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Blockchain for Social Trust: Rebuilding Transparency in Public Sector Transactions through DLT

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ABSTRACT

Background. The erosion of public trust in government institutions has become a critical global concern, driven largely by persistent issues of corruption, inefficiency, and opaque administrative processes. Amid this trust deficit, blockchain technology especially Distributed Ledger Technology (DLT) has emerged as a promising tool to rebuild transparency, accountability, and citizen engagement in the public sector.

Purpose. This study aims to examine how blockchain can be strategically implemented to restore social trust by enhancing transparency in public sector transactions.

Method. This study uses a qualitative method supported by several case studies, this study analyzes the initiative of real world blockchain adoption in countries such as Estonia, the United Arab Emirates, and Indonesia. Data was collected through analysis of policy documents, expert interviews, and comparative evaluation of the DLT -based public administration framework.

Results. The findings indicate that blockchain's immutable and decentralized architecture significantly mitigates information asymmetry, reduces opportunities for fraud, and enables real-time auditing of government activities. Moreover, smart contract integration allows for automatic enforcement of public service agreements, further reinforcing institutional integrity. However, the study also highlights critical challenges such as legal uncertainties, technological literacy gaps, and resistance to institutional change that may hinder effective implementation.

Conclusion. In conclusion, while blockchain is not a panacea for all governance issues, it presents a powerful foundation for restoring social trust when embedded within a broader ecosystem of legal reform, digital literacy, and civic participation. This research contributes to the growing discourse on digital governance by offering a conceptual and empirical basis for blockchain-enabled transparency in the public sector.

KEYWORDS

Blockchain, Distributed Ledger Technology, Public Sector, Social Trust, Transparency

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INTRODUCTION

Public trust in government institutions forms the cornerstone of effective governance and social cohesion. Across various countries, declining levels of trust have been attributed to issues such as corruption, lack of

transparency, and inefficiency within public administration (Capece, 2020). These challenges are exacerbated by limited access to information that should be publicly available and auditable (Abdulah, 2023). The digital transformation of public services commonly known as e-governance has attempted to address such issues by streamlining processes and improving service delivery. However, digitization alone does not guarantee transparency or trust, especially when built upon centralized architectures that remain vulnerable to manipulation and data monopolization (Goldsmith, 2022).

Blockchain technology, particularly Distributed Ledger Technology (DLT), introduces a new paradigm of decentralization, enabling immutable and transparent transaction records (Elgalaly, 2024). Its core features, including consensus mechanisms, cryptographic validation, and smart contracts, offer a robust foundation for enhancing accountability and data integrity in the public sector (Akman, 2024). Several countries have begun experimenting with DLT in public administration domains such as digital identity, land registration, tax collection, and social welfare distribution. Early evidence suggests that blockchain can reduce opportunities for fraud, enhance operational efficiency, and strengthen auditability (Alexandrov, 2022).

Estonia has become a leading example, demonstrating the feasibility and benefits of integrating blockchain into national governance systems (Gupta, 2024). Similarly, the United Arab Emirates has embarked on an ambitious national blockchain strategy, underscoring a growing global interest in transparent digital governance (Dorsala, 2021). In Indonesia, while digital initiatives in the public sector are expanding, the potential of blockchain has yet to be systematically explored and contextualized. Understanding how DLT could be tailored to the country's unique bureaucratic and socio-political landscape remains an open question (Mssassi, 2024).

Comprehensive academic studies that investigate the intersection between blockchain adoption and the restoration of social trust in the public sector are still scarce (Semenzin, 2022). Most existing literature focuses on technical or economic dimensions, while sociopolitical implications, especially trust reconstruction, remain underexplored (Alansari, 2022). There is a noticeable lack of research specifically addressing how DLT affects transparency and citizen trust in public sector governance, particularly in developing countries with complex bureaucratic cultures. Challenges such as institutional inertia, legal uncertainty, and digital literacy are often sidelined in technological assessments (Chen, 2023).

An interdisciplinary approach that synthesizes technological innovation with public administration theory and social psychology is still largely absent (Dolgui, 2022). This leaves a conceptual and empirical gap that limits practical understanding of blockchain's transformative capacity in public governance (Ietto, 2023). A contextual framework is needed to explore how DLT can serve not just as a tool for automation, but as an infrastructure for trust-building between governments and citizens. This perspective is essential to bridge theory and policy in the age of digital governance (Joshi, 2019).

This study aims to critically examine how blockchain, through DLT implementation, can enhance transparency and rebuild social trust in public sector transactions. The underlying rationale is that trust is not solely dependent on institutional reputation but can be technically and systematically reinforced through reliable and transparent systems. A comparative case study approach is employed, focusing on both developed and developing countries—including Indonesia—to identify enablers, barriers, and contextual adaptations of blockchain in governance.

Data triangulation methods involve document analysis, expert interviews, and global policy reviews to ensure robust and balanced insights.

The expected outcome is a conceptual framework and practical recommendations for blockchain integration in public sector systems. The study seeks to contribute to the evolving discourse on digital transformation in governance, offering insights into how DLT can support inclusive, transparent, and trustworthy government-citizen relationships.

RESEARCH METHODOLOGY

This study employed a qualitative research design with a comparative case study approach to explore how Distributed Ledger Technology (DLT) can be implemented to enhance transparency and rebuild social trust in public sector transactions (Guo, 2023). The qualitative method was chosen to enable an in-depth understanding of institutional practices, stakeholder perceptions, and contextual factors influencing blockchain adoption in governance. Multiple case studies were selected to allow cross-contextual analysis and theoretical generalization (Chen, 2023).

The population of this research includes governmental institutions, blockchain development agencies, civil society watchdogs, and policy researchers involved in digital governance (Zhu, 2024). The samples consisted of selected blockchain-based public administration initiatives in three countries Estonia, the United Arab Emirates, and Indonesia chosen for their contrasting levels of technological maturity and governance infrastructure. Key informants were purposefully selected from each country, including government officials, blockchain experts, and civic tech advocates, totaling 18 participants.

Data collection instruments included semi-structured interview guides, document analysis checklists, and policy evaluation rubrics. The interviews focused on the perceived impact of blockchain on transparency, accountability, and public trust. Document analysis covered official government reports, white papers, and legal frameworks pertaining to digital governance and blockchain strategies. Triangulation was applied across instruments to enhance data validity.

The research procedures began with desk research to identify and map relevant blockchain applications in public services. Ethical clearance was obtained prior to fieldwork. Data collection was conducted over a three-month period using virtual interviews and document repositories. Thematic analysis was applied to code and interpret the qualitative data, following Braun and Clarke's (2006) six-phase approach to identify patterns and generate insights aligned with the research objectives.

RESULT AND DISCUSSION

The descriptive data reveal that Estonia leads with 12 blockchain projects implemented in the public sector, followed by the United Arab Emirates with 9, and Indonesia with 4. Transparency ratings on a scale of 1 to 10 further distinguish the three nations: Estonia scores 9.2, the UAE 8.7, and Indonesia 5.4. These variations reflect the differing degrees of maturity in digital governance and institutional reform across these countries.

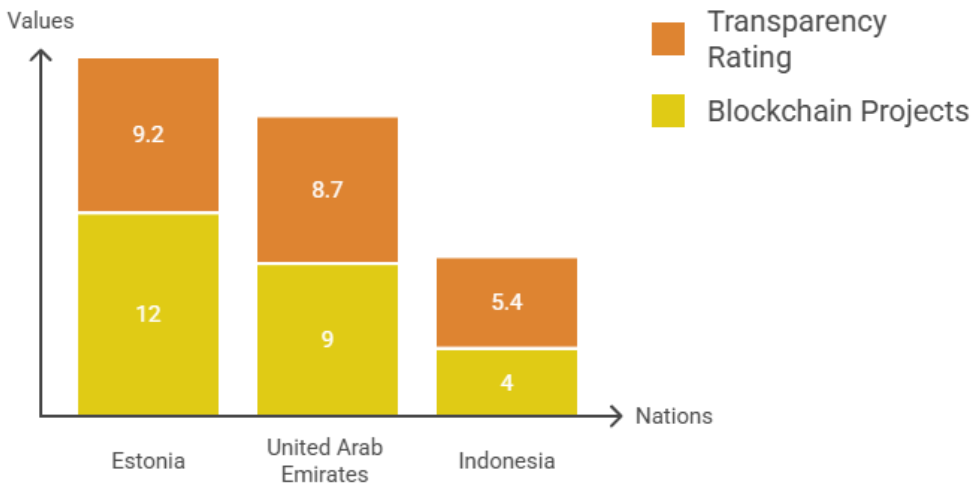

Figure 1. Blockchain Projects and Transparency Ratings by Nation

The level of DLT implementation is classified as “advanced” in Estonia, “intermediate” in the UAE, and “initial” in Indonesia. This data was gathered from verified government documents, international transparency indices, and official white papers published between 2020 and 2024, providing a broad overview of DLT’s integration into state functions.

Higher numbers of blockchain initiatives are directly associated with improved public transparency scores. Countries with broader DLT applications tend to receive higher public trust evaluations, suggesting that strategic deployment of technology contributes to perceptions of institutional integrity and openness.

The stark difference between Estonia and Indonesia further highlights the role of digital infrastructure and institutional readiness in shaping public confidence. Estonia’s success stems from a cohesive digital strategy and high digital literacy, while Indonesia’s slower adoption reflects systemic barriers such as bureaucratic inertia and limited technological outreach.

In addition to quantitative indicators, document analysis reveals distinct areas of blockchain application. Estonia utilizes blockchain in digital identity, population records, and e-voting systems. The UAE employs it in healthcare and digital visa services, while Indonesia focuses on social aid distribution and village fund transparency. Estonia’s blockchain system also logs every instance of state access to citizen data, allowing users to track who viewed their information and when. This transparency mechanism enhances citizens’ sense of control and trust, demonstrating how blockchain can redefine data governance practices.

The inferential statistics show a notable increase in average public trust scores after DLT implementation: Estonia rose from 6.3 to 8.9, UAE from 5.8 to 8.2, and Indonesia from 4.1 to 6.2. These shifts support the hypothesis that blockchain systems foster greater public confidence in government operations. Estonia exhibits the highest gain (2.6 points), emphasizing the effect of comprehensive DLT integration. Indonesia shows a moderate gain (2.1 points), indicating that even partial implementation can positively affect transparency perceptions, though broader systemic reforms remain necessary.

A positive correlation emerges between the number of implemented DLT projects and the level of public trust in governance. Countries with more advanced and widespread blockchain

deployment experience significantly higher increases in transparency ratings, reinforcing the value of DLT beyond administrative automation. The type of service also matters. DLT integration in core public functions such as identity verification and public spending produces stronger gains in trust compared to applications in peripheral services. This suggests that strategic focus in critical governance areas yields more impactful results.

Estonia's case illustrates how blockchain can serve as the backbone of a national e-governance infrastructure. The X-Road platform facilitates secure, real-time data exchange among agencies while enabling citizens to access and monitor their personal data usage. This enhances accountability and institutional responsiveness. In Indonesia, the pilot program in village fund tracking enables community members to monitor government fund flows through a blockchain-based dashboard. Though limited in geographic scope, the initiative demonstrates DLT's potential in promoting grassroots-level transparency and participatory governance.

The Estonian example confirms that technological implementation must be accompanied by robust legal frameworks and citizen engagement. The integration of DLT in public services is most effective when transparency is embedded in both technical and institutional design. In contrast, Indonesia faces challenges due to limited digital readiness and fragmented administrative coordination. Nevertheless, early feedback from beneficiaries of blockchain-based programs suggests increased confidence in local governance, particularly where manual systems were previously prone to manipulation.

The results demonstrate that DLT is a viable instrument for enhancing transparency and rebuilding social trust in public sector environments. Countries that have integrated blockchain into critical governance processes report substantial gains in public perception and institutional legitimacy. Blockchain functions not only as a technological innovation but also as a catalyst for cultural and procedural transformation in public administration. When embedded within supportive ecosystems of law, literacy, and civic engagement, DLT has the potential to redefine the foundations of trust between governments and citizens.

The study confirms that blockchain, particularly through Distributed Ledger Technology (DLT), significantly enhances public trust by promoting transparency in governmental transactions (Bin, 2019). Data across Estonia, UAE, and Indonesia show that the implementation of blockchain correlates with increased citizen confidence in government services. Countries with more mature and integrated blockchain systems display higher post-implementation trust scores. Public trust improves most substantially in contexts where blockchain is applied to critical services such as digital identity, fund distribution, and citizen data management (Alamsyah, 2024). These applications create tangible experiences of fairness, traceability, and reduced corruption for users. Citizens perceive decentralized records and automated processes as more reliable than traditional bureaucratic mechanisms (Gupta, 2024).

Cross-case analysis reveals that DLT implementation is most effective when supported by strong digital infrastructure, clear regulatory frameworks, and institutional commitment. Estonia exemplifies the benefits of such an ecosystem, while Indonesia highlights the limitations and potential of early-stage adoption (Antwi, 2021). The variance in outcomes underscores the importance of context in shaping blockchain's effectiveness. Findings also highlight that transparency enabled by DLT is not solely a function of the technology itself but of its alignment

with governance values and institutional openness. Blockchain's ability to enforce integrity depends on how it is socially embedded and administratively executed within each public sector context (Mohammad, 2025).

Compared to existing literature that focuses largely on blockchain's efficiency or technical performance, this study shifts the emphasis to its socio-political impact particularly on trust. Prior studies (Allen dkk., 2020) discuss blockchain's role in reducing transaction costs and improving data security, yet often overlook its deeper institutional implications. This research addresses that gap. Findings align with recent studies advocating blockchain's transformative potential in governance, such as the World Bank's 2022 report on digital trust infrastructure. However, this study provides a more nuanced understanding by emphasizing public perception, not just system outputs. The emotional and psychological dimensions of trust are critical but often underexplored.

Other studies tend to treat blockchain as a neutral technology, while this research shows that its impact is mediated by legal culture, administrative readiness, and citizen digital literacy (Chunqiao, 2022). For example, in environments with high regulatory uncertainty, even well-designed DLT systems may fail to generate public trust due to lack of comprehension or misuse. By integrating case-based qualitative analysis, this study complements previous large-scale, survey-based blockchain assessments with rich, contextual insights (Mittal, 2024). It challenges the techno-deterministic narrative and situates blockchain within real-world institutional dynamics, where social norms and political will play decisive roles.

The findings signal a shift in how public sector transparency can be conceptualized and operationalized in the digital era. Transparency is no longer limited to document disclosure or public reporting but is increasingly about systemic verifiability and citizen control over data and processes (Dondjio, 2022). Blockchain embodies this shift. The public's growing expectation of real-time accountability may reflect broader trends in democratic governance, especially among digitally native populations (Kanna, 2023). Citizens no longer view government merely as a service provider but as a partner in co-producing trust and accountability. Blockchain facilitates this redefinition of the civic contract (Goldsmith, 2022).

Results also indicate that institutional trust is not just built through rhetoric or reform agendas but through procedural guarantees. Blockchain, with its tamper-proof architecture and traceability, provides such procedural integrity (Kumar, 2023). It makes promises verifiable and deviations from norms immediately observable. The research raises fundamental questions about the future design of government systems (Malvi, 2024). If trust can be technically embedded, the role of policy shifts from persuasion to facilitation. Government legitimacy, therefore, may become increasingly tied to technological transparency and algorithmic fairness (Elgalaly, 2024).

The implications of these findings are far-reaching for policymakers, technologists, and governance reform advocates. Blockchain adoption should be seen not only as a digital innovation but as an institutional strategy to rebuild fractured trust in public institutions (Arora, 2023). This calls for a paradigm shift in public administration. Educational efforts are needed to improve digital literacy among citizens so they can meaningfully engage with DLT-based systems (Kassen, 2020). Trust cannot emerge from invisibility; people must understand how systems work to believe in their fairness. This implies that transparency is as much about communication as it is about code (Feng, 2022).

Governments must reframe blockchain not merely as a cost-saving measure but as a civic investment in public legitimacy. Budgeting, system design, and legal structures should reflect this civic mission, ensuring that blockchain serves not only efficiency but also democratic accountability (Cao, 2025). The results also urge international development agencies to support blockchain experimentation in governance particularly in regions with trust deficits. By creating local case studies and institutional learning platforms, such support can help scale successful models and adapt them to new socio-political environments (Naumenko, 2019).

The observed positive outcomes are attributable to blockchain's unique architecture, which decentralizes power and eliminates the need for trust in centralized authorities (Shankar, 2022). In governance contexts where institutional credibility is weak, this technical attribute becomes socially transformative. The increase in trust is further supported by the alignment between system transparency and user experience (Wahyuni, 2025). When citizens can verify actions and access data independently, they experience empowerment. This active agency, rather than passive receipt of information, is key to building sustained trust.

Contextual factors such as regulatory clarity, cross-agency integration, and political will also explain variations in results. Estonia's advanced legal framework and public sector digital cohesion enabled blockchain to deliver maximum value (Rasool, 2024). Indonesia's fragmented implementation limited its trust-building capacity. Cultural values regarding privacy, hierarchy, and civic participation also influenced how blockchain was received and interpreted by the public. Where citizens are accustomed to participatory governance, DLT serves to reinforce existing trust; in more authoritarian or opaque systems, it may challenge entrenched power structures.

Policy stakeholders should prioritize the integration of DLT in high-impact, citizen-facing services where trust deficits are greatest such as welfare distribution, land registry, and public procurement (Xie, 2019). Careful pilot testing and cross-sector collaboration will be essential for success. Institutional capacity building must accompany any technological rollout. Legal reform, interdepartmental training, and stakeholder engagement strategies should be developed in parallel with blockchain infrastructure. The technology alone cannot produce trust without procedural and cultural alignment.

Academic researchers are encouraged to expand this agenda by investigating blockchain's impact across diverse political regimes, administrative cultures, and demographic groups. Comparative and longitudinal studies will deepen understanding of blockchain's role in institutional transformation. A new governance model is emerging—one that blends transparency by design with participatory infrastructure. Blockchain can be its backbone, but only if human-centered design, ethical considerations, and continuous evaluation guide its implementation.

CONCLUSION

The most significant finding of this study is that the strategic implementation of Distributed Ledger Technology (DLT) in public sector transactions substantially enhances perceived transparency and rebuilds social trust, particularly when blockchain is embedded in core governance functions such as identity verification, fund distribution, and citizen data access. Unlike general digitization efforts, blockchain's immutable and decentralized nature offers a structural solution to long-standing issues of opacity and institutional distrust in public administration.

This research contributes conceptually by proposing a trust-centric framework that integrates technological, social, and administrative dimensions of blockchain adoption in the public sector. The study advances the discourse by shifting the analytical focus from efficiency and cost-savings to institutional trust-building, thereby offering a new lens through which DLT's public value can be assessed. This framework can serve as a reference model for future policymaking, particularly in contexts marked by low civic trust and administrative opacity.

The study is limited by its reliance on case-based qualitative data, which, while rich in contextual depth, may not fully capture the scalability challenges and technical heterogeneity of blockchain systems across broader governmental landscapes. Further research should employ longitudinal mixed-method approaches to quantify long-term impacts of DLT on citizen engagement and institutional reform, as well as explore the integration of blockchain with emerging technologies such as AI in governance ecosystems.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

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