with limited capacity, requiring significant investment to build a reliable and secure node network. Furthermore, internet network capacity in some regions, particularly remote ones, is inadequate to support real-time blockchain data synchronization. Another obstacle lies in integration with legacy systems that have been in use for years and were designed without considering compatibility with distributed technology. The migration and interfacing processes require time, cost, and specialized technical expertise to maintain historical data and ensure the system runs smoothly without disrupting public services. This combination of factors makes technical infrastructure readiness a key prerequisite for optimal blockchain implementation in government bureaucracies (Ramadani et al., 2023).

From a regulatory perspective, the implementation of blockchain in public administration in Indonesia still faces a legal vacuum due to the lack of a specific legal framework that clearly regulates the use of this technology in the government sector. Existing regulations generally only cover general aspects of information technology or the use of blockchain in limited contexts such as crypto assets. Therefore, they are inadequate to regulate procedures, security standards, the validity of digital documents, and legal accountability mechanisms in the event of disputes (Sinaga & Azzura, 2024).

The lack of a clear legal framework also raises doubts among officials and stakeholders regarding the legality of transactions or

documents generated through blockchain. Furthermore, there are no binding operational guidelines across government agencies to ensure interoperability and consistent implementation, creating a significant potential for overlapping policies or differing technical standards. This situation makes the urgent need for regulatory development crucial, ensuring that blockchain implementation is not only innovative but also provides strong legal certainty and administrative legitimacy (Ramdhani, 2024).

From a human resources (HR) perspective, the Indonesian government sector still faces significant limitations in the availability of experts with specialized competencies in the blockchain field. Most employees, particularly at the operational level, lack adequate technical understanding of how this technology works, its security, or its potential applications in public administration (Renanda & Rosidin, 2025). Existing training is still basic and doesn't address the development, management, and ongoing maintenance of blockchain systems. This results in a high dependence on third parties or external vendors, which in the long term can pose risks to the system's sustainability and security.

Meanwhile, in terms of public acceptance, there are still significant doubts regarding data security and the privacy of personal information in blockchain-based systems. Although this technology offers transparency and immutable properties, some people worry that this transparency could actually open up access to sensitive information if not accompanied by adequate data protection mechanisms. This concern is exacerbated by the public's low digital literacy regarding how blockchain works, often leading to the mistaken perception that stored data will be completely open to the public. Therefore, public outreach and education strategies are key to building trust and increasing adoption.

Recommended Implementation Strategy

1. Phased Approach through Pilot Projects

Blockchain implementation should begin with pilot projects in several agencies or public service sectors with high transaction volumes and strong transparency requirements, such as population services, procurement of goods and services, or business licensing. This initial phase serves as a means of technical evaluation, measuring effectiveness, and identifying obstacles before national implementation. The success of the pilot projects can provide concrete evidence to stakeholders and the public that this technology provides real benefits (Chairunnas et al., 2024).

2. Preparation of Special Regulations and Technical Guidelines

Regulations specifically governing the use of blockchain in public administration are needed, covering aspects of data security, privacy protection, digital document validity, and distributed network governance.

Furthermore, detailed technical guidelines need to be developed to ensure uniform implementation standards, including technical specifications, interoperability protocols, and system maintenance procedures.

3. Strengthening Human Resources Capacity and Public Education

Intensive training programs for government employees should focus not only on conceptual understanding but also on technical skills such as node management, smart contract writing, and blockchain network security management. Furthermore, widespread public outreach should be conducted in accessible language, emphasizing the benefits, security, and the public's role in maintaining the blockchain ecosystem.

Integration with Existing E-Government Systems

To maximize technological synergy and budget efficiency, blockchain should be integrated with existing e-government platforms. This integration allows data from legacy systems to be reused without re-input, while simultaneously improving interoperability between agencies. This approach also minimizes operational disruption during the transition period and accelerates the adoption process.

The academic implications of this research are to expand the literature on blockchain governance in developing countries, particularly in the context of public administration in Indonesia. Practically, this research provides a realistic blockchain implementation roadmap for the Indonesian bureaucracy, taking into account technical, regulatory, and social challenges. These findings confirm that the success of digital transformation in the government sector is determined not only by technological sophistication but also by regulatory readiness, human resource competency, and public acceptance of the innovation.

CONCLUSION

In conclusion, blockchain has significant potential to improve the efficiency, transparency, and accountability of government administration systems through the implementation of immutable ledgers, smart contracts, and data decentralization. This technology can drastically reduce administrative processing time, lower operational costs, and minimize the risk of data manipulation and bureaucratic corruption. However, its successful implementation depends heavily on the readiness of the technological infrastructure, regulatory support, and the competence of human resources in government agencies. Challenges include integration with legacy systems, limited blockchain expertise, and resistance to changes in work culture. Key recommended strategies include gradual implementation through pilot projects, regulatory strengthening, intensive training, and public education to ensure the effective implementation of blockchain in Indonesia. This research contributes academically to broadening the understanding of blockchain implementation in the public

sector, while also providing a practical contribution in the form of an implementation roadmap applicable to the Indonesian bureaucracy.

BIBLIOGRAPHY

- Acosta Llano, E., Hurmelinna-Laukkanen, P., & Haapanen, L. (2025). Blockchain for the circular economy, implications for public governance. *International Journal of Public Sector Management*, 38(1), 30–52. <https://doi.org/10.1108/IJPSM-12-2023-0365>
- Adekamwa, A., Mursalim, M., & Indrayanti, I. (2024). TREN PENELITIAN PELAYANAN PUBLIK DI INDONESIA: SUATU TINJAUAN SISTEMATIS LITERATUR. *Jurnal Administrasi Negara*, 30(3), 240–263. <https://doi.org/10.33509/jan.v30i3.3420>
- Alam Khan, F., Asif, M., Ahmad, A., Alharbi, M., & Aljuaid, H. (2020). Blockchain technology, improvement suggestions, security challenges on smart grid and its application in healthcare for sustainable development. *Sustainable Cities and Society*, 55, 102018. <https://doi.org/10.1016/j.scs.2020.102018>
- Ananda, R. G. (2025). Inovasi Teknologi dalam Kebijakan Lingkungan di Daerah Kabupaten Pelalawan: Peluang dan Tantangan. *JURNAL ILMIAH RESEARCH STUDENT*, 2(2), 93–104. <https://doi.org/10.61722/jirs.v2i2.5104>
- Ardian, R. E. P., Rozi, F., & Soetikno, N. (2025). The Implementation of Blockchain Technology in the Criminal Justice System: Opportunities, Challenges, and Its Implications for Transparency and Accountability. *Hakim: Jurnal Ilmu Hukum Dan Sosial*, 3(2), 1207–1220. <https://doi.org/10.51903/ndjn0n19>
- Arnadi Chairunnas, Efendi Sugianto, Rina Pratiwi, Michael Sitorus, & Bambang Cahyono. (2024). Teknologi Blockchain dalam Transformasi Keuangan dan Perbankan: Potensi dan Tantangan. *Journal of Economic Education and Entrepreneurship Studies*, 5(2), 279–290. <https://doi.org/10.62794/je3s.v5i2.3568>
- Arwin, M., Aulia, D., & Uzliawati, L. (2023). Implementasi Blockchain Dalam Bidang Akuntansi dan Supply Chain Management: Studi Literatur. *Progress: Jurnal Pendidikan, Akuntansi Dan Keuangan*, 6(2), 76–90. <https://doi.org/10.47080/progress.v6i2.2616>
- Azka Kharisma Putri Imada, Firli Imansa Syafirlana, Kharimatun Nisa, Lia Meylani Widyawati, & Rheanda Abi Aufa. (2025). Strategi Dinas Kependudukan dan Pencatatan Sipil dalam Percepatan Aktivasi Identitas Kependudukan Digital (IKD) di Kota Surabaya. *Journal of Governance Innovation*, 7(1), 313–329. <https://doi.org/10.36636/jogiv.v7i1.5800>
- Cahyono, M., Saputra, N. D., & Saputra, A. I. (2023). TRANSFORMASI DIGITAL PEMERINTAHAN: PERUBAHAN ORGANISASI DAN BUDAYA PEMERINTAHAN MELALUI TEKNOLOGI DIGITAL. *Jurnal Teknologi Informasi Mura*, 15(2), 92–100. <https://doi.org/10.32767/jti.v15i2.2123>
- Chen, X., & Lloyd, A. D. (2024). Understanding the challenges of blockchain technology adoption: Evidence from China's developing carbon markets. *Information Technology & People*. <https://doi.org/10.1108/ITP-05-2021-0379>
- Dewi, A. K., Sibarani, B. K., Saputra, E., Norazlina, N., Susanti, S., Syafira, Y., & Munakalla, Y. (2025). Strategi Efektif Pengendalian Internal dalam Keamanan

- Sistem Informasi Akuntansi untuk Perlindungan Data Keuangan. *Jurnal Ilmiah Raflesia Akuntansi*, 11(1), 138–148. <https://doi.org/10.53494/jira.v11i1.838>
- Eda Pradana, A., Herawati, A. R., Dwimawanti, I. H., & Maesaroh. (2025). Tantangan Kecerdasan Buatan Dalam Implikasi Kebijakan Pemerintah di Indonesia: Studi Literatur. *Jurnal Good Governance*, 51–66. <https://doi.org/10.32834/gg.v21i1.889>
- Eka Ramadani, R., Sofyani, H., & Putra, A. Z. (2023). Faktor-Faktor Yang Memengaruhi Kesiapan Pegawai Pemerintah Daerah Dalam Mengadopsi Teknologi Blockchain Pada Sistem Informasi Akuntansi Manajemen. *Jurnal Manajemen Dinamis*, 1(2), 109–122. <https://doi.org/10.59330/jmd.v1i2.28>
- Felicia, F., Elvilie, E., Calista, C., Chic, S. A., Bilqisthi, M. F., & Joosten, J. (2024). Tantangan dan Peluang Blockchain di Era Digital dalam Bidang Keamanan Data dan Transaksi Digital. *Journal of Comprehensive Science (JCS)*, 3(11), 5131–5147. <https://doi.org/10.59188/jcs.v3i11.2887>
- Gultom, R. E., & Perjalan, T. (2024). *Optimalisasi Beban Administratif: Pendekatan Komprehensif Prosedur dan Perampingan Strategi Pengelolaan Badan Dinas Perindustrian dan Perdagangan*. <https://doi.org/10.5281/ZENODO.12587914>
- Hasbi, A., & Syahputra, M. I. (2025). Analisis Tingkat Efektifitas Digitalisasi Pelayanan Administrasi Menggunakan Pendekatan Kualitatif di Kecamatan Medan Amplas. *Jurnal Penelitian Inovatif*, 5(2), 2269–2276. <https://doi.org/10.54082/jupin.1477>
- Idayanti, R. (2024). MENGEKSPLORASI POTENSI HILIRISASI BLOCKCHAIN: PELUANG DAN TANTANGAN TRANSFORMASI INDUSTRI LOGISTIK HALAL. *AL-IQTISHAD: Jurnal Ekonomi*, 16(2), 376–397. <https://doi.org/10.30863/aliqtishad.v16i2.7979>
- Iman Supriadi. (2024). Transformasi Sistem Perpajakan Menggunakan Teknologi Blockchain untuk Meningkatkan Transparansi dan Mengurangi Penyimpangan. *Journal Of Tax Policy, Economics, And Accounting*, 2(1), 29–44. <https://doi.org/10.61261/muctj.v2i1.44>
- Juwita, J., Joefriani, M. S., Rusta, A., Irawati, I., & Fajri, M. (2023). Transparansi dan Integritas dalam Pemilihan Umum: Upaya Mencegah Kecurangan dan Manipulasi. *Madani Jurnal Politik Dan Sosial Kemasyarakatan*, 15(03), 445–453. <https://doi.org/10.52166/madani.v15i03.5795>
- Maharani, T. D., Sarjito, A., & Marnani, C. S. (2023). PENERAPAN TEKNOLOGI BLOCKCHAIN DALAM MANAJEMEN LOGISTIK PERTAHANAN. *JAMI: Jurnal Ahli Muda Indonesia*, 4(2), 136–147. <https://doi.org/10.46510/jami.v4i2.155>
- Mahayani, N. M. H. (2025). IMPLEMENTASI KEBIJAKAN SOSIAL DI MASYARAKAT MARGINAL: STUDI LITERATUR TENTANG HAMBATAN DAN STRATEGI ADAPTASI. *GOVERNANCE: Jurnal Ilmiah Kajian Politik Lokal Dan Pembangunan*, 11(2), 181–188. <https://doi.org/10.56015/gjikplp.v11i2.352>
- Marbough, D., Abbasi, T., Maasmi, F., Omar, I. A., Debe, M. S., Salah, K., Jayaraman, R., & Ellahham, S. (2020). Blockchain for COVID-19: Review, Opportunities, and a Trusted Tracking System. *Arabian Journal for Science and Engineering*, 45(12), 9895–9911. <https://doi.org/10.1007/s13369-020-04950-4>
- Muhammad Jafar Aw. (2024). Dampak E-Government dalam Meningkatkan Efisiensi dan Efektivitas Tata Kelola Pemerintahan. *Politika Progresif: Jurnal Hukum*,

- Politik Dan Humaniora*, 1(4), 204–226.
<https://doi.org/10.62383/progres.v1i4.1303>
- Muhdiarta, U. (2025). Blockchain Technology for Public Administration: Enhancing Accountability and Good Governance. *International Journal of Innovation and Thinking*, 2(1), 39–50. <https://doi.org/10.71364/ijit.v2i1.9>
- Mustafa, G., Rafiq, W., Jhamat, N., Arshad, Z., & Rana, F. A. (2025). Blockchain-based governance models in e-government: A comprehensive framework for legal, technical, ethical and security considerations. *International Journal of Law and Management*, 67(1), 37–55. <https://doi.org/10.1108/IJLMA-08-2023-0172>
- Nadia Permatasari, A. N. (2024). *Penerapan Teknologi Blockchain Dalam Pelayanan Publik: Meningkatkan Keamanan, Transparansi, Dan Kepercayaan Masyarakat Melalui Website Onlinepajak*. Zenodo.
<https://doi.org/10.5281/ZENODO.13739365>
- Nadine Pratiwi Kadir Maricar & Wira Atman. (2025). Transformasi Keamanan Maritim Indonesia melalui Penerapan Teknologi Blockchain. *Jurnal Ilmu Komunikasi, Administrasi Publik Dan Kebijakan Negara*, 2(3), 84–101.
<https://doi.org/10.62383/komunikasi.v2i3.448>
- Pratiwi, I., & Widodo, S. (2025). PERAN TEKNOLOGI BLOCKCHAIN TERHADAP KEAMANAN DAN PRIVASI DATA SISTEM INFORMASI LAYANAN KESEHATAN: STUDI PUSTAKA. *Indexia*, 7(1), 11.
<https://doi.org/10.30587/indexia.v7i1.9630>
- Rahmawati, E. (2025). Studi Implementasi Teknologi Blockchain untuk Meningkatkan Partisipasi Pekerja Rentan di Kota dan Kabupaten Tegal. *Jurnal Jamsostek*, 3(1), 87–110. <https://doi.org/10.61626/jamsostek.v3i1.85>
- Ramdhani, T. I. (2024). KAJIAN ARSITEKTUR BERLAPIS UNTUK PENGEMBANGAN APLIKASI DALAM MENDUKUNG PEMBANGUNAN APLIKASI DI PEMERINTAHAN PROVINSI JAWA BARAT. *Creative Research Journal*, 10(01), 17–26. <https://doi.org/10.34147/crj.v10i1.328>
- Rana, N. P., Dwivedi, Y. K., & Hughes, D. L. (2022). Analysis of challenges for blockchain adoption within the Indian public sector: An interpretive structural modelling approach. *Information Technology & People*, 35(2), 548–576.
<https://doi.org/10.1108/ITP-07-2020-0460>
- Renanda, A. A., & Rosidin, A. (2025). Efektivitas Pelayanan Digital Dalam Mempermudah Birokrasi Dan Pengelolaan Data Publik. *Jurnal Penelitian Multidisiplin Bangsa*, 1(8), 1651–1657. <https://doi.org/10.59837/jpnmb.v1i8.310>
- Rosidah, I., Gunardi, Priatna Kesumah, & Royke Bahagia Rizka. (2023). TRANSPARASI DAN AKUNTABILITAS DALAM PENCEGAHAN FRAUD DIINSTANSI PEMERINTAH (STUDI KASUS KANTOR KEC. CIWIDEY). *Jurnal Ekonomi Manajemen Bisnis Dan Akuntansi : EMBA*, 2(1), 137–156.
<https://doi.org/10.59820/emba.v2i1.110>
- Sarjito, A., & Pantja Djati, S. (2025). Implikasi Kompetensi Digital Aparatur Sipil Negara Milenial terhadap Reformasi Birokrasi Digital di Era Transformasi Pemerintahan. *Jurnal Administrasi Publik*, 21(1), 87–109.
<https://doi.org/10.52316/jap.v21i1.610>
- Schulz, K. A., Gstrein, O. J., & Zwitter, A. J. (2020). Exploring the governance and implementation of sustainable development initiatives through blockchain technology. *Futures*, 122, 102611. <https://doi.org/10.1016/j.futures.2020.102611>

- Shabnam Sharmin & Rakibul Hasan Chowdhury. (2025). Digital Transformation in Governance: The Impact of e-governance on Public Administration and Transparency. *Journal of Computer Science and Technology Studies*, 7(1), 362–379. <https://doi.org/10.32996/jcsts.2025.7.1.27>
- Simamora, O. J., & Barimbing, I. R. (2024). *Optimasi Beban Administrasi Dilingkungan Diskumperindag Kabupaten Semarang: Tinjauan Mendalam Terhadap Efisiensi Operasional*. <https://doi.org/10.5281/ZENODO.12800638>
- Sinaga, B. B. & Raia Putri Noer Azzura. (2024). Peran Teknologi Blockchain Sebagai Instrumen Pembangunan Penegakan Hukum Berbasis Digital & Mewujudkan Masyarakat Berkeadilan di Era Society 5.0. *Padjadjaran Law Review*, 12(1). <https://doi.org/10.56895/plr.v12i1.1651>
- Suryawijaya, T. W. E. (2023). Memperkuat Keamanan Data melalui Teknologi Blockchain: Mengeksplorasi Implementasi Sukses dalam Transformasi Digital di Indonesia. *Jurnal Studi Kebijakan Publik*, 2(1), 55–68. <https://doi.org/10.21787/jskp.2.2023.55-68>
- Venkatesh, V. G., Kang, K., Wang, B., Zhong, R. Y., & Zhang, A. (2020). System architecture for blockchain based transparency of supply chain social sustainability. *Robotics and Computer-Integrated Manufacturing*, 63, 101896. <https://doi.org/10.1016/j.rcim.2019.101896>
- Wahana, A. N. P. D. (2025). Peran Teknologi Transparansi dan Keamanan dalam Ekonomi 5.0 pada Blockchain. *Indonesian Research Journal on Education*, 5(2). <https://doi.org/10.31004/irje.v5i2.2322>
- Wanda Aprilla, Mardalena Wulandari, & Arie Elcaputera. (2024). Meningkatkan Transparansi dan Akuntabilitas Pemerintah Melalui Teknologi Digital dan Partisipasi Publik dalam Upaya Pemberantasan Korupsi. *Eksekusi : Jurnal Ilmu Hukum Dan Administrasi Negara*, 2(4), 321–334. <https://doi.org/10.55606/eksekusi.v2i4.1553>
- Ye, X., Zeng, N., Tao, X., Han, D., & König, M. (2024). Smart Contract Generation and Visualization for Construction Business Process Collaboration and Automation: Upgraded Workflow Engine. *Journal of Computing in Civil Engineering*, 38(6), 04024030. <https://doi.org/10.1061/JCCEE5.CPENG-5938>