



Ethical Challenges and Big Data Technology Adoption Readiness in Tanzania Public Sector Auditing: A Qualitative Analysis

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Abstract

The adoption of big data technology in public sector auditing is expanding globally, offering opportunities for enhanced transparency, efficiency, and evidence-based decision-making. However, Big data's architecture marked by opaque algorithms, rapid aggregation, and dynamic data flows creates inherent ethical frictions when applied within rigid public frameworks. These ethical challenges can actively hinder institutional readiness by constraining auditors' ability to deploy tools in ways that comply with ethical standards. This study examines ethical challenges affecting the adoption readiness of big data technology in Tanzanian public sector auditing, grounded on socio-technical systems theory as its interpretative framework. A qualitative approach was employed, with purposive sampling used to collect data from twenty-five participants, analysed using a thematic technique. The analysis generated key themes including privacy, consent, transparency, fairness, and accountability which reflect the core ethical challenges affecting the adoption readiness of big data technologies in public sector auditing. The identified challenges do not merely represent risks but concretely limit organisational capacity and willingness to adopt big data systems, thereby stalling readiness in practice. The findings revealed a divergence between established ethical principles and the realities of big data technology practices, particularly in relation to privacy, consent, transparency, and fairness. In Tanzania, this divergence is intensified by localised conditions within public sector infrastructure. Limited digital innovation that can facilitate compliance with ethical standards, fosters uncertainty and apprehension among auditors which make readiness to adopt big data technologies uniquely complex in the Tanzanian public sector auditing context. Based on these findings, the study contributes by showing that adoption readiness is stalled by systemic frictions between technological imperatives and entrenched ethical/legal safeguards, and proposes XAI, dynamic consent, and PETs as pathways to reconcile them.

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Introduction

Big data technologies are increasingly transforming public sector auditing worldwide, offering opportunities for enhanced efficiency, transparency, and accountability (Thanasas et al., 2025). AI and big data technology are often used interchangeably, but they differ in scope and function. Big data technology refers to the tools and infrastructures for storing, processing, and analysing massive datasets, while AI builds on these datasets to enable learning, reasoning, and decision-making capabilities. In Tanzania, the integration of big data technology into auditing practices has the potential to strengthen oversight of public resources and improve audit quality; Yet, its adoption is limited as auditors are still constrained by conventional auditing practices (Maulani & Widuri, 2024; Matoka, 2024; Kwilasa & Koloseni, 2025). Big data architectures rely on massive, often unstructured datasets that include sensitive personal and institutional information. In public sector auditing, this scale and complexity heighten risks related to privacy, consent, and algorithmic transparency, thereby creating ethical friction within governance frameworks. These challenges create uncertainty that directly undermines readiness for adoption. When ethical safeguards are perceived as inadequate, institutions may delay or resist adoption due to concerns about legitimacy, compliance, and public trust. Ethical challenges thus directly hinder readiness by creating uncertainty in decision-making and limiting auditors' confidence in deploying big data tools. (Theodorakopoulos et al., 2024; Shahzad et al., 2025). Ethical challenges occur when auditors are required to leverage big data technology, yet the very use of this technology may undermine fundamental ethical principles enshrined in law and professional codes. Such challenges undermine readiness because auditors may fear of uncertainty about compliance with data protection law and struggle with technical systems that lack transparent interfaces to explain algorithmic logic. These conditions reduce confidence, foster hesitation, and ultimately limit the extent to which Tanzanian auditing institutions are prepared to fully embrace big data tools.

Although Tanzania has enacted governance measures such as the Personal Data Protection Act (2022) and strengthened oversight through the National Audit Office, these social and legal frameworks remain limited in their capacity to address the scale and complexity of big data technology in auditing. Legal safeguards alone cannot ensure compliance with ethical standards when technical systems lack mechanisms for privacy protection and accountability. This insufficiency highlights the need for structural and technical interventions to complement existing frameworks, meaning that technology and social systems must be integrated to achieve readiness for big data technology adoption. Tanzania is currently advancing a national digital transformation agenda (Matto, 2022), supported by e-government reforms and data governance legislation such as the Personal Data Protection Act (2022). Within this broader mandate, the National Audit Office has initiated several technology-driven reforms to modernise public sector auditing. These include adopting Teammate audit management software to streamline audit processes and enhance data handling capacity. While these initiatives demonstrate tangible progress toward digital readiness, they also highlight the ethical complexities of integrating big data technologies into public accountability frameworks. Concerns around privacy, transparency, and institutional trust remain central to determining how prepared Tanzanian auditing institutions are to fully embrace big data tools.

Despite the growing importance of ethical concerns surrounding big data technology in auditing, scholarly attention to these challenges in Tanzania remains limited (Kumbo et al., 2024; Bello & Mwakalinga, 2026). Existing studies have largely emphasised the technical potential of big data technologies, but little empirical work has examined how ethical challenges concretely undermine their readiness for adoption in the Tanzanian auditing context. Addressing this gap is critical to understanding the conditions under which big data technologies can be responsibly integrated into public sector auditing. This study interprets these challenges through the lens of



socio-technical systems theory, which emphasises the interplay between social/legal frameworks and technical infrastructures in shaping readiness for big data technology adoption.

Ethics in technology adoption involves applying moral principles to guide the behaviour of individuals and organisations that develop, implement, and interact with technology (Flahaux et al., 2023). According to Atlan (2025), ethics encompasses principles such as privacy, transparency, fairness, and accountability that guide the use of technology. The Systemic Data Ethics Framework (2025) expands this view by including algorithmic accountability, consent management, and socio-technical governance practices. The issue of ethics in technology use has drawn significant attention worldwide, with scholars and policymakers advocating for ethical practices that protect individual privacy. Several countries have enacted legislation to safeguard ethical standards in digital environments. For instance, in the United States, the California Consumer Privacy Act (CCPA, 2020) strengthens individual rights by requiring transparency and consent in data collection (Huang, 2025). In the United Kingdom, the Data Protection Act (2018) aligns national law with the European Union's General Data Protection Regulation (GDPR), ensuring fairness and accountability in data processing (Mugamba, 2025). Similarly, South Africa's Protection of Personal Information Act (POPIA, 2020) establishes comprehensive provisions for lawful and responsible data handling (Sema et al., 2025). These frameworks are important because they provide enforceable mechanisms to protect individuals from misuse of personal information, thereby reinforcing trust in digital transformation initiatives.

Among these, the GDPR has become the global benchmark for data protection, influencing legislation far beyond Europe. Its strict requirements on consent, transparency, and individual rights have been adopted or adapted by numerous jurisdictions worldwide (Pazhohan, 2023). In Tanzania, the Personal Data Protection Act (2022) outlines principles of lawful, fair, and transparent processing of personal data, thereby embedding ethical safeguards into the country's digital governance framework. Adherence to these frameworks is essential to ensure that big data adoption in public sector auditing aligns with ethical responsibilities and protects stakeholder trust. Auditors must carefully navigate between the requirements of personal data protection law and the demands of professional ethics. In practice, they are obliged to comply with legal provisions while simultaneously upholding ethical standards, and this dual responsibility generates tensions that manifest as ethical challenges in the big data technology environment.

In Tanzania, initiatives such as the draft National AI Strategy 2025 extend to big data technologies and provide general guidelines on the responsible use of artificial intelligence, including ethical considerations (MCIT, 2025; UNESCO, 2025). While this strategy outlines broad benefits, each sector encounters distinct ethical challenges that demand tailored policy frameworks. For instance, the education sector is guided by the National Guidelines for AI in Education 2025, and the health sector is guided by the Policy Framework for AI in the Health Sector 2022, both of which explicitly address sector-specific ethical considerations (MOH, 2022; MOE, 2025). However, no equivalent policy framework exists for the auditing sector. Although there is currently no ethical framework specifically designed for the application of AI, including big data technology, in auditing, auditors in Tanzania are not without guidance. Their professional conduct is formally governed by established international frameworks, notably the International Standards of Supreme Audit Institutions (ISSAI) and the International Federation of Accountants (IFAC) codes of ethics. These frameworks emphasise ethical principles: integrity, objectivity, confidentiality, and professional competence (INTOSAI, 2016; IFAC, 2018). They were designed for conventional auditing practices, where data was limited, structured, and relatively easy to control. These frameworks emphasised reliability of evidence, documentation, and compliance with ethical principles in environments where auditors could directly verify transactions and records. The emergence of big data technology, however, has disrupted this



model by introducing vast, unstructured, and continuously generated datasets that challenge traditional auditing procedures (KPMG 2023; Ahmed & Imrose, 2024). This shift has created a profound tension between ethical frameworks and the new realities of big data technology in auditing, raising unresolved ethical challenges about consent, transparency, fairness, and accountability. Ethical challenges are not uniform across sectors, rather, they differ depending on the maturity of regulatory frameworks, the strength of institutional capacities, and the influence of cultural norms that shape perceptions of accountability and ethical compliance (Suhag, 2024; UNESCO, 2025).

Understanding how these challenges empirically manifest in auditing practices is therefore critical. It generates evidence-based insights to inform policymakers in revising and expanding the existing auditing framework to explicitly address the ethical challenges posed by big data technology. At the global level, the study supports the United Nations Sustainable Development Goals (SDGs) 2030, which emphasise the importance of building effective, accountable, and transparent institutions (Goal 16), and the African Union's Agenda 2063 (Aspiration 3), which underscores the aspiration for strong institutions, respect for human rights, and responsible use of technology in driving socioeconomic transformation. At the national level, this study aligns with Tanzania's Vision 2050 (Pillar 1), which prioritises good governance, technological innovation, and sustainable economic management.

Within the Tanzanian audit framework, if these ethical challenges remain unaddressed, they pose significant risks, including the mishandling of sensitive data, which can erode public trust in auditing institutions. These institutions may face legal gridlock if audit findings are challenged on the grounds that data was acquired or analysed using methods that violate privacy laws such as the Personal Data Protection Act (2022). In such circumstances, audit reports may be disregarded, undermining both the legitimacy of the audit process and the institutional readiness to integrate big data technologies. Thus, this study examines the ethical challenges affecting big data adoption readiness in Tanzania's public sector auditing and proposes technical solutions to support compliance with ethical standards.

Literature review

Big data analytics frameworks have been developed across diverse sectors to enhance efficiency, decision-making, and predictive capabilities (Jamarani et al., 2024). These frameworks provide structured approaches for managing large datasets, integrating advanced algorithms, and supporting organisational innovation (Shahid et al., 2021). In the context of auditing and governance, they serve as foundational tools for understanding how digital technologies reshape accountability and oversight (Leocádio et al., 2025). However, while these frameworks demonstrate technical sophistication, they often reveal important gaps when examined through an ethical lens (Noor et al., 2026).

Existing ethical frameworks and their limitation

As technology advances, new ethical challenges emerge, requiring auditing professionals to use ethical frameworks to navigate these complexities. Several big data frameworks across sectors have been developed with a focus on operational efficiency, data mining, and predictive analytics, yet they often overlook critical ethical challenges. For instance, frameworks by Kim et al. (2014) and Song and Ryu (2015) concentrate on healthcare systems, emphasising service delivery through analysis of vital signs. Similarly, Jimenez-Marquez et al. (2019) and Munshi and Yasser (2017) focus on business intelligence and smart grid data, respectively. Although these frameworks address technical and functional aspects, they largely ignore ethical principles such as dynamic consent, transparency, and data governance.

In sub-Saharan Africa, countries such as Kenya, Ghana, Nigeria, and South Africa have Supreme Audit Institutions (SAIs) that have formally integrated ISSAI principles into their national audit



guidelines and operational manuals (AFROSAI-E, 2025). However, while ISSAIs provide a strong ethical foundation, they were primarily designed for traditional audit environments and often lack specific provisions for emerging technologies such as big data and artificial intelligence (Leocadia et al., 2024). As digital transformation accelerates across Sub-Saharan Africa, there is a growing need to expand these frameworks to address ethical concerns related to data privacy, algorithmic bias, and consent in automated audit systems (Pasipamire & Muroyiwa, 2024; Ceki & Moloi, 2025). This gap presents an opportunity for countries in the region to contextualise and update their ethical standards to ensure the responsible use of digital tools in public sector auditing. The International Professional Practices Framework (IPPF) by the Institute of Internal Auditors (IIA) provides foundational guidance but lacks specificity on data ethics in automated environments (IIA, 2024). KPMG (2025) notes that emerging technologies are reshaping audit practices, yet ethical oversight remains fragmented. Rowe (2024) argues that data-driven audits enhance decision-making but require robust ethical safeguards to prevent misuse and ensure transparency.

In Tanzania, beyond the auditing sector, scholars have made strides in developing frameworks for big data technologies. However, a notable gap in these frameworks is the inadequate attention to ethical issues. For instance, Matto (2019) proposed a framework for extracting crime patterns to support law enforcement, which was technically sound but did not incorporate ethical safeguards for data privacy or citizen consent. His framework, while valuable for crime detection, failed to address how sensitive data should be ethically managed, particularly in contexts involving surveillance and predictive policing. Furthermore, Matto (2022) proposed a big data analytics framework for Higher Education Institutions (HEIs) to improve institutional effectiveness through data-driven decision-making. While the framework addresses technical challenges such as data integration and storage, it notably lacks consideration of ethical issues around data privacy, consent, and governance. This omission reflects a broader trend in Tanzanian big data frameworks, where ethical safeguards remain underexplored despite increasing reliance on digital systems.

Theoretical framework

This study is grounded in Socio-Technical Systems (STS) Theory, developed by Eric Trist and Fred Emery in the 1950s. In this study, STS Theory was employed as an interpretative lens rather than as a framework for testing causal relationships or imposing predetermined variables. The theory argues that organisations consist of two interdependent systems: the technical system (tools, technologies, and processes) and the social system (people, culture, values, ethics, and organisational structures). According to STS Theory, effective organisational performance requires the joint optimisation of both systems, meaning that technology must be integrated in ways that comply with and reinforce organisational values and ethics. In the context of this study, the push to adopt big data technologies in public sector auditing often leads to optimisation breakdowns, where the technical system's capabilities clash with the rigid bureaucratic and legal frameworks of the social system. These frictions stall adoption readiness by preventing the joint alignment of technological innovation with established ethical and institutional structures. In other words, if auditors have advanced big data tools but the legal framework and ethical standards don't permit certain types of data analysis due to privacy restrictions, the technology can't be fully utilised. The mismatch between what the tool can do and what the law and ethical standards allow creates an optimisation breakdown affecting adoption readiness.

Methodology

The study employed an exploratory qualitative design grounded in an interpretivist orientation, chosen to capture how key informants interpret and explain the ethical challenges surrounding big data adoption in public sector auditing. Conducted in Dodoma, Tanzania's administrative



capital, the research targeted ministries, agencies, and parastatal organisations that generate large datasets requiring advanced auditing technologies. A purposive and snowball sampling strategy was used to recruit twenty-five participants, including legal officers, information system analysts, heads of audit units, database administrators, and IT department heads, each selected for their expertise in ethical, technical, and regulatory dimensions of data use. Prior to data collection, the interview guide was carefully reviewed to ensure clarity, relevance, and alignment with the study's objectives. To strengthen the instrument's rigour, three experts were consulted: one in auditing, one in legal matters, and one in information technology (IT). The auditing expert ensured that the questions reflected the realities of public sector audit practice; the legal expert assessed whether the guide adequately captured issues of compliance, accountability, and ethical responsibility; and the IT expert evaluated the appropriateness of questions related to big data technologies and their adoption. As a result, several refinements were made: questions with ambiguous wording were rephrased to avoid technical jargon and improve participant comprehension; overlapping items were consolidated to reduce redundancy and sharpen the focus on ethical challenges; and additional probes were introduced to balance coverage across technological, legal, and ethical domains.

Data were gathered through semi-structured interviews conducted in English, both in-person and via mobile calls; a dual-mode approach was adopted to ensure accessibility, accommodate participants' availability, and maintain continuity of data collection during periods when in-person contact was limited. As interviews progressed, preliminary analysis was conducted concurrently with data collection, enabling the researchers to monitor emerging themes and determine when saturation had been reached. Transcripts were coded and analysed using a thematic approach guided by principles of information ethics, ensuring that issues of privacy, consent, fairness, and transparency were consistently considered (Labadie & Legner, 2023; Kamaruddin et al., 2023; Bakare, 2024). Ethical protocols were strictly followed, including obtaining informed consent from all participants, who were provided with clear information about the study's purpose, their voluntary participation, and their right to withdraw at any time without consequence. Confidentiality was strictly maintained by anonymising transcripts and ensuring that no identifying details appeared in the analysis or reporting.

Table 1 presents the interview participants, showing their professional roles and organisational contexts. This highlights the diversity of expertise represented in the study, including audit heads, legal officers, IT managers, database administrators, and system analysts across ministries, parastatals, and agencies. Such diversity ensures that the findings capture perspectives from both technical and managerial domains.

*Table 1: Interview participants*

ID	Position/role	Organisation type
PT 1	Heads of audit units	Ministry
PT 2	Heads of audit units	ministry
PT 3	Heads of audit units	parastatal
PT 4	Heads of audit units	Agency
PT 5	Legal officers	Ministry
PT 6	Legal officers	Parastatal
PT 7	Legal officers	Parastatal
PT 8	Legal officers	Agency
PT 9	Information system analysts	Ministry
PT 10	Information system analysts	Ministry
PT 11	Information system analysts	Ministry
PT 12	Information system analysts	Parastatal
PT 13	Information system analysts	Parastatal
PT 14	Database administrators	Ministry
PT 15	Database administrators	Ministry
PT 16	Database administrators	Parastatal
PT 17	Database administrators	Parastatal
PT 18	Database administrators	Parastatal
PT 19	Database administrators	Agency
PT 20	Heads of the IT department	Ministry
PT 21	Heads of the IT department	Ministry
PT 22	Heads of the IT department	Parastatal
PT 23	Heads of the IT department	Parastatal
PT 24	Heads of the IT department	Agency
PT 25	Heads of the IT department	Agency

Findings and Discussion

The qualitative findings of this study were reported using illustrative quotes and narrative interpretation on identified themes (Younas et al., 2025; Ahmed et al., 2025). This approach is preferred because themes provide a structured way to present ethical issues affecting the use of big data technology, while illustrative quotes amplify participants' voices on the matter. The narrative interpretation wove together these themes and quotes, providing context and linking the findings with the research problem and existing literature (Rockmann & Vough, 2024). This methodology emphasises the importance of quotations and ensures a clear explanation of how the themes were derived from the data. The analysis uncovered several key ethical themes that pervade discussions surrounding the use of big data technology in auditing. Table 2 outlines the analytical framework, linking the main objectives and themes to illustrative extracts derived from participant interviews. The extracts demonstrate how participants articulated ethical challenges around consent, algorithmic bias, and regulatory compliance. These quotations are subsequently woven into the discussion, showing how participant expertise informs the thematic analysis and reinforcing the credibility of the findings.



Table 2: Analytical framework

Main objective	Theme	Illustrative extract
Ethical challenges affecting big data technology adoption readiness	Consent	-Traditional methods of obtaining explicit consent are inadequate in the fast-paced environment of big data technology
		-Big data technologies often utilize diverse datasets that can be analysed in multiple ways, diverging from their initial intent
		-Once data is stored and repurposed, it is challenging to verify whether consent remains valid.
		-Analytical models frequently apply data beyond its original intent, raising concerns about whether participants truly consented to such uses.
	Algorithm bias and transparency	-Reliance on biased datasets can distort the true representation of public sector audit outcomes.
		-The operational mechanisms of big data technology algorithms are often opaque, making it challenging for auditors to understand how conclusions are derived
		-Algorithms trained on incomplete or skewed data produce outputs that misrepresent reality.
		-Data quality issues contribute to systemic bias, undermining fairness in audit processes.
		-Lack of transparency in algorithmic decision-making raises accountability concerns under regulatory frameworks.
	Privacy Regulatory Compliance	-legal requirements are designed to safeguard personal data and ensure that data handling practices align with established privacy law
		-Non-compliance with privacy laws may compromise audit credibility and expose institutions to legal risks.
		-Ensuring compliance requires embedding privacy safeguards into system architecture and processes.
		-Legal requirements demand strict controls over data storage, access, and retention.
		-Analytical outputs must align with regulatory frameworks to avoid misuse of sensitive information.
		-Breaches of privacy regulations can result in significant legal repercussions and reputational damage.
		-Compliance must be enforced through organisational policy and technological infrastructure, ensuring consistent adherence across all units.



Consent concern

The ethical challenges associated with using big data technology in auditing are multifaceted, as revealed by this study's qualitative findings. One of the most pressing issues is consent. Participants emphasised the significant challenges of obtaining consent in a big data technology environment. One Participant observed that *"Traditional methods of obtaining explicit consent are inadequate in the fast-paced environment of big data technology"* (PT 2). This reveals that traditional approaches to consent, such as opt-in forms or one-time disclosures, are insufficient for dynamic, large-scale, continuous data flows, where data is often collected, processed, and repurposed rapidly, rendering static consent mechanisms outdated or impractical. This finding reflects a broader discourse in existing literature, where scholars have consistently argued that while privacy laws across jurisdictions mandate consent, compliance becomes increasingly complex when data is continuously generated, aggregated, and processed at high speed (Nitodas, 2024). Similar studies have found that the challenge lies not in the absence of legal provisions but in the practical impossibility of obtaining meaningful consent in big data environments (Renuka et al., 2025). Practically, this exposes auditors in Tanzania's public sector to ethical and operational challenges, as they must reconcile privacy laws with the realities of data-intensive technologies. Legally, it raises concerns about compliance with Tanzania's Personal Data Protection Act (2022) and other global frameworks, where failure to adapt could result in liability and erosion of public trust. The results also align with Socio-Technical Systems (STS) Theory, illustrating that traditional consent models, as part of the social system, are failing to keep pace with the demands of the technical system in big data environments. This misalignment generates ethical and legal tensions, as static consent mechanisms cannot adequately address the complexity of big data environments. The findings therefore highlight the need for adaptive consent models that align with dynamic data flows. Practically, this calls for integrating digital tools to ensure that consent remains meaningful in fast-paced technological environments.

Another privacy theme that emerged was the ethical implications of using data for purposes other than those for which it was originally collected. One participant explained that *"big data technologies often utilize diverse datasets that can be analysed in multiple ways, diverging from their initial intent"* (PT 10). Similarly, another participant observed that *"Once data is repurposed, verifying whether consent remains valid becomes nearly impossible"* (PT 14). This highlights the operational challenge administrators face when datasets are reused beyond their original purpose. It highlights how consent mechanisms quickly lose relevance in dynamic big data environments.

In addition, another participant noted that *"Consent validity collapses when data flows are continuous and reused across multiple systems"* (PT 15). This adds to PT 14's observation, showing that the speed and interconnectedness of big data systems make static consent models ineffective, leaving administrators unable to ensure compliance.

Moreover, another participant noted that *"Consent processes lag behind technological innovation, exposing organisations to compliance risks"* (PT 20). This emphasises the strategic dimension whereby the outdated consent procedures cannot keep pace with rapid advances in data processing. This is also reinforced by another participant who explained that *"Auditors are left with compliance gaps because consent frameworks evolve more slowly than technology"* (PT 21). This reinforces PT 20's concern, underscoring that the mismatch between legal frameworks and the pace of technological change undermines organisational readiness.

The flexibility in data usage makes it challenging to restrict data to specific purposes, leading to situations where information may be applied in contexts that individuals did not anticipate or consent to. Such practices can result in unintended consequences, violating ethical standards and potentially undermining public trust in auditing processes. This finding aligns with recent



scholarship that has observed similar challenges around purpose limitation in big data environments. For example, Schwalbach and Mauer (2025) noted that datasets can be repurposed beyond their original intent due to the complexity of big data technologies. Similarly, Al-Jumaili et al, (2023) found that attempts to enforce purpose limitation often fail due to the velocity and complexity of big data processing, which makes monitoring and restricting use nearly impossible. These studies collectively point to the same concern raised by participants: that big data technology can diverge from its initial purpose, creating ethical challenges that show traditional approaches to purpose limitation are insufficient, and that there is a pressing need for regulatory innovation and technical tools to enforce purpose boundaries in dynamic data environments.

Algorithm bias and transparency

The issue of data bias emerged as a significant concern among participants, who emphasised that the effectiveness of big data technologies relies heavily on the quality and comprehensiveness of the datasets used to train these systems. If datasets fail to capture all relevant aspects of auditing, the resulting outputs may be skewed or incomplete. One participant explained that *“reliance on biased datasets can distort the true representation of public sector audit outcomes”* (PT1). This finding proves how biased algorithms can compromise the integrity of audit results, highlighting the need for diverse and representative datasets to ensure reliable outcomes. These concerns resonate with observations from another participant who noted that *“incomplete or skewed datasets can misrepresent reality and affect data quality in auditing”* (PT 9). Moreover, another participant reinforced these points by noting that *“biased outputs undermine fairness and incomplete datasets can distort audit outcomes”* (PT 12). Beyond data bias, participants also raised concerns about the transparency of algorithms used in big data auditing. One participant explained that *“the operational mechanisms of these algorithms are often opaque, making it challenging for auditors to understand how conclusions are derived”* (PT11). This lack of transparency complicates accountability, as auditors are expected to provide assurance on the reliability, fairness, and accuracy of financial and operational data. This is stressed by a participant who explained that *“the black-box nature of algorithms weakens auditors’ accountability, since the processes within the system make it impossible to clearly observe or attribute who did what in the decision-making chain”* (PT 23). When algorithms function as ‘black boxes,’ auditors may be unable to trace how conclusions are reached, weakening their ability to verify results, detect bias, or ensure compliance. Without transparency, the credibility of audit findings is undermined, and public trust in auditing processes may erode. These findings align with recent empirical studies that have reported similar challenges around fairness and transparency in algorithmic systems. Chaudhary (2024) noted that the opaque nature of algorithms undermines transparency and complicates accountability, while Jui and Rivas (2024) emphasised that fairness is compromised when models trained on biased datasets produce discriminatory outcomes. These studies confirm broader ethical challenges, showing that algorithmic opacity and bias are systemic issues across contexts.

Moreover, transparency and accountability are explicitly emphasised in the auditing profession under the International Federation of Accountants (IFAC) and the International Standards of Supreme Audit Institutions (ISSAIs), where they are recognised as the foundation of trust and integrity. Yet, as evidenced in public sector auditing, achieving these principles is profoundly challenging in the context of big data technologies. The black-box nature of algorithms limits visibility into decision-making processes, thereby undermining transparency and weakening accountability. This tension between algorithmic opacity and the professional requirement to uphold transparency and accountability has become critical, highlighting the need for technological tools that enhance algorithmic explainability and strengthen auditors’ ability to ensure fairness and compliance.



Privacy Regulatory Compliance

Participants highlighted the critical importance of adhering to legal frameworks governing data usage, emphasising that compliance is essential for maintaining ethical standards in auditing. As outlined in current audit ethics frameworks, auditors are required to comply with various laws, including the Personal Data Protection Act of 2022, the Electronic Transaction Act of 2015, and other cybersecurity-related regulations. One participant explained that *“legal requirements are designed to safeguard personal data and ensure that data handling practices align with established privacy law”* (PT7). However, participants raised the concern that in big data environments, data is often collected in real time from diverse sources, and integrating various data systems for auditing purposes can pose compliance challenges.

Another participant noted that *“Statutory mandates are difficult to align with real-time data integration, as laws were designed for slower, more predictable systems”* (PT 5). This highlights the legal gap between traditional regulatory frameworks and the dynamic realities of big data. It shows that compliance is not simply a matter of following rules but requires rethinking how laws can adapt to rapid, continuous data flows. Similarly, others stressed that *“Maintaining data integrity while meeting retention requirements creates constant tension in fast-moving big data environments”* (PT 15). Here, the technical challenge is emphasised, whereby administrators must balance the need to preserve data accuracy with strict retention policies, often under conditions where data is generated and processed at high speed. However, other participants observed that *“Retention rules clash with operational realities, making compliance a daily struggle for administrators”* (PT 16). It was also explained that *“The absence of technological innovations to embed compliance into system architecture leaves organisations exposed to regulatory risks”* (PT 24). This broadens the discussion to the strategic level, stressing that without built-in compliance tools, organisations remain vulnerable. It connects the technical and legal concerns to the need for innovation in IT governance. Ensuring that all components of the data ecosystem comply with regulations requires significant effort to align different technological and operational practices. The study reveals that the absence of technological innovations designed to ensure compliance with privacy laws may expose organisations to significant risks of non-compliance. This shortfall not only hinders their ability to uphold ethical standards but also risks their overall credibility and trustworthiness in managing user data.

Conclusion

This study examined the ethical challenges affecting the readiness to adopt big data technology in Tanzania’s public sector auditing. The findings reveal a structural misalignment in which the rigid bureaucratic procedures, statutory mandates, and accountability mechanisms of Tanzania’s public architecture collide with the disruptive characteristics of big data systems. Within public sector auditing, the rapid aggregation of heterogeneous datasets, reliance on machine learning models, and opacity of algorithmic processes manifested as concrete difficulties in upholding consent, transparency, and fairness. These frictions demonstrate that adoption readiness is stalled not by technical limitations alone but by systemic breakdowns in aligning technological imperatives with entrenched ethical and legal safeguards. By applying Socio-Technical Systems (STS) Theory, the study shows that organisational readiness cannot be achieved through technological upgrades in isolation; rather, it requires reforms that reconcile the social system with the technical subsystem. Situating these challenges through a socio-technical lens advances theoretical understanding of how ethical tensions destabilise readiness and offers practical insights for regulators and auditors seeking to strengthen compliance and trust in digital transformation.



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