Data-Driven Urban Governance: Opportunities and Challenges in Zimbabwean Cities

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Abstract

The study investigated the opportunities and challenges associated with data-driven urban governance in Zimbabwean cities, focusing on Harare, Bulawayo and Mutare. It employed a qualitative, descriptive research design, drawing on document analysis and semi-structured interviews with municipal officials, urban planners and ICT officers. Guided by the theoretical lens of Technological Determinism, the research identified significant opportunities for improving urban governance through real-time data, predictive analytics, digital citizen engagement and smart city initiatives. However, it also revealed major constraints, including infrastructural deficits, the digital divide, outdated planning frameworks, fragmented data governance and low levels of digital literacy. The study concluded that, while data technologies held transformative potential, their effective implementation in Zimbabwe required strengthened institutional capacity, ethical data governance and inclusive digital development strategies. Without addressing these foundational issues, data-driven urban governance risked reinforcing existing structural inequities rather than resolving them.

Keywords: Data-driven, Urban governance, Opportunities, Challenges, Zimbabwean cities

Introduction

The rapid pace of urbanisation in Zimbabwe has placed immense pressure on urban governance systems that are already strained by economic, infrastructural and institutional limitations. Cities such as Harare, Bulawayo and Mutare increasingly grapple with service delivery bottlenecks, informal settlement growth, deteriorating infrastructure and inefficient administrative processes (Kamete, 2013; UN-Habitat, 2022). As these challenges intensify, the need for innovative governance approaches becomes more urgent. Despite the complex and dynamic nature of urban environments, many Zimbabwean municipalities continue to rely on traditional, paper-based systems that are inadequate for contemporary governance needs. This disconnect highlights a critical problem: the underutilisation of digital technologies and data systems that could support more responsive, accountable and efficient urban management.

Globally, the concept of data-driven urban governance has emerged as a key strategy for enhancing the effectiveness of city administration. This approach emphasises the use of digital technologies, spatial data, big data analytics and real-time monitoring to support evidence-based decision-making, optimise service delivery and strengthen citizen engagement (Batty et al., 2012). In both the Global North and increasingly across the Global South, smart city

frameworks and open data platforms are helping governments respond to urban complexity with greater agility. In Zimbabwe, however, the adoption of these tools and frameworks remains uneven and, in many cases, underdeveloped. This raises important questions about the country's institutional readiness, infrastructural capacity and strategic alignment in pursuing data-enabled urban transformation.

The study draws on Technological Determinism, a theoretical perspective which argues that technological change plays a central role in shaping societal structures and institutional practices to frame this analysis (Smith & Marx, 1994). Applied to urban governance, this perspective suggests that the introduction and integration of data technologies can profoundly influence how decisions are made, how resources are allocated and how power is exercised within city systems. In contexts like Zimbabwe, where institutional inertia and political dynamics often shape governance outcomes, this theory provides a useful lens for understanding both the transformative potential and the limitations of adopting data-driven models.

Zimbabwe's national development goals, outlined in Vision 2030 and the National Development Strategy 1 (NDS1), emphasise modernisation and innovation as vehicles for inclusive and sustainable growth (Government of Zimbabwe, 2020). These strategic documents recognise the importance of ICTs and digital infrastructure in achieving national objectives, including urban development. However, policy recognition has not always translated into effective implementation at the municipal level. Challenges persist in operationalising digital systems within city governance structures, pointing to a gap between national aspirations and local realities. Addressing this implementation gap is crucial for ensuring that digital transformation efforts contribute meaningfully to urban resilience and inclusivity.

Emerging studies from both academia and international development institutions highlight a broader pattern of underutilisation of data in urban governance, especially across low-income countries. According to the World Bank (2021), while African cities often collect large volumes of administrative and spatial data, much of it remains fragmented, siloed, or unused in planning and decision-making processes. Similarly, the UNDP (2022) notes that although digital tools are becoming more accessible in sub-Saharan Africa, public institutions frequently lack the strategies, skills, and governance frameworks necessary to convert data into actionable intelligence. The African Union (2023), in its Agenda 2063 digital transformation report, also underscores that most African cities, including Zimbabwean ones, have not yet developed robust, interoperable systems to fully harness the power of digital technologies in governance.

These findings point to a growing recognition of both the potential and the implementation barriers associated with data-driven governance in African urban contexts. In Zimbabwe, anecdotal evidence and scattered initiatives suggest some movement toward digitalisation, but a systematic assessment of the current state, challenges and possibilities remains lacking in the literature. Understanding the extent to which Zimbabwean cities are engaging with data technologies and what factors are enabling or constraining this engagement, is therefore essential for informing future policy and investment decisions.

This paper sought to fill that gap by examining the opportunities and challenges associated with data-driven urban governance in Zimbabwean cities. Rather than providing a general overview, the study focuses specifically on how data and digital tools are being used in practice, what barriers exist within institutional and policy environments and what potential avenues for innovation can be identified. In doing so, it contributes to broader conversations on digital

governance in low-resource settings and offers insights for stakeholders seeking to promote more inclusive, data-informed urban futures. The article is organised as follows: introduction is followed by research methodology, results and discussions and conclusions.

Research Methodology

This study employed a qualitative and descriptive research design aimed at exploring the opportunities and challenges associated with data-driven urban governance in Zimbabwean cities. Given the exploratory nature of the subject, particularly in a context where data governance is still evolving, qualitative methods were deemed appropriate to capture context-specific insights and institutional perspectives. The study followed Creswell's (2014) guidelines for qualitative inquiry, emphasising the need to understand complex social phenomena within their natural settings. The focus was not on quantifying relationships, but rather on interpreting governance dynamics, policy gaps and institutional constraints affecting the adoption of digital and data-based tools in urban management.

Data were collected through two primary sources: (1) document analysis of existing urban policy frameworks, government strategy papers, development agency reports and academic literature. (2) a limited number of key informant interviews with municipal officials, urban planners and ICT officers in selected cities, primarily Harare, Bulawayo and Mutare. Document analysis followed the guidance of Bowen (2009), emphasising systematic review and triangulation of policy and institutional documents. These included Zimbabwe's National Development Strategy 1 (2021–2025), municipal ICT strategic plans and reports from organisations such as the World Bank, UNDP and UN-Habitat. Where direct interviews were possible, they were semi-structured, conducted either in person or via virtual platforms and designed to explore local experiences, institutional readiness and governance frameworks related to data usage.

Thematic analysis was applied to organise and interpret the results, focusing on two overarching categories: (1) opportunities for enhancing governance through data use and (2) challenges that hinder such adoption. Following Braun and Clarke's (2006) approach, themes and recurring patterns were identified. These themes were also interpreted considering the paper's theoretical lens—Technological Determinism—to draw insights into how technology influences institutional behaviour. Ethical considerations were observed throughout the study, including informed consent and confidentiality for interview participants. While the study is limited by its scope and sample size, its qualitative depth provides meaningful contributions to the discourse on digital transformation in urban governance within low-resource settings.

Table 1: Summary of Research Methodology

Component	Description
Research Design	Qualitative, descriptive, exploratory
Data Sources	1. Policy and institutional documents (for example, NDS1, municipal ICT strategies) 2. Key informant interviews with urban planners, ICT officers, municipal officials
Sampling Approach	Purposive sampling of documents and informants in Harare, Bulawayo and Mutare
Data Collection	-Document review (Bowen, 2009) - Semi-structured interviews
Data Analysis	Thematic analysis (Braun & Clarke, 2006)

Ethical Measures	Informed consent, confidentiality, voluntary participation

Source: Authors

Results and discussion

This section focused on the results and discussion of the findings. Specifically, the results explored how data and digital technologies were being used (or could be used) in urban governance, what benefits (opportunities) would emerge from such initiatives and what constraints (challenges) hindered the effective implementation. Each opportunity–challenge pair corresponds directly to key governance functions, service delivery, planning, citizen engagement, transparency, resilience, investment attraction, which were all essential components of urban governance.

Real-Time Urban Service Optimisation vs. Digital Infrastructure Deficits

A key finding of this research was the transformative potential of real-time data in enhancing urban service delivery in Zimbabwean cities. Through the integration of digital technologies—such as Internet of Things (IoT) devices, geospatial sensors and analytics dashboards—urban planners can gain immediate insights into core service areas including traffic management, energy consumption and waste collection. This data-driven visibility enables municipal authorities to anticipate demand patterns and operational inefficiencies, allowing for a shift from reactive service models to more predictive and proactive forms of governance. According to Arum Visuals (2024), these technologies "can be used to optimise resource allocation, reduce congestion and enhance overall quality of life," reflecting broader global trends in smart urbanism (Arum Visuals, 2024).

However, while the theoretical benefits of these innovations are substantial, the practical realisation of real-time governance systems in Zimbabwe is severely constrained by underlying infrastructural weaknesses. Empirical data and stakeholder interviews highlighted frequent power outages, poor internet connectivity and low sensor deployment as critical bottlenecks undermining digital implementation. These limitations are not merely technical hurdles but structural conditions that systematically block the flow of actionable data. As noted by Arum Visuals (2024), "infrastructure limitations … including power outages and unreliable internet connections" continue to obstruct the development and sustained operation of data systems in most Zimbabwean urban local authorities.

Without foundational improvements in digital infrastructure, the deployment of real-time data platforms remains largely aspirational. Municipal dashboards and automated systems intended to streamline urban governance risk becoming symbolic tools rather than functional instruments. This gap between digital ambition and infrastructural capacity underscores the need for targeted investment in broadband expansion, power stability and sensor technologies before the full potential of real-time urban governance can be achieved. Ultimately, this finding reveals that while data-driven innovation offers significant opportunity, its success in Zimbabwean cities is inextricably tied to addressing persistent infrastructural deficits.

Digital Citizen Engagement vs. The Urban Digital Divide

The research also revealed that digital platforms are increasingly being leveraged to enhance citizen engagement in urban governance across Zimbabwe. Local authorities in cities such as Harare, Bulawayo and Mutare have begun using social media, mobile apps and participatory

budgeting portals to improve communication with residents and foster transparency. These tools represent a significant step toward participatory governance, particularly by enabling real-time citizen feedback on service delivery and local development issues. As Arum Visuals (2024) notes, such platforms are being used to "promote transparency and integrity" by allowing residents to hold council officials to account, especially during periods of restricted physical interaction, such as the COVID-19 pandemic.

However, the effectiveness of these digital initiatives is severely constrained by the persistent and widening digital divide across Zimbabwe's urban areas. The study found that while residents in medium- and low-density suburbs often had some access to devices and mobile data, those in high-density or informal settlements were largely excluded from digital participation. A participant from a high-density suburb remarked, "Procuring a modem … it's a luxury. One should buy bundles… not filter into local authorities' platforms" (SpringerLink, 2024). Such testimonies highlight how affordability barriers, limited digital infrastructure and uneven digital literacy restrict meaningful engagement for most urban residents particularly women, the elderly and low-income groups.

Consequently, while digital engagement platforms theoretically expand democratic participation, in practice they risk entrenching new forms of exclusion. The capacity to participate becomes tied not to one's citizenship or civic rights, but to one's access to digital tools and connectivity. This unevenness raises critical equity concerns. Rather than fostering inclusive governance, digital tools may inadvertently deepen existing socioeconomic disparities unless accompanied by deliberate policies to ensure universal access. Therefore, the promise of digital civic engagement in Zimbabwean cities can only be fully realised if digital inclusion strategies covering affordability, infrastructure and skills training are systematically integrated into urban governance frameworks.

Evidence-Based Urban Planning vs. Institutional Rigidity and Colonial Planning Legacies

The study further identified that data-driven decision-making holds significant promise for transforming urban planning practices in Zimbabwean cities. Traditionally reliant on outdated zoning models and inflexible administrative routines, urban planning systems in cities such as Harare, Bulawayo and Mutare, are now encountering opportunities to adopt more empirical and adaptive approaches. The integration of geospatial data, urban informatics and real-time analytics allows for improved resource allocation, land use forecasting and service delivery targeting. As highlighted in global smart city governance literature, digital technologies when effectively integrated can enable planning systems to move from top-down control toward more dynamic and responsive models (Islam & Sufian, 2022).

Zimbabwe's policy environment has taken initial steps to support this transition. The Smart Zimbabwe 2030 Master Plan and the National ICT Policy (2022–2027) provide a strategic vision for embedding data and technology into governance and planning processes. These frameworks establish a normative basis for digital transformation, encouraging local authorities to incorporate ICT tools into service delivery and development strategy. However, thematic analysis and stakeholder insights from this study reveal that historical institutional legacies continue to obstruct meaningful implementation. As Sandercock (2019) argues, "traditional planning systems are failing … there is a need for a new planning theory," one that can account for the informal, fluid and often undocumented realities of urban growth in Zimbabwean contexts.

The persistence of colonial-era urban planning frameworks characterised by rigidity, exclusion and an emphasis on formalisation limits the adaptability of planning institutions to emerging digital methodologies. Informality remains a defining feature of urban development in Zimbabwe, particularly in peri-urban settlements, yet current planning systems often render these areas invisible or illegitimate. Thus, while evidence-based urban planning is a compelling opportunity, its transformative potential is curtailed unless accompanied by institutional reforms. Planning authorities must recalibrate their systems to accommodate data on informal settlements, participatory mapping and community-driven development, ensuring that digital tools support inclusive, context-sensitive governance rather than reinforcing outdated regulatory norms.

Predictive Governance and Risk Mitigation vs. Data Governance Fragmentation

The research also revealed that predictive governance presents a powerful opportunity for improving urban management in Zimbabwean cities. By harnessing both historical and real-time data, local authorities can develop foresight models that anticipate service demand patterns, emergency response needs, infrastructure stress points and housing shortages. This forward-looking approach shifts governance from reactive to preventative, allowing municipalities to optimise limited resources and reduce risks before they escalate into full-scale crises. The concept aligns with broader global discourse on smart city development, where data analytics and machine learning tools are increasingly employed to support urban resilience, particularly in resource-constrained environments (Islam & Sufian, 2022; Wikipedia, 2025).

However, the practical implementation of predictive governance in Zimbabwe is severely limited by fragmented data governance structures and a lack of institutional trust. Stakeholder interviews and document analysis show that various government departments, municipal councils and state agencies operate in data silos, often unwilling or unable to share critical information. This fragmentation results in duplicated efforts, policy misalignment and inefficient planning cycles. The absence of interoperable systems, standardised data protocols, and central oversight mechanisms means that predictive models when developed are often speculative or narrow in scope. Even when data exists, it is rarely integrated across sectors in a way that supports actionable decision-making.

Although Zimbabwe has introduced legislation such as the Cyber and Data Protection Act, policy experts argue that it remains underdeveloped and lacks the normative safeguards needed to promote open, rights-based data use. As noted by Research ICT Africa (Hlomani & Timcke, 2023), “legal refinement is needed … there are legacy concerns about using these laws to constrain digital civil rights and allow authoritarian authority.” This mistrust undermines institutional cooperation and inhibits the data-sharing norms necessary for predictive governance to thrive. Until Zimbabwe establishes robust, transparent and participatory data governance frameworks, the promise of predictive systems will remain unrealised functioning more as aspirational tools than operational solutions within the country’s urban governance landscape.

Participatory Data Collection in Informal Settlements vs. Institutional Exclusion of Community Data

The research also identified participatory data collection particularly in informal settlements as a valuable but underleveraged dimension of data-driven urban governance in Zimbabwe.

Citizen science and participatory mapping offer tools for empowering communities that are often excluded from formal planning processes. In urban areas where municipal data is sparse or outdated, especially in informal or peri-urban contexts, these bottom-up initiatives can generate timely, granular and locally relevant information. Wolff et al. (2021), for instance, document how a community-led flood monitoring project in an informal settlement produced thousands of geotagged images, enhancing urban authorities' understanding of risk exposure and resilience planning needs.

In addition to risk assessment, participatory Geographic Information Systems (GIS) allow residents to identify local development challenges—such as illegal waste dumping, burst sewers, or inadequate road access and to visually represent these issues in ways that can inform decision-making. These forms of data democratisation enable local communities to move from passive recipients of urban policy to active contributors in shaping it. As Arum Visuals (2024) highlights, participatory GIS platforms are increasingly being used to foster accountability and visibility for neglected neighbourhoods. The wider literature on participatory technologies also suggests that such approaches can significantly strengthen citizen agency and improve governance outcomes, especially when traditional planning systems fail to recognise informal settlements (Wikipedia, 2025).

Despite this potential, the study found that participatory data is often met with scepticism or institutional indifference. City authorities frequently question the reliability, accuracy, or methodological rigor of community-generated data, resulting in its exclusion from official databases or planning processes. Without clear validation mechanisms, integration protocols, or policy frameworks that recognise participatory contributions, such efforts risk being rendered symbolic rather than impactful. As noted in both policy documents and interviews, community data may be tolerated but rarely institutionalised thereby limiting its ability to influence urban planning or service delivery decisions. Consequently, while participatory data initiatives can offer inclusive, context-rich insights, their utility depends on the political will and institutional capacity to recognise and embed them into formal governance structures.

Open Data and Transparency Tools vs. Weak Ethics and Anti-Corruption Structures

The research further established that open data systems and digital transparency tools hold significant potential to improve accountability in Zimbabwean urban governance. When municipal data such as budget allocations, service delivery metrics, and urban planning frameworks is made publicly accessible, it enables citizens, civil society, and watchdog organisations to scrutinise performance and advocate for reform. Globally, open data dashboards have proven effective in promoting transparency by demystifying governance processes and enhancing civic oversight (Islam & Sufian, 2022). In Zimbabwe, there have been modest efforts by city councils to share procurement and budgeting data online, aligned with broader smart governance ambitions (Arum Visuals, 2024).

However, the impact of open data initiatives in Zimbabwe is significantly curtailed by weak institutional ethics and fragile anti-corruption mechanisms. Despite the availability of certain public datasets, underlying governance structures remain susceptible to political interference, elite capture and patronage networks. According to Mutema (2016), "the ethics architecture … is not effective to counter the problem of corruption" in Zimbabwean urban councils, highlighting the disjunction between transparency tools and actual accountability outcomes. In such environments, digital openness may become performative offering the appearance of reform without meaningful checks on misconduct or mismanagement.

Thus, while open data systems can theoretically drive more accountable governance, their effectiveness is contingent on the presence of robust ethical institutions and independent oversight. In the absence of these safeguards, data transparency can be undermined or selectively implemented, reinforcing rather than challenging dominant power structures. The research findings suggest that for open data to catalyse real accountability in Zimbabwean cities, it must be embedded within a broader governance reform agenda one that strengthens ethical frameworks, enforces compliance and fosters civic trust. Without these complementary systems in place, the transformative promise of digital transparency risks being neutralised by deeply rooted institutional dysfunction.

Smart City Investment and Economic Growth vs. Resource and Skills Constraints

The research found that smart city initiatives present a compelling opportunity for economic development and technological innovation in Zimbabwean urban governance. Projects such as Zim Cyber City, a flagship smart city development in Mount Hampden (Harare), are positioned to attract foreign direct investment, create high-skilled employment and promote ICT-driven urban infrastructure aligned with the national Vision 2030 agenda. These developments, if successfully implemented, could help reposition Zimbabwe as a competitive regional digital hub and diversify the country's urban economies away from informal and extractive sectors. The global literature on smart cities supports the notion that high-tech zones can generate economic spillovers, foster innovation ecosystems and elevate national branding (Islam & Sufian, 2022; Wikipedia, 2025).

However, these ambitious urban transformation agendas face significant structural constraints in the Zimbabwean context. Chief among them are persistent financing shortfalls, capacity deficits and weak project execution mechanisms. According to a report by NewsDay Zimbabwe (2024), the rollout of many smart-city programmes has been "hampered by financial and capacity constraints," with several local authorities lacking the technical expertise or institutional coherence to manage complex ICT infrastructure projects. Moreover, dependence on private capital or foreign investors can create vulnerabilities—especially when governance safeguards or fiscal transparency are inadequate. These constraints not only delay project timelines but also reduce the transformative potential of smart-city strategies.

Therefore, while smart city investments carry significant potential for catalysing urban economic growth, their long-term impact hinges on the establishment of sustainable financing models, strategic capacity building and inclusive development frameworks. Without these foundations, smart city initiatives risk becoming elite enclaves or stalled infrastructure projects that exacerbate spatial inequality rather than resolve it. To ensure that smart urbanism contributes meaningfully to Zimbabwe's broader development goals, investment must be matched with deliberate efforts to build local technical skills, enhance institutional capacity and embed equitable access into project design and implementation.

Multi-Sector Data Collaboratives vs. Power Imbalances and Trust Deficits

The research highlights that multi-sector data collaboratives offer significant potential for advancing data-driven urban governance in Zimbabwe. By facilitating partnerships between government agencies, academic institutions, non-governmental organisations (NGOs) and private-sector actors, these collaboratives can pool diverse datasets and expertise to address complex urban challenges such as housing shortages, health disparities and service delivery

inefficiencies. Global studies including those by the World Health Organisation (WHO) and McKinsey demonstrate that collaborative data ecosystems can yield substantial societal benefits, particularly in the domains of urban health, disaster response and infrastructure planning (Wikipedia, 2025; Islam & Sufian, 2022). In contexts with limited resources, such as Zimbabwe, these shared data systems are especially valuable in generating insights that no single entity could produce alone.

However, the study found that Zimbabwe's local data ecosystems are plagued by fragmentation, mistrust and structural inequities that inhibit meaningful collaboration. Data-sharing initiatives are often shaped by extractive or one-sided practices, where powerful actors such as state agencies or international organisations control data flows and define participation rules. This power asymmetry tends to marginalise smaller institutions, local governments, or community groups, leading to scepticism and resistance. Hlomani and Timcke (2023), in their policy analysis for Research ICT Africa, warn that "the enormous public and private benefits… can only be realised when… policymakers need a conceptual shift," pointing to the necessity of moving from a technocratic data model to one grounded in inclusive governance and ethical reciprocity.

Therefore, while data collaboratives hold considerable promise, their success in Zimbabwe depends on building a foundation of mutual trust, equitable governance structures and localised agency. This involves not only establishing clear data-sharing agreements and transparency norms but also ensuring that all stakeholders especially those representing marginalised communities have a genuine voice in shaping collaborative frameworks. Without these safeguards, data partnerships may inadvertently reinforce existing power imbalances, extract value without reciprocal benefit, or further entrench governance inequalities. For such initiatives to become transformative rather than transactional, they must be guided by principles of fairness, co-ownership and sustained institutional trust.

Data Protection Frameworks for Public Trust vs. Civil Liberties and Authoritarian Risk

The study further identified that strong data protection frameworks are a foundational requirement for fostering public trust in digital urban governance systems. As cities increasingly rely on the collection and use of personal and geospatial data, especially through surveillance systems, mobile applications and service platforms, concerns about misuse and overreach grow accordingly. International scholarship consistently emphasises that public trust in data ecosystems hinges on clear policies for accountability, transparency and ethical oversight (Islam & Sufian, 2022; Wikipedia, 2025). In contexts like Zimbabwe, where public scepticism toward state surveillance is already high, building this trust becomes even more critical for ensuring citizen engagement and system legitimacy.

In recognition of these concerns, Zimbabwe introduced the Cyber and Data Protection Act, aiming to regulate data collection and improve digital security. The legislation establishes basic principles of data privacy and sets standards for data processors, ostensibly aligning with international norms on responsible data governance. However, critical policy analyses and stakeholder interviews suggest that this legal framework remains insufficiently developed and vulnerable to political manipulation. As Hlomani and Timcke (2023) note, "legal refinement is needed" in Zimbabwe's data protection environment, with persistent fears that such laws could be used to curtail civil liberties and increase state surveillance under the guise of national security. These ambiguities weaken the legal and ethical underpinnings of urban data systems,

making citizens reluctant to share information or interact with digital platforms operated by the state.

As a result, the promise of inclusive and transparent data-driven governance in Zimbabwe risks being undermined by authoritarian tendencies and inadequate safeguards. If citizens perceive that data systems are instruments of control rather than empowerment, their willingness to participate whether in e-governance platforms, digital reporting tools, or public consultations will likely diminish. For data governance to gain legitimacy and foster meaningful engagement, it must be rooted in rights-based enforcement, independent oversight bodies and mechanisms that ensure transparency and public accountability. Without these critical protections, the implementation of digital governance frameworks may deepen mistrust and ultimately compromise the very systems they are meant to strengthen.

Digital Literacy and Capacity Building vs. Uneven Access and Outdated Training Models

The research concluded that digital literacy and institutional capacity building are fundamental pillars for the success of data-driven urban governance in Zimbabwe. As municipal governments adopt new technologies and analytics tools, it becomes critical that both public officials and citizens possess the requisite knowledge to use these systems effectively. Global research on smart governance emphasises that investments in digital skills are essential for ensuring not just adoption, but also meaningful and sustainable use of digital infrastructure (Arum Visuals, 2024). In the Zimbabwean context, the development of ICT competencies among city staff and broader communities is especially important given the country's evolving policy frameworks and push toward digital transformation under the Smart Zimbabwe 2030 initiative.

Despite the recognised importance of capacity development, the study found that most digital literacy initiatives in Zimbabwe remain uneven, outdated and inadequately resourced. Training programmes are often donor-driven and short-term, lacking follow-up or institutional embedding. In cities such as Gweru, training efforts have failed to reach many residents in high-density areas, where access to both connectivity and digital learning is limited. Participants from these areas noted that “some areas … still [receive] somewhat outdated” content, which does not align with current technological demands or real-world urban governance needs (SpringerLink, 2024). Moreover, many municipal staff receive generic ICT training that overlooks the specific skills required for managing urban data systems, such as spatial analysis, open data management and predictive analytics.

As a result, the absence of sustained, inclusive and forward-looking capacity-building strategies poses a serious barrier to effective digital governance. When only a subset of citizens or officials can meaningfully engage with data platforms, the governance process risks becoming exclusionary reinforcing existing digital divides and administrative inefficiencies. For Zimbabwean cities to fully leverage the benefits of smart governance, digital literacy programmes must be scaled, localised and embedded into institutional development plans. This includes tailoring content to context-specific needs, expanding access in underserved areas and ensuring continuous professional development. Without this foundational investment in human capital, the broader aims of participatory, data-driven urban governance will remain aspirational rather than actionable.

Interpreting Findings through the Lens of Technological Determinism

The insights emerging from this study offer a nuanced validation of Technological Determinism as a theoretical lens for interpreting the evolving relationship between digital innovation and urban governance structures in Zimbabwe. The theory's core assertion—that technological change plays a determinative role in reshaping societal institutions (Smith & Marx, 1994)—is borne out by findings that show how the introduction of digital tools has begun to reconfigure decision-making processes, service delivery strategies and forms of citizen engagement. For instance, real-time monitoring systems and participatory GIS initiatives demonstrate how technology can make governance more responsive, inclusive and data informed. Yet, the study also reveals how these possibilities are constrained by legacy systems, infrastructural deficits, and uneven institutional capacity, highlighting that while technology has the potential to reshape governance, its influence is contingent on the broader socio-political and economic landscape. Thus, in the Zimbabwean case, technological determinism operates not as an absolute force but as a conditional catalyst—its impact mediated by institutional readiness and power dynamics.

This conditionality resonates with prior literature that critiques overly linear or utopian models of technological determinism in the Global South. Studies by UNDP (2022), the World Bank (2021), and the African Union (2023) similarly caution that while data technologies hold transformative promise, their adoption in low-income urban contexts is often hindered by fragmentation, skill shortages and political interference. The Zimbabwean findings echo these themes: the existence of smart city initiatives like Zim Cyber City or data dashboards remains largely symbolic without corresponding investments in capacity building, ethical governance and infrastructure. Moreover, even where national policies like the Cyber and Data Protection Act or Smart Zimbabwe 2030 advocate for digital innovation, actual implementation at the municipal level remains weak or inconsistent. These parallels underscore that the technological transformations envisioned by the theory must be rooted in localised governance ecosystems and adapted to existing institutional realities, especially in postcolonial urban environments.

Importantly, the findings reinforce and extend the introductory claims of the paper, which situate data-driven governance as both a necessity and a challenge in the face of Zimbabwe's rapid urbanisation and institutional strain. The introduction posits that cities like Harare, Bulawayo and Mutare are trapped in outdated administrative paradigms despite growing urban complexity a condition directly addressed by the study's evidence of outdated training models, weak ethics structures and fragmented data systems. The research confirms that while digital technologies can offer a pathway out of governance dysfunction, the mere presence of these tools is insufficient. It is their institutional embedding, ethical regulation and equitable accessibility that determine whether they can genuinely transform urban governance. In this way, the study not only illustrates the applicability of Technological Determinism but also contributes to evolving theoretical debates that call for more situated, context-aware understandings of how technology interacts with governance in the Global South.

Conclusion and Recommendations

This study set out to explore the opportunities and challenges associated with data-driven urban governance in Zimbabwean cities, using a qualitative, descriptive design that proved well-suited to the research objectives. Through a combination of document analysis and semi-structured interviews, the study was able to develop a rich and contextually grounded understanding of both structural and institutional dynamics shaping the implementation of

digital governance. Document analysis provided a foundational lens for identifying legacy planning frameworks, policy gaps, and systemic constraints, while interviews with municipal officials, urban planners and ICT officers offered practical insights into how digital systems are experienced, adapted, or resisted within local governance structures.

Thematic analysis, following Braun and Clarke's approach, enabled the identification of recurring patterns and emerging themes across the data. These themes were further interpreted through the lens of Technological Determinism, allowing for a coherent analysis of how technological potential interacts with institutional limitations in shaping governance outcomes. This theoretical and methodological integration strengthened the study's ability to critically assess both the transformative promise and the structural barriers inherent in data-driven governance models in Zimbabwe.

The research highlighted several key opportunities: the use of real-time data to improve service delivery, digital platforms for citizen engagement, the potential of predictive analytics and the promise of smart city initiatives and multi-sector data collaboratives. However, it also revealed persistent challenges, including inadequate infrastructure, entrenched digital divides, fragmented data ecosystems, colonial-era planning legacies, low digital literacy and weak institutional ethics. These constraints are deeply embedded in Zimbabwe's broader urban governance architecture, suggesting that digital innovation alone is insufficient without foundational reforms.

The study concludes that the success of data-driven urban governance in Zimbabwe rests not only on technological advancement but also on deliberate investments in institutional capacity, inclusive digital literacy, ethical data governance and policy reform. Without addressing these underlying issues, there is a real risk that digital systems will entrench existing inequalities rather than resolve them. A valuable area for future research would be to examine how data-driven governance models could be adapted to better serve informal urban settlements, where exclusion from digital systems is most acute yet the need for innovative governance is greatest

References

Abebe, R., Aruleba, K., Birhane, A., Kingsley, S., Obaido, G., Remy, S. L., & Sadagopan, S. (2021). Narratives and counter narratives on data sharing in Africa. arXiv. https://doi.org/10.48550/arXiv.2103.01168

African Union Commission. (2023). Agenda 2063: Digital transformation and data governance progress report. AUC.

Arum Visuals. (2024, November 20). Digital governance in Zimbabwe's cities: Navigating the future. Arum Visuals. https://arumvisuals.com/2024/11/20/digital-governance-in-zimbabwes-cities-navigating-the-future/

Arum Visuals. (2024, October 10). Smart cities in Zimbabwe: Leveraging technology for efficient local governance. Arum Visuals. https://arumvisuals.com/2024/10/10/smart-cities-in-zimbabwe-leveraging-technology-for-efficient-local-governance/

Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... & Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics,* 214(1), 481–518. https://doi.org/10.1140/epjst/e2012-01703-3

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27–40. https://doi.org/10.3316/QRJ0902027

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Creswell, J. W. (2014*). Research design: Qualitative, quantitative and mixed methods approach (4th ed.).* Sage Publications.

Government of Zimbabwe. (2020). National development strategy 1: 2021–2025. Ministry of Finance and Economic Development.

Hlomani, H. & Timcke, S. (2023). Data governance in Zimbabwe: Opportunities and challenges. Research ICT Africa. https://researchictafrica.net/publication/data-governance-in-zimbabwe-opportunities-and-challenges/

Islam, M. A. & Sufian, M. A. (2022). Data analytics on key indicators for the city's urban services and dashboards for leadership and decision-making. arXiv. https://doi.org/10.48550/arXiv.2212.03081

Kamete, A. Y. (2013). Missing the point? Urban planning and the normalisation of 'pathological' spaces in southern Africa. Transactions of the Institute of British Geographers, 38(4), 639–651. https://doi.org/10.1111/j.1475-5661.2012.00552.x

Mhlanga, D. (2021). Artificial intelligence in the public sector in Africa: The Zimbabwean experience. Technology in Society, 67, 101733. https://doi.org/10.1016/j.techsoc.2021.101733

Mutema, E. P. (2016). Governance and ethics architecture: A study of five urban local authorities in Zimbabwe [Masters dissertation, Midlands State University]. MSU Institutional Repository. http://cris.library.msu.ac.zw/jspui/handle/11408/2902

Mutsvangwa, L. L. (2017). Adoption of e-governance applications in local authorities in Zimbabwe: A case study of the City of Harare (2010–2015) [Masters thesis, University of Zimbabwe]. University of Zimbabwe Institutional Repository. http://ir.uz.ac.zw/handle/10646/4321

NewsDay (Zimbabwe Independent). (2024, March 28). Will smart cities become reality? NewsDay Zimbabwe. https://www.newsday.co.zw/theindependent/opinion/article/200031342/will-smart-cities-become-reality

Sandercock, L. (2019). Contestations for urban space: Informality and institutions of disenfranchisement in Zimbabwe—the case of Masvingo City. *Geo Journal, 84*(5), 1105–1117. https://doi.org/10.1007/s10708-019-10022-4

Smith, M. R. & Marx, L. (1994). Does technology drive history? The dilemma of technological determinism. MIT Press.
UN-Habitat. (2016). World Cities Report 2016: Urbanisation and development – Emerging futures. United Nations Human Settlements Programme. https://unhabitat.org/world-cities-report
United Nations Development Programme. (2022). Digital strategy report: Enabling inclusive digital transformation in Africa. https://www.undp.org/publications
United Nations Human Settlements Programme (UN-Habitat). (2022). Smart cities and urban governance in Africa. https://unhabitat.org
Wolff, E., French, M., Ilhamsyah, N., Sawailau, M. J. & Ramirez-Lovering, D. (2021). Collaborating with communities: Citizen science flood monitoring in urban informal settlements. arXiv. https://doi.org/10.48550/arXiv.2112.07128
World Bank. (2021). Harnessing data for better urban planning in Africa. https://www.worldbank.org
World Economic Forum. (2019). Data collaboratives: Exchanging data to improve people's lives. World Economic Forum in collaboration with McKinsey. https://www.weforum.org/reports/data-collaboratives-exchanging-data-to-improve-people-s-lives/
Wikipedia contributors. (2025). Smart city. Wikipedia. https://en.wikipedia.org/wiki/Smart_city
Wikipedia contributors. (2025). Urban resilience. Wikipedia. https://en.wikipedia.org/wiki/Urban_resilience
Wikipedia contributors. (2025). Data collaboratives. Wikipedia. https://en.wikipedia.org/wiki/Data_collaboratives
Wikipedia contributors. (2025). Participatory GIS. Wikipedia. https://en.wikipedia.org/wiki/Participatory_GIS