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BLOCKCHAIN TRANSPARENCY AND PUBLIC SERVICE DELIVERY: EMPIRICAL EVIDENCE FROM KENYA'S NATIONAL GOVERNMENT MINISTRIES

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ABSTRACT

Transparency is a foundational principle of good governance, essential for fostering accountability, public trust, and efficient service delivery. Blockchain technology through its decentralized, auditable, and tamper-resistant structure offers a novel approach to enhancing transparency in government operations. This study investigates the relationship between blockchain transparency and service delivery within Kenya's national government ministries. Grounded in the Technology Acceptance Model (TAM), the research conceptualizes transparency in terms of visibility, traceability, and auditability of government processes, and examines its influence on service quality, timeliness, and citizen satisfaction. A cross-sectional survey was conducted with 319 respondents, including 220 government officials and 99 citizens selected through stratified and purposive sampling. Structured questionnaires were used to collect data, which were analyzed using regression analysis. The results revealed a statistically significant and positive relationship between blockchain transparency and service delivery ($\beta = 0.241$, $p < 0.05$), indicating that greater transparency leads to more effective and accountable public services. The findings underscore the potential of blockchain as a digital trust infrastructure in public sector reforms and call for its strategic adoption to reinforce transparency, efficiency, and citizen engagement in government service delivery.

KEY: *Block Chain Transparency, Public Service Delivery, National Government Ministries Kenya*

1. INTRODUCTION

Governments around the world are under increasing pressure to deliver public services that are not only efficient but also transparent, accountable, and citizen-focused. Transparency in public service delivery ensures that decision-making processes, resource allocations, and service outcomes are visible and traceable to stakeholders, particularly the public. In developing countries such as Kenya, persistent concerns about bureaucratic opacity, corruption, and information asymmetry continue to hinder the effectiveness of government operations (World Bank, 2017; OECD, 2018). These challenges have fueled the demand for technology-driven solutions that can enhance visibility into government actions and promote more responsive service delivery.

One of the emerging technologies with the potential to address these governance challenges is blockchain. Originally designed to support cryptocurrencies, blockchain has evolved into a distributed digital ledger technology with cross-sectoral applications, including in finance, healthcare, education, and public administration (Gupta & Bansal, 2020; Nakamoto, 2008). A key feature of blockchain is transparency; the ability for all authorized parties to access and verify transactions or records in real-time without the need for a central intermediary. Through its structure of shared, immutable, and cryptographically secured records, blockchain enables governments to create digital audit trails, reduce opportunities for fraud, and promote openness in service delivery processes (Abiteboul & Stoyanovich, 2019).

In the context of Kenya's national government ministries, transparency remains both a constitutional obligation and a policy challenge. Despite the digitization of many public services—such as e-citizen portals, payroll systems, and procurement platforms—there are persistent gaps in traceability, data openness, and auditability. Citizens often lack real-time access to information about services, budgets, or complaints resolution mechanisms, which undermines public trust and weakens social accountability (Smith & Johnson, 2019). Blockchain, with its decentralized and tamper-proof architecture, offers a potential breakthrough by embedding transparency into the very design of service delivery systems.

The study is guided by the Technology Acceptance Model (TAM), which posits that individuals' acceptance and use of new technologies are influenced by their perceptions of usefulness and ease of use (Davis, 1989). In this context, blockchain transparency is expected to shape how public officials and citizens evaluate the usefulness of digital systems in enhancing service delivery, especially through improved visibility, reduced discretion, and enhanced trust. The Technology Acceptance Model (TAM), developed by Davis (1989),

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provides the conceptual lens for this study. TAM posits that users' decisions to adopt and use a new technology are influenced primarily by two perceptions: Perceived Usefulness (PU); the belief that the technology enhances job performance, and Perceived Ease of Use (PEOU), the belief that the technology is free of effort. These perceptions affect users' attitudes, intentions, and actual usage behavior. In the context of public service delivery, TAM is particularly relevant as it explains how government employees and citizens respond to innovations such as blockchain systems. If transparency features within blockchain (e.g., auditability, traceability, visibility) are perceived as useful in improving service accountability and reducing corruption, users are more likely to adopt and support these technologies (Venkatesh & Davis, 2000). Furthermore, the decentralized, verifiable nature of blockchain aligns well with institutional goals of openness and performance monitoring (Gupta & Bansal, 2020). This study applies TAM to assess how perceptions of blockchain-enabled transparency influence stakeholders' evaluations of public service delivery effectiveness within Kenya's national ministries. It treats transparency as a technological attribute that enhances user trust, system integrity, and the quality of citizen experiences.

Blockchain is a distributed ledger technology that enables secure, immutable, and decentralized recording of transactions across a peer-to-peer network. Its transparency feature is built into the architecture, allowing authorized participants to view, verify, and trace activities in real time (Zhang et al., 2019). This visibility reduces opportunities for data manipulation, opaque decision-making, and unauthorized transactions (Abiteboul & Stoyanovich, 2019). In public administration, transparency is vital for reducing corruption and promoting public trust. Blockchain has been piloted in areas such as public procurement, land registries, and digital identities, where visibility and verifiability of data are critical (Rodriguez & Scholl, 2018). Research by Laurent & Moreau (2018) found that blockchain improved financial oversight and auditability in public finance institutions by ensuring that once data is entered, it cannot be retroactively altered. Transparency in service delivery means that processes, criteria, and outcomes are accessible to citizens, auditors, and oversight bodies. It enables citizens to know what to expect, how to access services, and how government decisions are made (OECD, 2018). Lack of transparency often correlates with poor service quality, inequity, and corruption. In Kenya, efforts to enhance service transparency include online portals for tax payments, e-citizen platforms, and procurement disclosures. However, challenges such as limited interoperability, weak enforcement, and inconsistent record-keeping hinder their effectiveness (World Bank, 2017; Van Der Merwe, 2023). Blockchain, by ensuring real-time traceability and tamper-resistance, can close these gaps and increase institutional accountability (Park et al., 2020).

While previous studies have explored blockchain in general, few have empirically isolated transparency as a determinant of service delivery outcomes. Transparency contributes to service delivery by reducing administrative discretion, exposing inefficiencies, and allowing for external scrutiny (Smith & Johnson, 2019). For instance, citizens are more likely to engage with government services when they understand how decisions are made, how complaints are tracked, or how funds are allocated. Gupta & Bansal (2020) argue that blockchain transparency enhances perceived fairness and legitimacy, which are essential for user satisfaction. Studies in Taiwan and Ghana further support the claim that when citizens can track their interactions with government in real time, trust and responsiveness improve (Wang & Li, 2019; Ofori & Mensah, 2020). By focusing specifically on blockchain transparency and testing its influence on public service delivery, this study fills an important empirical gap and contributes to the growing body of digital governance literature.

2. OBJECTIVE

This study seeks to empirically examine the relationship between blockchain technology transparency and service delivery in Kenya's national government ministries. While much scholarly attention has been paid to blockchain's features such as immutability and resilience, relatively few empirical studies have explored how transparency, as a standalone attribute, contributes to improving public service outcomes. In particular, there is a research gap on how blockchain-enabled transparency affects the perceived efficiency, accountability, and accessibility of government services among both service providers and citizens.

3. METHODOLOGY

This study employed a quantitative cross-sectional survey design to evaluate the relationship between blockchain transparency and service delivery in Kenya's national government ministries. The design enabled the collection of empirical data from a diverse group of respondents; both internal service providers and external service users at a single point in time. A quantitative approach was deemed appropriate for testing hypotheses and identifying statistically significant relationships between the perceived transparency enabled by blockchain systems and the quality of public services (Christensen & Lægreid, 2007).

4. SAMPLING DESIGN

The target population consisted of two main groups. The first included government officers working in national ministries located in Nairobi County, who were responsible for planning, administering, or monitoring service delivery systems. The second group comprised citizens who had recently accessed services from these ministries and could offer experiential feedback on the accessibility, reliability, and openness of those services.

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To ensure comprehensive representation, the study employed a combination of stratified sampling, based on ministry and respondent category, and purposive sampling, based on service relevance and availability. A total of 319 respondents were selected, comprising 220 government officials and 99 citizens. The sample size was determined using Yamane's formula (Yamane, 1967), which provided statistical adequacy for both regression analysis and subgroup comparisons.

5. STATISTICAL DESIGN

Data were collected using a structured questionnaire consisting of three main parts. Section A captured demographic information such as the respondent's role, department, and experience. Section B focused on items measuring blockchain transparency, including perceptions of system openness, auditability, and visibility. Section C assessed key service delivery attributes, such as timeliness, accessibility, responsiveness, and trust.

All perceptual items were rated on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was adapted from prior studies on blockchain transparency and public service quality (Gupta & Bansal, 2020; Smith & Johnson, 2019), and was piloted to evaluate clarity, internal consistency, and contextual relevance. Adjustments were made based on feedback from the pilot exercise. To assess the reliability of the scale constructs, Cronbach's alpha was computed. Both the blockchain transparency and service delivery dimensions achieved alpha values exceeding 0.7, indicating acceptable levels of internal consistency (Zhang et al., 2019).

The independent variable in this study was blockchain transparency, which was operationalized using items that assessed key aspects such as information visibility, traceability, auditability of systems, and user awareness of public service processes. These indicators were designed to capture how transparent and accessible blockchain-supported government operations are perceived to be by users (Rodriguez & Scholl, 2018; Park et al., 2020). The dependent variable, service delivery, was measured based on respondents' perceptions of critical service dimensions, including efficiency, fairness, accessibility, and responsiveness. These indicators reflect the extent to which citizens and government officials view public services as timely, equitable, and user-centered (OECD, 2018; World Bank, 2017).

All variables were measured through self-reported perceptions, a method well-suited for capturing attitudes, experiences, and behavioral responses in the context of digital technology adoption. This approach allowed for nuanced insight into how blockchain transparency features are experienced and interpreted by different stakeholders in government service delivery. Data were coded and entered into SPSS for analysis. The analytical process involved several steps. Initially, descriptive statistics were computed to summarize the demographic characteristics of the respondents and provide an overview of responses to the main constructs. This helped in understanding the distribution and central tendencies of the data collected.

Following this, a reliability analysis was conducted using Cronbach's alpha to assess the internal consistency of the measurement scales. This step ensured that the items used to measure blockchain transparency and service delivery were statistically sound and dependable. Subsequently, a simple linear regression analysis was carried out to test the hypothesis regarding the relationship between blockchain transparency and service delivery. The strength of the association between the two variables was interpreted using the standardized beta coefficient (β), while the proportion of variance in service delivery explained by blockchain transparency was assessed through the coefficient of determination (R^2). Statistical significance was determined at the 0.05 level, which served as the threshold for confirming the presence of a meaningful relationship.

6. RESULTS

Descriptive statistics were used to summarize respondents' perceptions of blockchain transparency and public service delivery. Among government officers, the mean score for blockchain transparency was 3.76 (SD = 0.58), suggesting a strong agreement that systems used in national government ministries provide traceability, visibility, and verifiability of operations. Officers cited improvements in internal audit trails, document management, and budget tracking features in blockchain-enabled systems (Laurent & Moreau, 2018). Among citizens, the mean transparency score was 3.62 (SD = 0.65), indicating moderate satisfaction. While citizens appreciated receiving digital notifications, access to receipts, and clarity on processes like licensing or ID registration, some expressed uncertainty regarding how decisions were made in the background or how complaints were handled. This reflects the need for more user-facing transparency mechanisms that complement backend system improvements (Smith & Johnson, 2019).

With regard to service delivery, government officers reported a mean score of 3.82 (SD = 0.54), and citizens reported 3.74 (SD = 0.59). Both groups agreed that services had improved in timeliness, accessibility, and clarity, particularly in departments that had adopted automated or semi-blockchain-supported platforms (OECD, 2018). However, some gaps in responsiveness and feedback loops remained, especially in citizen feedback systems. To evaluate the strength of the relationship between blockchain transparency and service delivery, a simple linear regression analysis was conducted. The analysis revealed a standardized regression coefficient (β) of

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0.241, indicating a positive relationship between the two variables. The p-value was less than 0.05, confirming that the relationship was statistically significant at the 95 percent confidence level. Furthermore, the coefficient of determination (R^2) was 0.474, suggesting that approximately 47.4 percent of the variance in service delivery outcomes could be explained by perceived blockchain transparency.

These results support the hypothesis that increased transparency, achieved through features such as immutable ledgers, shared access, and visible workflows, is associated with improved perceptions of service quality, accountability, and responsiveness. The statistical strength of this model implies that incorporating blockchain transparency mechanisms into public service systems may contribute to notable improvements in citizen trust and user satisfaction (Gupta & Bansal, 2020; Abiteboul & Stoyanovich, 2019).

The findings of this study reveal a statistically significant and positive relationship between blockchain transparency and public service delivery in Kenya's national government ministries. With a standardized regression coefficient of $\beta = 0.241$ and a p-value < 0.05, the results confirm that greater perceived transparency; facilitated through blockchain systems leads to better service outcomes. This supports the study's hypothesis and aligns with the foundational assumptions of the Technology Acceptance Model (TAM), which argues that perceived usefulness and clarity of system processes encourage technology uptake and improve outcomes (Davis, 1989; Venkatesh & Davis, 2000). From a practical standpoint, the results indicate that blockchain-enabled transparency contributes to greater accountability, reduced corruption, and improved citizen engagement in service delivery. Citizens who perceive they can track service progress, verify transactions, and access decision records are more likely to trust government systems and interact with them consistently (Smith & Johnson, 2019). This echoes findings from previous studies in similar governance environments, where blockchain transparency improved procurement oversight, reduced fraud, and enabled real-time public reporting (Rodriguez & Scholl, 2018; Gupta & Bansal, 2020).

The positive perceptions from government officers further suggest that transparency tools also enhance internal efficiency, supporting better monitoring, faster verification, and more confident decision-making. Officers acknowledged that blockchain systems helped maintain a verifiable audit trail, which reduced disputes and simplified compliance procedures (Laurent & Moreau, 2018). Despite these gains, some limitations in citizen experiences particularly around real-time feedback, complaint resolution visibility, and limited awareness of system backends highlight areas where transparency has not been fully extended to the user interface (Van Der Merwe, 2023). This suggests a need for more user-centered design in transparency features, ensuring that citizens can not only access information but also interpret and act on it meaningfully (Abiteboul & Stoyanovich, 2019).

By isolating transparency as a distinct feature of blockchain and empirically linking it to service delivery, this study contributes a new dimension to blockchain governance literature. Previous research often focused on immutability and security, but this analysis shows that transparency alone, defined as visibility, traceability, and auditability, can have a direct and measurable impact on perceived service quality. The findings also validate TAM's applicability in public sector digital reforms. When transparency is perceived as useful and easy to understand, users, both citizens and staff are more likely to view government systems as trustworthy, legitimate, and service-oriented (Wang & Li, 2019; Ofori & Mensah, 2020).

7. SUGGESTIONS

Ministries should mainstream transparency features in all digital service systems. This includes designing platforms with built-in visibility, allowing both internal users and citizens to access real-time status updates, process logs, and decision histories. There is also a need to increase public access to audit trails and service records. Wherever appropriate, citizens should be able to verify the status of applications, complaints, payments, and service requests through open dashboards, USSD codes, or online tools. Such access would promote accountability and strengthen citizen engagement. The governments should also invest in blockchain systems that emphasize traceability and openness. Preference should be given to technologies that enable distributed verification, tamper-resistant records, and decentralized access, as opposed to centralized systems that are more vulnerable to manipulation and opacity. Training is essential to both government staff and citizens on transparency interfaces. Awareness and capacity-building initiatives should aim to help all users understand what transparency entails, how to interact with transparency tools, and how to interpret and act on information provided through such systems.

Ministries should embed transparency indicators into performance management frameworks. Metrics such as time to information disclosure, frequency of user access, and the visibility of grievance resolution should be systematically tracked and reported as part of service delivery evaluations. Blockchain transparency therefore, is more than a technical feature it is a governance tool that enables openness, strengthens institutional accountability, and enhances citizen confidence in government systems. For Kenya's national ministries, adopting blockchain systems with strong transparency capabilities can unlock substantial gains in service quality, trust, and public sector transformation.

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8. CONCLUSION

This study set out to examine the relationship between blockchain transparency and public service delivery within Kenya's national government ministries. Guided by the Technology Acceptance Model (TAM) and supported by empirical evidence from both government officers and citizens, the study found a statistically significant and positive association between the perceived transparency enabled by blockchain systems and the quality-of-service delivery. With a standardized regression coefficient of $\beta = 0.241$ and a p-value < 0.05, the findings confirm that blockchain transparency characterized by traceability, visibility, and auditability can significantly enhance the efficiency, fairness, and responsiveness of public services.

The study makes two important contributions. Theoretically, it extends the application of TAM to the public sector by demonstrating that perceived usefulness, specifically in the form of system transparency, plays a crucial role in shaping outcomes such as citizen trust, engagement, and satisfaction. Empirically, it isolates transparency as a distinct technological attribute of blockchain and provides evidence of its measurable effect on how public services are both delivered and perceived by users.

In Kenya's context, where challenges such as corruption, inefficiency, and citizen disengagement continue to hinder service effectiveness, the transparent architecture of blockchain offers a strategic pathway for reform. Ministries that embed traceability and real-time visibility into their digital systems are more likely to foster public trust, minimize discretionary actions, and improve overall operational performance.

9. AREA FOR FURTHER RESEARCH

Future studies should examine how transparency functions across different counties, levels of government, and cultural settings, and explore the mediating roles of digital literacy, trust in institutions, and system usability in shaping outcomes.

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