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DIGITAL TRANSFORMATION IN PUBLIC PROCUREMENT: OPPORTUNITIES AND CHALLENGES IN SOUTH AFRICAN MUNICIPALITIES

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Abstract. This study explores the opportunities and challenges associated with digital transformation in public procurement within South African municipalities. The article is grounded in the understanding that traditional procurement systems are often characterized by inefficiency, excessive paperwork, procurement delays, limited transparency, and vulnerability to corruption and financial mismanagement. Consequently, municipalities are turning to digital technologies such as e-procurement platforms, electronic tendering systems, digital supplier databases, and automated workflow systems to modernize procurement processes. The study adopts a qualitative research approach based on a review of existing literature on government reports, policy documents, and scholarly publications related to digital governance and public procurement in South Africa. The findings reveal that digital transformation in public procurement presents significant opportunities for municipalities, including improved procurement efficiency, reduced administrative costs, enhanced transparency, strengthened accountability, faster service delivery, and better monitoring of procurement activities. However, the study further identifies several challenges such as inadequate digital infrastructure, limited financial resources, shortage of technical skills, resistance to organizational change, cybersecurity risks, unreliable internet connectivity, and weak institutional capacity hindering the successful implementation of digital procurement systems in South African municipalities. The study concludes that although digital transformation has the potential to revolutionize public procurement and strengthen good governance in South African municipalities, its success depends on strategic leadership, investment in digital infrastructure, capacity building, and the development of effective regulatory frameworks. The study recommends increased investment in digital skills training, stronger cybersecurity measures, and improved collaboration between government and technology stakeholders to ensure sustainable and effective digital procurement systems in local government.

Keywords: *digital transformation, public procurement, digital technologies, municipalities.*

Rezumat. Acest studiu explorează oportunitățile și provocările asociate cu transformarea digitală în achizițiile publice din municipalitățile sud-africane. Articolul se bazează pe

înțelegerea faptului că sistemele tradiționale de achiziții sunt adesea caracterizate de ineficiență, birocrație excesivă, întârzieri în achiziții, transparență limitată și vulnerabilitate la corupție și management financiar defectuos. În consecință, municipalitățile apelează la tehnologii digitale, cum ar fi platformele de achiziții electronice, sistemele electronice de licitații, bazele de date digitale ale furnizorilor și sistemele automatizate de flux de lucru pentru a moderniza procesele de achiziții. Studiul adoptă o abordare calitativă a cercetării, bazată pe o analiză a literaturii existente privind rapoartele guvernamentale, documentele de politici și publicațiile academice legate de guvernanta digitală și achizițiile publice din Africa de Sud. Constatările arată că transformarea digitală în achizițiile publice prezintă oportunități semnificative pentru municipalități, inclusiv îmbunătățirea eficienței achizițiilor, reducerea costurilor administrative, sporirea transparenței, consolidarea responsabilității, furnizarea mai rapidă a serviciilor și o mai bună monitorizare a activităților de achiziții. Cu toate acestea, studiul identifică în continuare mai multe provocări, cum ar fi infrastructura digitală inadecvată, resursele financiare limitate, lipsa competențelor tehnice, rezistența la schimbarea organizațională, riscurile de securitate cibernetică, conectivitatea nesigură la internet și capacitatea instituțională slabă, care împiedică implementarea cu succes a sistemelor digitale de achiziții în municipalitățile sud-africane. Studiul concluzionează că, deși transformarea digitală are potențialul de a revoluționa achizițiile publice și de a consolida buna guvernare în municipalitățile din Africa de Sud, succesul acesteia depinde de leadership strategic, investiții în infrastructura digitală, consolidarea capacităților și dezvoltarea unor cadre de reglementare eficiente. Studiul recomandă creșterea investițiilor în formarea competențelor digitale, măsuri mai puternice de securitate cibernetică și o colaborare îmbunătățită între guvern și părțile interesate din domeniul tehnologiei pentru a asigura sisteme de achiziții digitale sustenabile și eficiente în administrația locală.

Cuvinte cheie: *transformare digitală; achiziții publice, tehnologii digitale, municipalități.*

1. Introduction

Public procurement plays a vital role in ensuring effective delivery service, financial accountability, and building citizen trust in local government institutions. In South Africa, municipalities have encountered persistent issues such as procurement inefficiencies, excessive paperwork, delays, and corruption, which impede governance and development outcomes [1,2]. The advent of digital transformation offers municipalities an opportunity to modernize their procurement systems, aligning them with principles of good governance and improving institutional performance [3]. Digitisation provides a transformative approach to addressing issues related to public procurement. Globally, governments are adopting digital tools to enhance supply chains and procurement processes. The Organisation for Economic Co-operation and Development (OECD) 2015 procurement framework identifies e-procurement as one of its fundamental principles of best practices, while the World Bank has advocated for electronic Government Procurement (e-GP) to boost transparency and efficiency [4]. South Africa has acknowledged this trend as well.

The Supply Chain Management Review (2015) outlined a strategy for modernising procurement, which includes the implementation of e-procurement [5,1]. A new Public Procurement Bill is currently being developed to consolidate and update procurement legislation, offering a significant opportunity to integrate digital processes into the core of the system [6]. Some foundational elements are already established; the Office of the Chief Procurement Officer (OCPO) has initiated a Central Supplier Database (CSD) for online vendor

registration and an e-Tender portal for announcing bid opportunities [7]. These platforms have begun to enhance transparency and accessibility, although they only address certain aspects of the procurement cycle. This study, therefore, evaluates both the opportunities and challenges of digital procurement systems, concentrating on their role in reducing corruption, improving accountability, and enhancing service delivery in South African municipalities.

2. Background of procurement systems in South Africa

Public procurement and supply chain management serve as the foundation for government service delivery. In South Africa, public procurement holds particular significance, representing approximately 15% of the nation's GDP [8]. During the 2021-22 period alone, there were 2.94 million procurement transactions documented across national and provincial departments, engaging over 76,000 suppliers, with 83% being small or medium enterprises [9]. Consequently, effective supply chains have a direct impact on the quality of services provided to citizens and the economic empowerment of businesses. However, the government supply chain processes in South Africa have historically faced challenges related to inefficiencies and integrity [10]. Traditional manual methods, characterized by extensive paperwork, in-person approvals, and isolated systems, create opportunities for human error and interference [7]. This has led to issues such as fraud, corruption, delays, and a lack of accountability, which ultimately compromise service delivery. Recent high-profile procurement scandals and audit findings highlight the urgent need for reform [10]. Section 217 of the South African Constitution 1996, supported by the Public Finance Management Act (1999) and the Municipal Finance Management Act (MFMA) (2003), mandates that public procurement be executed in a manner that is fair, equitable, transparent, competitive, and cost-effective. Nevertheless, an antiquated, paper-based system hinders the ability to achieve these standards. The Auditor-General has previously characterized public procurement processes as “deteriorating” and has raised concerns regarding the insufficient use of IT [11]. Therefore, it is evident that a new approach is essential to bridge the gap between policy and practice.

The local government in South Africa is currently experiencing significant turmoil, primarily due to elevated levels of corruption and inadequate financial accountability. The degree to which municipal governance is prepared by the Auditor General of South Africa (AGSA). As per the Consolidated General Report on Local Government Outcomes MFMA 2021 [12], 64% of South African municipalities engaged in unauthorized expenditures totaling R20.45 billion. Similarly, 75% of municipalities reported incurring fruitless and wasteful expenditures. Furthermore, only 16% of municipalities achieved a clean audit, while 38% received unqualified audits with findings. Additionally, 30% of municipalities were qualified with findings, 2% received adverse findings, and 10% were issued disclaimers, marking them as the poorest performers [3;12]. Ms. Tsakane Maluleke, the Auditor General, stated that local government is characterised by accountability and service delivery failures, poor governance, weak institutional capacity, and instability [13]. This situation has placed a significant burden on the public procurement processes within South African municipalities.

Furthermore, the Consolidated Municipal Audit Reports 2025 observes that there is a looming crisis within the procurement processes in the country. The Unauthorised, Irregular, Fruitless, and Wasteful Expenditure (UIFWE) balance has escalated from R264.10 billion to R268.13 billion between the periods of 2023/24 and 2024/25 due to the failure of internal control mechanisms, consequence management, and the violation of SCM regulations

[13,14]. Several municipalities, including eThekweni, Tshwane, and Nelson Mandela Bay, have repeatedly been reported for irregular expenditure, inadequate contract management, and the lack of implementation of corrective measures [15]. There has been a series of irregular procurement in Johannesburg due to poor oversight and regular turnover in senior managerial positions. Although Cape Town has better governance systems, it still faces challenges with digitisation in the procurement process [14]. These statistics suggest that traditional procurement systems, which rely on manual operations and paper documentation, are inherently incapable of addressing ongoing inefficiencies and corruption.

Digital transformation in public procurement gave birth to electronic procurement (e-procurement) or digital procurement in the public sector. E-procurement is recognized as a unique element of the government service internet nexus, commonly referred to as e-government [10]. The predominant perspective on the definition of e-procurement is based on the viewpoint of the United Nations regarding the topic. The World Bank defines public electronic procurement (e-procurement) as the utilization of information and communication technology (particularly the Internet) by governments to manage their procurement interactions with suppliers for the acquisition of goods, works, and consultancy services needed by the public sector [4,16]. The essence of this definition is rooted in the understanding that e-procurement is viewed through the lens of an online transactional relationship between the government and service providers [17]. According to [18] public e-procurement is the use of information and communication technology, such as the internet, by governments in their procurement relationships with bidders for the acquisition of goods, works, and services required by the public sector." This consistency underscores the prominence of the commercial interpretation of e-procurement.

On a global level, frameworks (for example, OECD Digital Government Toolkit and Electronic Government Procurement (e-GP) Framework) established by the OECD and World Bank have shown that digitization reduces fraud, enhances accountability, and strengthens governance [6,19]. Unlike partial reforms such as policy changes or staff restructuring, digital procurement represents the only comprehensive solution capable of resolving procurement challenges, as it incorporates transparency, traceability, and automation throughout all stages of the procurement process [17]. Therefore, by minimizing human discretion, creating audit trails, and enabling real-time monitoring, digital systems effectively address the core issues identified in Auditor-General reports, including irregular spending, insufficient consequence management, and non-compliance. Thus, without digitization, municipalities will continue to perpetuate inefficiencies and corruption; however, with its adoption, they can establish robust procurement systems that restore public trust and ensure sustainable service delivery [15].

Fundamentally, it is against this background that this study sought to highlight both the opportunities and challenges of integrating digital processes into procurement, making it essential to evaluate their effects on enhancing governance, reducing corruption, and improving service delivery in South African municipalities. The study therefore is guided by the following objectives;

- To identify the opportunities presented by digital procurement systems in enhancing transparency, accountability, and service delivery.
- To assess the challenges affecting the implementation of digital transformation in municipal procurement systems.

- To examine the impact of digital procurement systems on reducing corruption and procurement irregularities in municipalities.

3. Literature Review

Public procurement in South African municipalities has been plagued by inefficiencies, excessive paperwork, delays, and a vulnerability to corruption, all of which erode service delivery and public trust [17]. In response to these challenges, digitization has emerged as a transformative solution, reflecting a global trend where governments are increasingly adopting digital tools to modernize their supply chains and procurement systems [5, 16]. International guidelines, such as the OECD's 2015 procurement principles and the World Bank's e-GP model, highlight the importance of e-procurement in enhancing transparency, efficiency, and accountability. South Africa is beginning to embrace this approach, as evidenced by the National Treasury (2015) and the development of a Public Procurement Bill that lays the foundation for digital transformation [3,19]. Initiatives like the Central Supplier Database (CSD) and the e-Tender portal, launched by the Office of the Chief Procurement Officer, have already improved transparency and accessibility, although they currently cover only parts of the procurement process. At the municipal level, practical examples include Cape Town's use of e-procurement platforms, eThekweni's electronic tendering systems, Johannesburg's digital supplier databases, and Tshwane's automated workflow systems, all of which illustrate the growing adoption of digital tools [8]. These developments show the incorporation of e-procurement in South African municipalities.

3.1. Theoretical Framework - Good Governance Theory

The theory of good governance outlines key principles for effective government functioning, regardless of its structure [20]. Established by [21], it emphasizes accountability, control, responsiveness, transparency, public participation, economy, and efficiency. This framework aims to encompass these principles and more [21]. Its relevance in this research is highlighted by its focus on accountability, transparency, efficiency, responsiveness, and integrity as vital for effective public sector management. In South African municipalities, the Auditor-General's reports for 2024 and 2025 reveal procurement failures, with irregular expenditures exceeding R268 billion in 2025, undermining these governance principles [13]. Traditional procurement systems, characterized by excessive documentation and poor oversight, struggle to ensure accountability and transparency. In contrast, digital procurement systems embody Good Governance Theory by enhancing traceability (through audit trails), transparency (via e-tender portals), and efficiency (through automated workflows). By adopting digital tools, municipalities can streamline procurement processes, making them faster, more cost-effective, and accountable to the public. Thus, Good Governance Theory provides a framework that clarifies why digital procurement is the best solution to address inefficiencies and irregularities in municipalities [6].

3.2. The role of digital technologies in improving public procurement processes in South African municipalities

One of the functions of digitizing public procurement is to enhance transparency and accountability. By utilizing digital platforms for public procurement, each stage of the process can be recorded and made accessible to regulatory authorities and the public [22]. This significantly diminishes the chances for corrupt practices, such as clandestine agreements or modified documents. This is exemplified by Johannesburg's e-Procurement System, which

permits the public to track every tender and contract, allowing suppliers and citizens to observe procurement activities in real time [19]. Likewise, Cape Town has adopted digital systems for supplier registration and tender access, which enhance administrative efficiency and foster fair competition [23]. The eThekweni and Tshwane municipalities have also embraced electronic tendering and automated workflow systems, resulting in quicker procurement cycles and improved oversight [17]. These instances mitigate the risk of fraud and corruption by restricting human discretion and automating processes, thus enhancing transparency and accountability.

The Industry 4.0 emphasizes not only the incorporation of cutting-edge technologies but also the reorganization of the methods by which data and resources are acquired, distributed, and utilized to provide services in a more efficient and sustainable manner [24]. For example, the Nelson Mandela Bay Municipality has implemented online supplier registration systems to minimize paperwork and enhance accessibility for small and medium enterprises [12]. The Buffalo City Metropolitan Municipality has launched electronic tender submission portals, which decrease turnaround times and lower administrative expenses [23]. In a similar vein, the Mangaung Metropolitan Municipality has embraced workflow automation tools to oversee procurement activities, ensuring adherence to regulations and minimizing irregular spending [25]. Even smaller municipalities, such as Polokwane, have trailed cloud-based procurement systems to enhance transparency and efficiency in the acquisition of goods and services [7]. These instances illustrate that South African municipalities are progressively acknowledging the significance of Industry 4.0 principles in procurement. Therefore, by utilizing automation, cloud technologies, and digital tendering systems, they are not only cutting costs and delays but also bolstering transparency and accountability.

Cloud computing and Internet of Things (IoT) are revolutionizing procurement in South African municipalities, allowing them to adapt to changing demands. According to [26] cloud platforms provide unmatched flexibility for organizations to scale their systems as needed. This is crucial in municipal procurement, where demand can vary due to emergencies or seasonal needs. In addition, [27] notes that cloud computing supports remote work, ensuring procurement continuity during disruptions like the COVID-19 pandemic. Municipalities are adopting these technologies; for example, Nelson Mandela Bay Municipality has tested cloud-based supplier registration for quick vendor onboarding during peak demand [25]. Buffalo City Metropolitan Municipality uses IoT for logistics tracking, enabling real-time supply chain adjustments. Mangaung Municipality has implemented cloud-supported workflow automation to scale procurement for large infrastructure projects [26]. Even smaller municipalities like Polokwane are using cloud systems to manage fluctuating demands for essential services [12]. This scalability not only addresses immediate needs but also strengthens the overall procurement framework. By integrating IoT with cloud platforms, municipalities improve inventory visibility and supply chain management, reducing stock-outs and delays in infrastructure projects.

Digital technologies are increasingly essential for improving public procurement in South African municipalities. They enhance efficiency, transparency, service delivery, and public satisfaction [28]. Digitized procurement ensures timely delivery of learning materials to schools, essential medicines to clinics, and fewer delays in infrastructure projects [29]. Digital tracking provides reliability by allowing stakeholders to monitor order placements, approvals, and expected arrivals, which reduces disruptions and builds public trust in

government commitments [7]. Municipalities are adopting these technologies across various services. For example, the City of Ekurhuleni has launched pilot smart water management systems using IoT sensors to monitor water distribution, reducing leaks and ensuring timely access to potable water [30]. The Msunduzi Municipality has introduced digital waste management platforms to optimize collection routes and schedules, improving efficiency and reducing illegal dumping [23]. In Sol Plaatje Municipality, land allocation processes are now digitized, allowing citizens to access information on available plots and track application progress transparently [28]. Similarly, Mogalakwena Municipality is testing cloud-based procurement systems to effectively manage infrastructure project demands [10; 25]. These examples show that digital procurement systems provide benefits beyond financial savings, significantly improving daily life. By reducing paperwork and adopting electronic workflows, municipalities are enhancing their operations.

Digital technologies are becoming increasingly vital in enhancing public procurement processes within South African municipalities. They not only improve efficiency and transparency but also play a direct role in enhancing service delivery and public satisfaction [28]. When procurement systems are digitized, schools receive their learning materials promptly, clinics are stocked with essential medicines, and infrastructure projects experience fewer delays [11; 23]. The reliability provided by digital tracking, allowing stakeholders to know precisely when an order was placed, who approved it, and when it is expected to arrive, minimizes disruptions and fosters public trust in the government's capacity to fulfil its commitments [16].

Municipalities are already implementing these technologies across various service sectors. For instance, the City of Ekurhuleni has initiated pilot programs for smart water management systems that utilize IoT sensors to oversee water distribution networks, thereby reducing leakages and ensuring the timely provision of potable water [19, 29]. The Msunduzi Municipality has launched digital waste management platforms that monitor collection routes and schedules, enhancing efficiency and curbing illegal dumping [31]. In the Sol Plaatje Municipality, land allocation processes have been digitized, enabling citizens to access information regarding available plots and track the progress of their applications transparently [15, 26].

Likewise, the Mogalakwena Municipality has tested cloud-based procurement systems to manage varying demands for infrastructure projects, ensuring that resources are allocated effectively [10]. These instances demonstrate that digital procurement systems offer benefits that extend beyond mere financial savings, leading to significant enhancements in daily life. Consequently, by minimizing paperwork and embracing electronic workflows, municipalities are promoting environmental sustainability, in line with the National Development Plan and broader green economy objectives.

4. Methodology

The article uses a qualitative research approach to explore the opportunities and challenges of digital transformation in public procurement within South African municipalities. The methodology involves analyzing secondary data sources, including government policy documents, Auditor-General Reports, National Treasury publications, municipal records, and academic literature on digital governance and procurement. The Auditor-General's municipal audit reports provide crucial statistical evidence of procurement inefficiencies, irregular expenditures, and systemic weaknesses, forming the empirical basis

for problem identification. Case studies from municipalities like Cape Town, eThekweni, Johannesburg, Tshwane, and Nelson Mandela Bay highlight practical experiences with digital procurement initiatives, showcasing both successes and ongoing challenges. The data were thematically analyzed with a focus on three main objectives (i) examining the impact of digital systems on reducing corruption and irregularities, (ii) identifying opportunities for enhanced transparency, accountability, and service delivery, (iii) identifying challenges to implementation. This methodology ensures a comprehensive understanding of how digitization can address procurement challenges, situating South Africa's procurement reforms in a global context and demonstrating why digital procurement is the most effective solution for reducing inefficiencies and corruption in municipalities.

5. The impact of digital procurement systems on reducing corruption and procurement irregularities in municipalities

Digital procurement systems are essential for reforming South African municipalities, addressing inefficiencies, irregularities, and corruption in public procurement. In addition, [33] notes that these systems enhance transparency, efficiency, inclusivity, and oversight, promoting good governance and accountability in municipal services. E-tender portals and supplier databases make procurement information publicly available, reducing manipulation and fostering citizen trust [23, 33]. For instance, Cape Town's e-procurement platforms allow online supplier registration and access to tender opportunities, streamlining processes and ensuring fair competition [32, 34]. Automation improves efficiency by cutting down paperwork and speeding up procurement cycles, thus saving taxpayer money and ensuring timely resource allocation for service delivery [33]. The eThekweni Municipality's electronic tendering systems demonstrate how digitization can reduce delays and costs while limiting fraud opportunities [19]. Ultimately, real-time monitoring tools enhance oversight, enabling officials to detect irregularities early, ensure compliance with regulations, and integrate accountability into municipal operations, thereby reducing corruption and procurement issues.

Digital procurement systems are crucial for reforming South African municipalities by addressing inefficiencies and corruption in public procurement. More so, [32] highlights that these systems promote transparency, efficiency, oversight, and inclusivity, thereby enhancing good governance and accountability. For example, Johannesburg has implemented digital supplier databases to ensure fair competition and accountability [34, 35]. Online tendering platforms increase inclusivity, allowing SMMEs to access procurement opportunities, which supports local economic development. The Tshwane Metropolitan Municipality has adopted automated workflows to speed up procurement cycles and improve monitoring, further promoting inclusivity and accountability [36]. By implementing modern e-procurement systems, South African municipalities can maximize the value of public spending, especially given the Auditor-General's reports on significant procurement failures and irregular expenditures. Thus, digital procurement systems represent a governance reform that integrates transparency, efficiency, inclusivity, and oversight, offering a path to restore accountability, reduce corruption, and improve service delivery [28, 35].

South Africa's e-procurement system, centralized through the e-Tender Publication Portal and Central Supplier Database (CSD), provides a unified framework for municipalities to modernize procurement, reduce irregularities, and fight corruption [37]. Leading municipalities like Cape Town and Johannesburg have pioneered digital procurement, while

other municipalities, such as Nelson Mandela Bay, have adopted electronic supplier registration and automated compliance checks to limit human discretion and ensure only approved suppliers can tender [35,38]. Similarly, Buffalo City Metropolitan Municipality has improved supplier verification using the CSD, preventing fraud and enhancing accountability. Mangaung Metropolitan Municipality has tested digital workflow systems for real-time procurement oversight, enabling officials to identify and address irregular spending promptly [38]. Polokwane Municipality has also adopted online tender advertising, increasing access for small and medium enterprises (SMMEs) and promoting inclusivity in local economic development [30, 36]. These examples show how municipalities beyond major cities are aligning with the OCPO's strategic goals, using ICT tools to standardize procurement, improve oversight, and enhance transparency in governance. Overall, these digital procurement initiatives represent not just technical upgrades but also governance reforms that boost efficiency, reduce corruption, and restore public trust in municipal institutions, ensuring optimal public expenditure for South African citizens.

In Gauteng, an IT infrastructure was acquired without following procurement procedures, resulting in a loss of over R148 million, despite cheaper options [37]. In the Northern Cape, significant funds were spent on mammogram services, although the hospital lacked a mammogram machine [34, 38]. In KwaZulu-Natal, contracts for radiology equipment were awarded to unqualified bidders who also inflated their prices compared to rightful bidders [39]. The Eastern Cape's Department of Road and Public Works did not follow proper procurement procedures when hiring a consultant for its 2016/2017 financial statements [16, 39]. The department sought approval to bypass competitive bidding as per Treasury regulation 16A6.4, but the request was denied. They appointed the consultant, anyway, reporting the R45 million expenditure as irregular [38]. These cases underscore the need for digital procurement to reduce corruption and irregularities in South African municipalities.

6. The opportunities presented by digital procurement systems in enhancing transparency, accountability, and service delivery

The e-Procurement system in South African municipalities has diminished opportunities for corruption, streamlined supplier registration, and improved contract management, thereby strengthening trust in public institutions. This has been observed in South African municipalities that have adopted digital technologies and where digital procurement reforms have been implemented to tackle inefficiencies and irregular expenditures [31]. For instance, in Cape Town, the introduction of an e-procurement platform has enhanced supplier access and alleviated administrative bottlenecks [27]. Likewise, eThekweni has adopted electronic tendering systems that have reduced procurement cycles and minimized human interference [33, 38]. In Johannesburg, digital supplier databases have improved contract management, although challenges remain due to inadequate oversight and leadership turnover [40]. Therefore, the experiences of these municipalities in South Africa illustrate that digitization in procurement not only mitigates corruption but also instils accountability and efficiency within governance frameworks.

Digital procurement systems offer significant opportunities to improve transparency, accountability, and service delivery within South African municipalities [16]. In Cape Town, the implementation of an e-procurement platform has alleviated administrative bottlenecks by allowing suppliers to register and access tender opportunities online [2, 40]. This advancement operationalizes transparency by making procurement cycles visible and

traceable, thus reducing the chances for manipulation [30]. From a theoretical perspective, Good Governance Theory highlights the importance of accountability and efficiency, both of which are enhanced through audit trails and automated workflows. The experience of Cape Town illustrates how digitization institutionalizes accountability, as it minimizes discretion and strengthens oversight, ultimately leading to improved service delivery outcomes by ensuring fair and efficient allocation of resources [41]. This example demonstrates how digital procurement systems integrate governance principles into municipal operations, transforming procurement from a bureaucratic obstacle into a transparent and citizen-focused process.

In eThekweni, the adoption of electronic tendering systems has optimized procurement cycles, leading to reduced delays and less human interference [1, 5]. It is evident that through the implementation of digital tender submissions and evaluations, eThekweni has diminished opportunities for corruption while expediting procurement processes, thus improving responsiveness to the needs of citizens. The municipality's embrace of digital procurement exemplifies how technology can act as a governance facilitator, incorporating accountability mechanisms that guarantee fair competition among suppliers [9,12]. The efficiency improvements realized in this context translate directly into enhanced service delivery, as procurement delays, previously a significant barrier, are reduced, enabling more effective allocation of resources in infrastructure and social services [6, 39]. Therefore, this case underscores how digital procurement systems not only modernize administrative functions but also promote the diffusion of innovation throughout institutional frameworks, strengthening both accountability and transparency in municipal governance.

Finally, Tshwane has adopted automated workflow systems that expedite procurement approvals and enhance monitoring [4]. This situation highlights the relevance of Good Governance Theory, as automation minimizes irregular expenditure by restricting human discretion and ensuring adherence to procurement regulations. The system's capability to produce real-time reports improves accountability by equipping decision-makers with precise data for oversight [15, 29]. From the perspective of service delivery, expedited approvals allow for quicker project implementation, meeting community needs without bureaucratic hindrances. Tshwane's experience illustrates how digital procurement systems can revolutionize governance frameworks by integrating transparency and accountability into routine processes, thereby bolstering citizen confidence in municipal institutions [16;40]. Consequently, it can be concluded that digital procurement is not just a technological advancement but a governance reform that enhances institutional capacity, mitigates corruption, and improves service delivery. As a result, by embedding transparency and accountability into procurement cycles, Tshwane exemplifies how digital systems actualize governance principles, ensuring that procurement serves as a catalyst for legitimacy and citizen trust [29].

7. The challenges affecting the implementation of digital transformation in municipal procurement systems

The issue of ICT infrastructure within South African municipalities is clearly reflected in the inconsistent adoption of digital procurement systems. Although digitisation necessitates reliable internet connectivity, modern hardware, and integrated platforms, numerous municipalities continue to face challenges with outdated computers and unstable networks [3, 9]. This situation has resulted in a disjointed digital environment where certain

metropolitan areas, such as the City of Cape Town, have successfully utilized the e-Tender portal, while smaller municipalities like Moroka Local Municipality still depend on manual processes [6, 40,41]. In Cape Town, supplier data frequently needs to be re-entered into separate systems for contract management, which undermines efficiency and leads to duplicated efforts [38]. Likewise, the eThekweni Municipality has tested electronic tendering; however, connectivity problems in satellite offices often necessitate that emergency procurements are processed offline. This circumvents digital records and diminishes transparency [5, 23]. The Tshwane Metropolitan Municipality has implemented workflow monitoring tools, yet procurement deviations, such as direct appointments below threshold values, are still managed manually, resulting in substantial expenditures remaining outside the digital framework [30]. In Nelson Mandela Bay, reports from the Auditor-General have highlighted irregular expenditures associated with inadequate ICT infrastructure, where officials have reverted to using spreadsheets due to unreliable networks, thereby creating unclear records that undermine accountability objectives [23,38]. These instances demonstrate the challenges faced in implementing e-procurement across South African municipalities.

Public procurement in South Africa functions within a highly regulated framework, which poses considerable challenges to digital transformation. The current procurement legislation, spread across the PFMA, MFMA, and Treasury regulations, was established for traditional paper-based processes [29]. Municipal instances vividly illustrate these challenges; for example, in the City of Johannesburg, officials have reported difficulties in reconciling electronic tender submissions with the statutory requirements for physical documentation, resulting in duplication and delays [33,41]. The eThekweni Municipality, despite testing e-tendering platforms, continues to handle deviations and emergency procurements offline due to regulatory requirements that mandate manual authorization [40]. In Nelson Mandela Bay, findings from the Auditor-General revealed irregular expenditure associated with the inconsistent application of procurement rules, where digital systems were circumvented to adhere to outdated legal requirements [43]. These instances illustrate how Good Governance Theory, which promotes transparency and accountability through streamlined digital systems, contrasts with the reality of bureaucratic inertia that perpetuates inefficiency. The South African scenario emphasizes that effective e-procurement necessitates not only technological readiness but also legal and institutional adjustments to foster transparency, efficiency, and accountability across all municipalities.

The effectiveness of technology in public procurement ultimately depends on its users, with the human factor being one of the most significant barriers to digital transformation in South African municipalities. Numerous procurement officials and supply chain managers have received training in, and are familiar with, paper-based or semi-digital processes, resulting in a skills gap when it comes to operating advanced e-procurement software, analyzing digital data, and troubleshooting system issues [32, 43]. This gap is particularly noticeable in municipalities like the City of Tshwane, where officials have faced challenges in adapting to workflow monitoring tools, frequently reverting to manual reporting formats. Likewise, in the City of Johannesburg, inadequate training has resulted in inconsistent utilization of e-platforms, thereby undermining the anticipated efficiency improvements [44]. Resistance to change exacerbates this issue. In municipalities such as eThekweni, certain officials have opposed e-procurement reforms due to the heightened transparency that diminishes opportunities for discretion or potential corruption [1, 9]. Others have voiced

concerns regarding technology or fear that automation may make their positions obsolete, mirroring observations in Nelson Mandela Bay, where Auditor-General reports highlighted staff reluctance to fully adopt digital systems. This resistance illustrates a broader institutional inertia, where established routines and vested interests hinder the pace of reform. In conclusion, the human element, comprising skills, attitudes, and professionalization, remains a critical determinant of the success or failure of digital procurement in South African municipalities.

8. Recommendations

Budget limitations can thus serve as an obstacle – particularly at the local government level, where IT funding is restricted. A sustainability strategy is essential to ensure that once an e-procurement platform is implemented (occasionally with support from donors or central authorities), it remains funded and maintained over the long term. The World Bank cautions that e-GP initiatives frequently commence as projects but struggle once initial funding ceases, making long-term commitment vital.

The obstacles to digitising the procurement of South Africa's government are considerable, yet they are not impossible to overcome. These challenges include gaps in technology and infrastructure, the necessity for legal and procedural reforms, human factors, and considerations of equity. The experiences of other nations, along with guidance from international organizations, offer valuable lessons on how to address these challenges. The following section examines some of these frameworks and best practices that South Africa can utilize to alleviate difficulties and ensure a successful digital transformation of its public procurement.

The findings reveal that transitioning procurement to an online platform entails the digital storage of sensitive information (including bid prices, company data, and government purchasing plans). This data can become vulnerable to cyber-attacks or fraud if not adequately protected. Recent years have witnessed an increase in cyber incidents targeting South African institutions, highlighting the necessity for strong security protocols. The e-procurement system must incorporate robust encryption, user access controls, and monitoring mechanisms to avert hacking or data breaches.

The findings also suggest that another facet of the regulatory challenge is the bureaucratic red tape that may hinder digitisation. Public sector procurement is often criticized for being overly rule-bound and rigid. Experts have advised that South Africa should streamline and simplify procurement processes as part of the digitisation initiative. This entails revising specific approval workflows, bid evaluation methods, or reporting obligations to conform to best practices and the capabilities of contemporary technology. Essentially, the government should refrain from automating inefficiencies; rather, it should re-engineer processes to be more efficient before digitising them. Accomplishing this may necessitate modifications to Treasury instructions or guidelines.

A comprehensive field analysis study must be conducted, incorporating insights from all e-procurement stakeholders, including system administrators, procurement managers, and suppliers. The insights gathered from these e-procurement stakeholders should focus on their experiences with e-procurement during the procurement process, as well as other supporting factors such as the user-friendliness of the system and its accessibility.

9 Conclusion

This research showed that digital transformation in public procurement equips South African municipalities to address inefficiencies, corruption, and accountability issues. By adopting e-procurement platforms, electronic tendering, supplier databases, and automated workflows, municipalities can enhance transparency, reduce administrative costs, and improve governance. Digital procurement offers significant benefits, including increased efficiency, lower costs, better transparency, stronger accountability, faster service delivery, and improved monitoring. However, challenges like inadequate infrastructure, limited technical skills, weak institutional capacity, and cybersecurity threats can impede success. The Auditor-General's reports reveal a need for reform, with irregular expenditures exceeding R268 billion in 2025, highlighting governance failures. Without strategic leadership and investment, digital procurement may become ineffective. In conclusion, digital procurement is a key solution to South Africa's municipal procurement crisis, dependent on strategic leadership, infrastructure investment, skills development, and robust regulations. If municipalities embrace these reforms, digital procurement could restore public trust, reduce corruption, and ensure service delivery meets citizens' needs transparently and accountably.

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