

Exploring the Key Challenges Faced By the South African Public Sector in Adopting Artificial Intelligence

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ABSTRACT

The widespread use of artificial intelligence (AI) technologies has not only streamlined internal processes of the public sector but also advanced public services to citizens globally. Although these trailblazing technologies have been valued for their enhanced efficiency and streamlined processes, they have been susceptible to challenges that hinder their full potential, particularly in developing countries like South Africa. The purpose of this study is to explore the key challenges faced by the South African public sector in adopting AI. Grounded in the interpretivist paradigm, this study employs a qualitative methodology, utilising the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) technique to collect and synthesise data from the literature. The systematic analysis included 20 studies extracted from the Web of Science database. The findings of this study reveal that digital infrastructural deficit, digital illiteracy, policy and regulatory gaps, and ethical dilemmas are all key challenges encountered in the adoption of AI in the South African public sector. The implications of this study are relevant to deepening understanding and advising policymakers, decision-makers, and practitioners on AI challenges.

Keywords: Artificial intelligence, Challenges, Public services, Public sector, PRISMA, South Africa

INTRODUCTION

The ubiquitous application of information and communication technology (ICT) has profoundly transformed public services (Baloyi & Beyers, 2019). Artificial intelligence (AI) has recently gained momentum across diverse sectors, including public administration. With the burgeoning use of AI in the global realm, public sectors have undergone a profound reshaping of public services for citizens and various stakeholders. AI-driven mechanisms and techniques, such as machine learning, virtual assistants, virtual payments, natural language processing, deep learning and chatbots, among others, have tremendously transfigured the internal processes of public sectors and improved service delivery (Tveita & Hustad, 2025). While AI is regarded as preliminary in developing countries like South Africa (Janneker, 2025), most advanced economies across the globe (e.g., the United Kingdom, the United States of America, Australia and Japan) have long been on the edge of automated decision-making and already reaped the benefits brought by AI-enabled technologies (Baloyi, 2025). More to this, whereas most advanced economies have continuously been rendering digitalised services to the citizens, developing countries such as South Africa are still beleaguered with contextual challenges, including but not limited to digital infrastructure, digital illiteracy, policy and regulatory deficit, and ethical dilemmas, impeding the full-fledged usage of AI technologies (Shekgola & Modiba, 2025; Chilunjika, 2024).

South Africa has consistently been a beacon of hope in service delivery to its citizens. The Republic of South Africa gained freedom after the apartheid regime and post-colonisation in 1994. Nevertheless, even after 31 years of democracy, the country remains plagued by socio-economic discrepancies, commonly referred to as the triple scourge: poverty, inequality, and a high unemployment rate (Baloyi, 2025). This triple scourge is detrimental and often impedes the complete realisation of emerging digital technologies, including AI. For instance, although the country experiences obstacles such as a digital infrastructural deficit, unreliable internet connectivity, and cellular network disparities, the digital divide is regarded as the most significant contributing factor exacerbating digital failures, especially in remote or rural areas, affecting marginalised groups (Malope, 2025; Maleka & Maidu, 2024). Further to this, despite the significant strides made in embracing AI-driven

technologies, the lack of a legal and regulatory framework governing the ethical use of AI appears to be perplexing (Naidoo, 2024). In other words, the paucity of policies regulating AI in the South African public sector remains a challenge to the implementation of digital ideas. Even though steps were taken to embrace and tackle AI by developing policy, such as “the South African National Artificial Intelligence Policy Framework” in 2024, to date, however, the cabinet has not yet endorsed such a policy (Baloyi, 2025). Given these debates, it is essential to investigate the key challenges the South African public sector faces in adopting AI to thrive in the digital landscape.

In the South African public sector context, AI has been rampant and manifested in different forms to diverse industries, include but not limited to, *healthcare services* (Janneker, 2025; Malope, 2025), *municipal services* (Bester, 2024), *rural development* (Naidoo, 2024), *public administration* (Modiba, 2025), and *basic education* (Saal et al., 2025), *inter alia*. Notwithstanding the vulnerabilities outlined earlier, AI-related technologies have considerably increased efficiency and effectiveness in delivering services in South Africa, more especially in the private sector. Yet, like many other countries throughout the world, South Africa is expected to achieve the Sustainable Development Goals (SDGs) as set by the United Nations, as well as the National Development Plan (NDP) and Vision 2030, which is fast approaching. That being the case, implementing digital technologies (including AI) is imperative to enhance citizens’ welfare while working towards the realisation of the NDP, aiming to eradicate poverty. Against this background, this study aims to address the following research question: *What are the key challenges faced by the South African public sector in adopting AI?*

Theoretical Perspective

Several theories guide and navigate the adoption of technology at both the individual and institutional levels in the public sector. These include, but are not limited to, technology acceptance model (TAM), technology acceptance model (TAM) version 2, technology–organisation–environment framework (TOE), theory of planned behavior (TPB) and unified theory of acceptance and use of technology (UTAUT) (Baker, 2012). Due to the proliferating necessity to embrace AI to deliver streamlined public services in the digital landscape and the novelty of its adoption in the South African public sector, Tornatzky and Fleischer's (1990) TOE is seen as pertinent in evaluating the capabilities and limitations of institutions using the three contextual dimensions: technology, organisation, and environment (see Figure 1 below). The TOE has been extensively employed by diverse sectors (both private and public) in appraising organisational condition when pursuing the uptake of digital technologies, utilising these three dimensions. Notwithstanding its wide application in diverse phenomena where technology acceptance is prevalent, the TOE has been commended for its feasibility and practicability in assessing the organisational capacity (e.g., the capability and availability of resources).

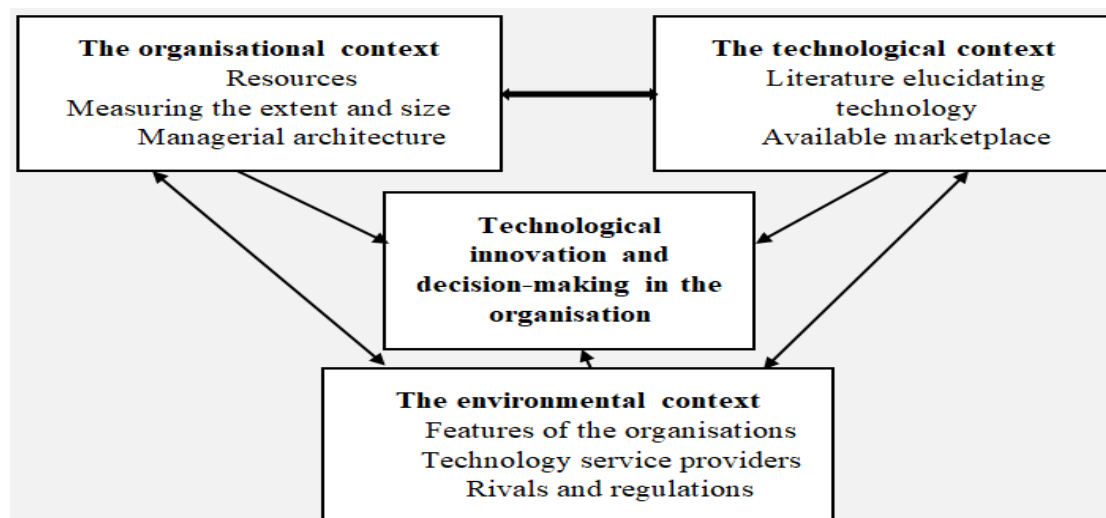


Figure 1 Technology-organisation-environment model (Tornatzky and Fleischer, 1990)

The technological dimension relates to the scope and rapidity of technological transformations and innovations that are volatile, erratic, and non-negotiable, yet applicable for acceptance by the public sector (Bryan & Zuva, 2021). It includes digital advances (such as AI, cloud computing, virtual platforms, big data, and the Internet of

Things) that governments can adopt to enhance their decision-making processes and deliver efficient services to society. On the other hand, the organisational dimension is concerned with scanning internal capacities (i.e., strengths and vulnerabilities) that are critical in accepting new digital technologies (Baker, 2012). It involves having sufficient resources to accommodate technological changes, such as human, financial, and technical resources, as well as an innovative culture, a vibrant organisational structure, leadership drive, and effective reward strategies (Awa et al., 2017). The environmental dimension entails being mindful of the ecosystem (ecology) while adhering to governmental prescriptions when adopting digital technologies (Baker, 2012). These include regulatory frameworks and guidelines that direct digital technologies in the digital era.

MATERIALS AND METHODS

To achieve the purpose and respond to the research question of this study, a critical review of academic discourse was conducted to ensure an ample, all-inclusive, explicit, and replicable method for retrieving, selecting, and interpreting literature related to the current topic (Page et al., 2021). Grounded on the interpretivist paradigm, this study employs qualitative methodology using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) technique to explore the key challenges faced by the South African public sector in adopting AI. The PRISMA technique has been lauded for enhancing transparency, inclusiveness, and reliability in appraising the literature by rigorously clustering related studies within a specific area or field (Page et al., 2021). According to Sohrabi (2021), the advantages of employing the PRISMA technique include: (1) while executing large amounts of data, it ensures explicit and dependable study conclusions, (2) it helps reduce prejudice in the selection and interpretation of literature, and (3) it enables critical assessment of literature and identification of pertinent themes. Even though PRISMA originates from medical research (Page et al., 2021), it has been extensively applied in social science research, particularly in the context of AI phenomena in the public sector (Madan & Ashok, 2023; Tomazevic et al., 2024). The PRISMA process involves four steps: identification, screening, eligibility and inclusion (Knobloch et al., 2011).

The identification of studies

At the outset, sources on AI in the public sector were retrieved from the Web of Science (WoS) database, the most prominent scholarly literature pool worldwide. The search strings were restricted to the key concepts, such as “*artificial intelligence*”, “*AI*”, “*challenges*”, “*obstacles*”, “*public services*”, “*service delivery*”, “*public sector*”, “*public administration*”, and “*South Africa*”. Considering that cutting-edge technologies (e.g., AI) are volatile and rapidly evolving due to the ever-changing business landscape (political, economic, social, technological, and ecological – PESTE) in the digital era, this study only included current sources from the 2023 to 2025 academic years. This enabled the authors to access current debates on AI.

The screening process

Following a comprehensive search of the literature in WoS, the screening process has been initiated. The sources were meticulously assessed by scrutinising the abstracts to ascertain their suitability for this study. Aside from that, the sources were critically and systematically synthesised to discover pertinent themes and patterns. While themes and patterns related to the subject were identified during the screening process of the sources, the authors observed alignment with the study’s purpose. Three autonomous evaluators were delegated to assess the sources to circumvent prejudice during the selection procedure and improve data reliability when scrutinising the sources. Slight differences of views were reflected and settled, finally reaching a consensus. The EndNote Reference Manager (Version 21.5) was utilised to efficiently manage and handle the replicated references and create a complete data file.

Considering the eligibility and inclusion criteria

After thoroughly screening the academic sources, the authors considered the eligibility criteria (inclusion and exclusion). Only studies published in the public sector context were included to enhance reliability and validity. To this end, however, apart from the irrelevant sources, non-English studies were excluded due to the complexity of interpretation. Table 1 below underscores the inclusion and exclusion criteria of this study.

Table 1 Eligibility requirements

Item	Description
Domain	Only sources published within the public sector domain were included in the study.
Literature	This study included peer-reviewed journal articles and conference papers.
Key concepts	The search for key concepts was limited to the following terms: “ <i>artificial intelligence</i> ”, “ <i>AI</i> ”, “ <i>challenges</i> ”, “ <i>obstacles</i> ”, “ <i>public services</i> ”, “ <i>service delivery</i> ”, “ <i>public sector</i> ”, “ <i>public administration</i> ”, and “ <i>South Africa</i> ”.
Period	The study included sources published between 2023 and 2025 to ensure the prevalence of the academic discourses.
Research methods	Studies that included both qualitative and quantitative research methods were considered.
Language	Only sources written in English were included. Sources in other languages were excluded based on translators' difficulty accessing them.

Data quality evaluation

Following the screening process, the data were systematically and thoroughly assessed to determine their value and enhance quality assurance, while also ensuring the reliability and validity of the sources. Furthermore, the rigorous quality appraisal procedure helped identify sources that could significantly contribute to the study in response to the research question, thereby achieving the study's purpose. Most importantly, to improve the quality of sources consulted, only research published in the most renowned journals was deemed suitable to meet the quality appraisal requirements. The data quality evaluation (DQE) was based on the factors underscored in Table 2.

Table 2 Data quality evaluation requirements of eligibility

DQE Code	Specification	Response
DQE 1	Is the primary purpose/objective explicitly stated?	Absolutely = 1, Moderately = 0,5 and Not applicable = 0
DQE 2	Is the theoretical framework (if applicable) clearly explained and aligned to the study?	
DQE 3	Is the underpinning methodological choice thoroughly elucidated and rationalised?	
DQE 4	Do the findings offer explicit implications and suggestions?	
DQE 5	Does the research attain secondary objectives, if any?	

RESULTS

The comprehensive search of the literature using the WoS search engine yielded 1003 sources (as illustrated in Figure 2), in addition to 7 sources suggested by the experts. While the authors considered the eligibility requirements, the sources without abstracts, non-English, identical and irrelevant, amounting to 689, were eliminated, leaving 314. Of the 314 sources, 243 full-texts were removed based on the study's eligibility requirements, leaving 71. Furthermore, the quality evaluation was conducted on 71 sources, resulting in 20 sources being included in the systematic analysis. Most notably, only sources that focused on AI in the public sector were suitable for inclusion in the broad review, while also considering the South African studies that

informed the contextual factors influencing the adoption of AI. Ultimately, 20 sources, comprising 16 peer-reviewed journal articles and four conference papers, were included in the systematic analysis. The statistical contribution of sources is as follows: 16 (80%) of peer-reviewed journal articles and four (20%) of conference papers.

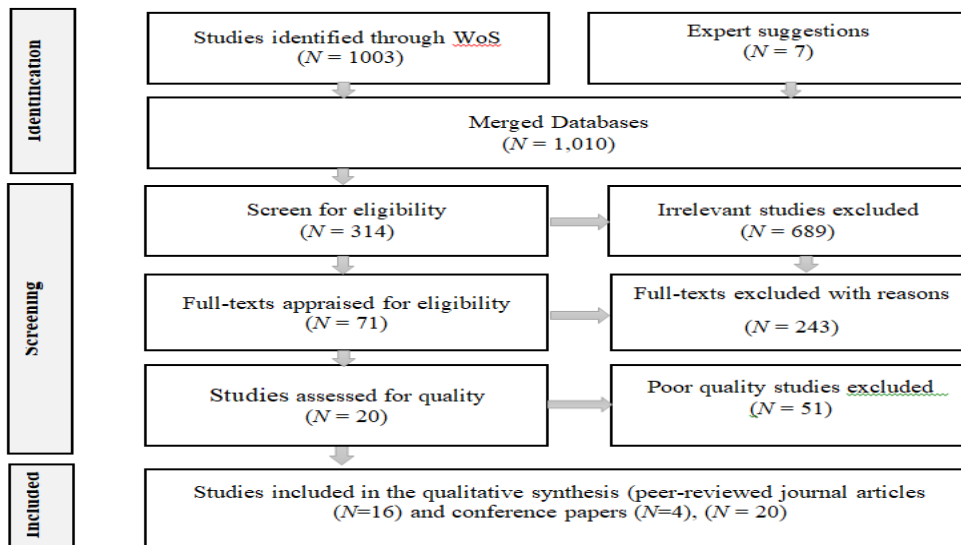


Figure 2 PRISMA flow diagram (Page et al. 2021)

DISCUSSION OF FINDINGS

The comprehensive and rigorous systematic literature analysis was undertaken in response to the research question: *What are the key challenges faced by the South African public sector in adopting AI?* This section elucidates the implications of the themes derived from the PRISMA technique, such as digital infrastructural deficit, digital illiteracy, policy and regulatory gaps, and ethical dilemmas.

Digital infrastructural deficit

Generally, although digital infrastructure plays an integral role in driving digital innovation (including AI), accelerating public services and boosting economic expansion of the country, most African countries are faced with limited digital infrastructure (e.g., broadband internet connectivity), encumbering the accomplishment of digital solutions in the digital arena (Osei, 2024). To this end, Osei's study confirms a positive linkage between digital infrastructure and innovation. Like other emerging countries, Naidoo (2024) corroborates that since South Africa faces funding challenges concerning digital infrastructure, particularly in remote areas affecting designated (marginalised) groups, this further exacerbates the persistent socio-economic discrepancies (digital divide in those communities and the application of AI in those communities. This is consistent with the ideas of Zindi and Majam (2024), who opine that while digital infrastructure (including electricity distribution) is one of the fundamental impediments to downplaying the development of AI and the provision of digitalised service delivery by municipalities in South Africa, the effective and efficient public services have been drastically disrupted. That said, it is worth remarking that digital infrastructure is a crucial aspect not only in enhancing AI adoption but also in the uptake of other emerging technologies such as cloud computing, big data, virtual platforms, and blockchain in the context of the public sector (Henk & Henk, 2025; Modiba, 2025).

Digital illiteracy

The public sector, specifically in developing countries, is characterised by digital illiteracy or the absence of skilled professionals compared to the private sector (Mahusin et al., 2024). The lack of investment in comprehensive training and development of public servants aggravates this issue. Furthermore, the scarcity of digital competencies in South Africa has been identified as a significant barrier to the adoption of AI tools and techniques (e.g., machine learning) in the public sector (Baloyi, 2025; Chilunjika, 2024). More to this, notwithstanding AI being regarded as a vehicle for fast-tracking seamless public services and ensuring improved

productivity, it is contended that most public servants across the South African public sector (including local government) lack appropriate competencies to operate AI-related technologies in the digital world (Motadi, 2024; Zindi and Majam, 2024). It is argued that apart from the critical drawbacks brought about by AI, such as job displacement and skepticism, employees in the public sector are negatively impacted by the absence of expertise necessary to drive AI-enabled technologies (Henk & Henk, 2025). Most remarkably, older public servants seem reluctant to accept modernised public services (i.e., the integration of AI into processes) imposed by technological changes, primarily due to a lack of interest in acclimating and adjusting to the new processes (Barodi & Lalaoui, 2025). That being the case, it drags the progress of fulfilling modernised public services as the traditional paradigm supersedes AI applications.

Policy and regulatory gaps

Policy and regulatory frameworks are the focal point of AI acceptance in the public sector. To this effect, many developing countries are plagued by the scarcity of policy and legislative models guiding the development of AI technologies (Motadi, 2024), as well as AI-related legal uncertainties that often hinder the smooth deployment of ethical AI – specifically, concerns over data security, privacy, and transparency (Androniceanu, 2024). Even though the South African government has taken radical steps to assimilate AI tools into systems in diverse areas in the public sector, include but not limited to, law and judiciary, agriculture, social services, home affairs, education, and health, *inter alia*, the regulatory framework governing AI is still blurred (Janneker, 2025; Chilunjika, 2024; Motadi, 2024). For instance, regardless of the attempts made to establish AI policy (e.g., “*South Africa National Artificial Intelligence Policy Framework*”), the framework remains a draft and is nevertheless in the process of endorsement by the Minister of Communication and Digital Technologies after a thorough consultation with the public and different stakeholders (Baloyi, 2025). In a similar vein, it is vital to develop robust AI legal mechanisms and enforcement to circumvent potential ethical concerns (such as public trust, fairness, and bias), thereby enhancing transparency in AI algorithms (Tomazevec et al., 2024). This may help minimise bias in AI usage. Furthermore, as AI rapidly penetrates public administration due to volatile business conditions, developing binding laws and regulations has become mandatory to accelerate the delivery of cost-effective services (Henk & Henk, 2025; Madan & Ashok, 2023).

Ethical dilemmas

Ethical concerns are a crucial consideration when adopting AI technologies in the public sector. For instance, moral concerns, including but not limited to data security, privacy, transparency, accountability, and the bias of algorithms, play a prominent role in warranting the ethical use of AI, not only in providing efficient public services but also in enhancing fairness and non-discrimination for its users (Shekgola & Modiba, 2025). Additionally, while AI technologies present potential gains (e.g., economic growth, cost savings, and enhanced decision-making) through automated decision-making, especially in advanced economies globally, developing countries like South Africa and other African countries are overwhelmed with ethical conundrums, hindering the utilisation of AI by citizens (Baloyi, 2025). It is substantiated that the persistent ethical dilemmas emphasised earlier lead to AI initiatives’ failures and sluggish service delivery, thus disrupting the achievement of the public sector’s strategic objectives and the NDP’s SDGs goals (Naidoo, 2024), at the same time, eroding public trust (Maleka & Maidi, 2024). It is important to integrate ethical principles (data security and privacy) and governance standards (accountability and transparency) when designing AI legal frameworks and models, and in developing and implementing AI systems to prevent unnecessary AI resistance by citizens and other stakeholders.

Despite the challenges delineated, the South African government endeavours to embrace AI-driven technologies in the public sector. For instance, Stellenbosch University in South Africa has compiled policy data related to the global application of AI. The University found that AI is prevalent in providing public services across various sectors by the South African government (Stellenbosch University, 2025). Most profoundly, the policy identified AI tools that governments are currently employing or have yet to utilise in rendering services. The following serves as an example.

Table 3 AI tools in the South African public sector (The Stellenbosch University, 2025)

No.	AI	Type of service	Sector	Status
1.	GRIT-GBV Zuzi chatbot.	Public order and safety.	Law and Judiciary.	Implemented.
2.	Project Vikela.	Discover illicit rhino poaching.	Agriculture.	In development.
3.	Automated Biometric Identification System.	AI-powered matching of fingerprints, faces & palm prints.	Home Affairs.	Operational.
4.	SARS “AI Assistant” chatbot.	Natural-language bot answers tax, customs & traveller queries.	South African Revenue Service (SARS).	Operational.
5.	AI-assisted TB screening vans (CAD4TB/Qure.ai).	Portable X-ray units score images with AI.	Health.	Pilot.
6.	GovSearch.	An intelligent search engine centralises reports, policies, and sector plans.	Cooperative Governance & Traditional Affairs.	Planned (not yet implemented).
7.	CSIR Body and number plate recognition system.	An integrated face, body and license plate recognition system for secure access control and surveillance, combining multiple biometric technologies for enhanced security.	Council for Scientific and Industrial Research (CSIR).	Pilot/Tested.

Given the disparate implementation status highlighted above, it is evident that South Africa is in a nascent phase of AI adoption. Although the South African government’s AI initiatives in service delivery efforts are necessary, as indicated in Table 3, further efforts are needed to enhance AI adoption in the public sector. Yet again, as the South African public sector continues to adopt various AI-enabled technologies to streamline internal processes and augment efficiency, its services to citizens can be significantly improved.

CONCLUSION

This study aimed to investigate the key challenges encountered by the South African public sector in adopting AI. Even though AI has been praised by multiple governments around the world for its efficiency in public services, the South African public sector has yet to reach that level. The identified themes (i.e., digital infrastructural deficit, digital illiteracy, policy and regulatory gaps, and ethical dilemmas) play an adverse role in realising AI initiatives, although they are imperative in remedying the status quo and assisting in expediting the South African public sector's adoption of AI-driven technologies. It is suggested that long-term investment in infrastructure development, digital skills, and funding for digital technologies can be considered key to harnessing and nurturing AI technologies in the South African public sector. Furthermore, whereas the global business environment is ever-evolving and AI is continuously becoming part of our daily lives, the rate at which various sectors (public and private) embrace AI is significant. As such, the South African public sector cannot disregard the adoption of AI technologies if modernised and better ways are to be found to improve the efficiency and streamlining of public services.

This study contributes to the body of knowledge by exploring the key challenges faced by the South African public sector in adopting AI. Addressing these key challenges is an essential aspect that can enable the South African public sector to thrive in the digital era. Furthermore, policymakers, practitioners, and decision-makers in the public sector can consider the findings of this study to be imperative for policy development and in

remodelling internal processes through selected digital strategies, specifically for those in the early stages of adopting AI-driven technologies.

Conflict Of Interest

The author declares that he has no financial or personal relationships that may have inappropriately influenced him in writing this article.

Statement Of Ethical Approval

The present research work does not contain any studies performed on animal/human subjects.

Data Availability

The authors confirm that the data supporting the findings of this study are available within the article and in the bibliography.

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