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A conceptual framework for ethical emerging digital technologies: A South African public sector perspective

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Orientation: Emerging digital technologies (EDTs) have drastically reshaped global public services. With the growing uptake of EDTs, many governments have experienced increased efficiency, transparency and greater accountability. Contrariwise, the proliferating adoption of EDTs has always been triggered by ethical concerns and dilemmas (e.g. privacy and security) in their application.

Research purpose: The primary objective of this study was to present a conceptual framework for ethical EDTs of the South African public sector.

Motivation for the study: With the changing business setting, integrating ethics into EDTs becomes imperative for the South African public sector to render efficient and streamlined services to its citizens.

Research design, approach and method: This study adopted a constructivist worldview and a qualitative approach using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) research technique.

Main findings: The study discovered the benefits of incorporating ethics into EDTs, including reduced cyberattacks, diminished bureaucracy, increased efficiency and enhanced productivity.

Practical/managerial implications: By developing a conceptual framework for EDTs, this study sought to contribute to policymaking and decision-making while advancing knowledge and providing far-reaching solutions to multifaceted social challenges in a turbulent business setting.

Contribution/value-add: This study provides an insight by critically appraising the literature and devising a conceptual framework, which is paramount in exploiting best practices of EDTs while considering critical ethical standards in strategic decision-making processes.

Keywords: ethics; emerging digital technologies; ethics framework; conceptual framework; public sector; public administration; PRISMA.

Introduction

Several public sectors across the globe are increasingly adopting emerging digital technologies (EDTs), also referred to as the Fourth Industrial Revolution (4IR), to deliver basic services to their citizens. These essential services include, but are not limited to, public health, education, municipal services, human settlements, car licensing and tax returns. Scholars in academic discourse have identified the significance of EDTs (i.e. artificial intelligence [AI], the Internet of Things [IoT], big data, cloud computing and virtual platforms) in fast-tracking public service delivery in the turbulent digital economy (Bajpai & Singh 2024). However, these EDTs are susceptible to ethical issues (data privacy and security), the most significant challenge impacting their application in the public sector. While ethics in EDTs remains a considerable concern for academics and governments, the public sector struggles to assimilate these fundamental ethical factors into EDTs to enhance their operations (Madan & Ashok 2023), particularly in emerging economies like South Africa (Baloyi 2025). For instance, cyberattacks as a form of ethical issues have been pervasive in the public sector in South Africa (Dagada 2024). To support this statement, in 2024, the Companies and Intellectual Property Commission (CIPC), a State-Owned Enterprise within the Department of Trade, Industry and Competition, in charge of company registration, was targeted by a ransomware attack demanding R1.9 million (Siphambili et al. 2024). Thus, research is necessary to delve into pertinent ethical issues that impact EDTs in the South African public

sector and to develop a conceptual framework that devises strategies to mitigate the crucial and recurring ethical problems.

Like many other African countries, South Africa, as an emerging economy, has made significant developments in the adoption of EDTs, despite typical and persistent hurdles (e.g. the digital divide and limited digital literacy) (Worku 2024). The prevalence of EDTs in rendering public service delivery in South Africa has been attained through e-government platforms (Baloyi & Beyers 2019). These platforms include, among others, the South African Revenue Service (SARS) e-filing system, the Department of Home Affairs' biometric identification system, the Department of Transport's Electronic National Administration Traffic Information System (e-NATIS) and the National Treasury's e-tendering system. To a great extent, the country's use of these platforms into administrative processes has significantly improved the interactions between the government and stakeholders (Jakoet-Salie 2020) and boosted economic growth (Masilela & Nel-Sanders 2023). Apart from the digital success stories emphasised, e-government platforms do not only create advantages for their users but also present drawbacks in their application, such as ethical issues.

One of the most pressing ethical issues impacting public sectors regarding the efficient application of these technologies is the absence *of data protection*, which often leads to cyberattacks (Dagada 2024). For instance, although the South African government effectively adopts emerging technologies, such as big data and analytics, to store and manage vast datasets (e.g. census statistics), the need for regulatory frameworks and control mechanisms on data flow raises ethical concerns for users. To this effect, while EDTs accelerate public services, they have also been interlocked with ethical impediments such as data breaches and cybercrimes (Ionescu 2025). With the burgeoning use of 4IR by citizens and stakeholders in the South African public sector, the ability to integrate ethics into these technologies cannot be overstated (Baloyi 2025). Moreover, considering the need to gear towards attaining the National Development Plan's Sustainable Development Goals Vision 2030 and other envisaged strategic objectives, the South African public sector should gear towards accelerating EDTs to thrive in the digital landscape.

Problem statement

Research has been conducted on the link between ethics and EDTs in the public sector (Madan & Ashok 2023). However, most studies are context dependent, focusing on ethics policy development and implementation within their specific settings (for example, James 2024). In other words, the contextual factors, such as the scope and extent of the governments in addressing ethical issues, cannot be viewed as a one-size-fits-all approach, as the South African public sector differs from other regions. That said, EDTs of the public sector in South Africa are unique and can demand dissimilar approaches in devising ethical solutions. Considering the scholarly debates, the scarcity of ethical frameworks guiding the uptake of EDTs in the South African public sector has been identified as a gap leading to this research (Department of Communications and Digital Technologies [DCDT] 2024a, 2024b; Mkhatshwa & Mawela 2023). Moreover, as the government in South Africa is at the core of service delivery in the technology-driven economy, the influence of ethics on EDTs cannot be overstretched if the innovative ways to render efficient services to the citizens and other stakeholders have to be improved.

Research objectives

Based on the problem above, the primary objective is to present a conceptual framework for ethical EDTs of the South African public sector. To achieve the primary objective, the following secondary objectives are:

- To examine the benefits of integrating ethics into the EDTs of the public sector.
- To delve into the ethical concerns of various EDTs for the public sector.

Literature review

This section discusses literature about ethics and EDTs in the public sector. It begins with underscoring the context of the study, followed by the theories that underpin it.

The context of the study

South Africa became a free country after the demise of the apartheid era in 1994. With the introduction of the new public administration, e-government strategies were implemented in 1999 through the State Information Technology Agency (SITA), an agency responsible for accelerating digital transformation in South Africa (Jakoet-Salie 2020; Komna & Mpungose 2024). Although digital government in South Africa has been commended for its capability to improve efficiency, modernise internal processes, diminish costs and enhance service delivery, it has also been besieged with the contextual determinants hampering its full realisation, such as digital skills deficit, ethical issues (data privacy, security, accountability and transparency), limited digital infrastructure and the lack of appropriate regulatory frameworks guiding digital technologies, *inter alia* (Nkgapele 2024; Worku 2024). For instance, while the country has taken drastic steps to embrace digitalised and automated services throughout, the socio-economic disparities (e.g. poverty, unemployment and inequality) continue to exacerbate the *status quo*.

Digital policy initiatives have recently been undertaken to respond to the ever-evolving business environment. For example, the 'Draft Digital Government Policy Framework' was introduced to facilitate the development and implementation of EDTs in the public sector, even though it has not yet been endorsed by the South African parliament (Department of Public Service and Administration [DPSA] 2024). On the other hand, the 'National Data and Cloud

Policy Framework' was instituted to tackle the burgeoning necessity to reshape digital government models and administer vast data through cutting-edge and emerging technologies, such as cloud computing (DCDT 2024a). Furthermore, the South African government has also published the 'South African National Artificial Intelligence Policy Framework', with the view to enhance the assimilation of AI-based technologies (e.g. machine learning algorithms, natural language processing, virtual assistants, etc.) into the internal processes of different departments while improving the health of the citizens and other stakeholders in the digital epoch (DCDT 2023). To this end, however, apart from the 'National Data and Cloud Policy Framework' approved by the Minister of DCDT, all other policies underscored above are still being drafted. Furthermore, notwithstanding the enactment of legislative frameworks such as the *Protection of Personal Information Act (PoPIA) of 2013* and the Electronic Communications and Transactions Act (ECTA) of 2002, among others, they are said to be incompatible with the EDTs (Mtuze & Morige 2024).

Ethical theories underpinning this study

It is crucial to indicate that issues about the moral consequences of EDTs are not novel; instead, they have proliferated as those technologies are continuously becoming pervasive in the digital realm. To this end, scholarly discourse has reflected on the three ethical frameworks, namely: utilitarianism, deontology and virtue ethics, also referred to as 'the big three', to validate the adoption and implementation of technologies through ethics in diverse sectors (Drašček, Rejc Buhovac & Mesner Andolšek 2021; Farayola & Olorunfemi 2024). That being the case, normative ethical theories have been prevalent in making sound ethical decision-making for appraising technological choices envisaged by the organisation (Bednar & Spiekermann 2024). Apart from that, these frameworks have been pivotal in providing the rules of how individuals should conduct themselves. The frameworks are critical in policy formulation and decision-making processes in different areas where technology adoption is prevalent (Bajpai & Singh 2024). Primarily, as these normative theories present a unique viewpoint and the requirements for appraising moral obligations and ascertaining actions of individuals, they are relevant and feasible in shaping the ethics of EDTs in this study.

Jeremy Bentham's utilitarianism, as a form of consequentialist ethical theories within moral philosophy, is an outcome-based approach that centres on the outcomes or implications of the conduct to ascertain the moral value of individuals (Akhundov 2025). Even though several utilitarian ethical guidelines have been explored in the corpus of academic discourse, the focal points of these guidelines are based on Bentham's framework: amplifying utility, broadening the general good and prioritising public pleasure (Bednar & Spiekermann 2024). Specifically, the classic utilitarianism by Bentham considers utility with reference to excitement or pleasure. One of the advantages of the utilitarian stance is that it provides a tangible approach to determining the morally correct course of action (Tsou & Walsh 2023). Utilitarianism is segregated into two features that emphasise the implications of actions and rules: Act and Rule Utilitarianism. While Act Utilitarianism entails that 'actions that maximise utility are morally good', Rule Utilitarianism, on the other hand, corroborates 'the rules that maximise utility are morally good' (Tsou & Walsh 2023:2). In this study, the utilitarian stance is based on the feasibility of generating rewards on a large scale through the application of EDTs in the public sector. This implies improving the overall well-being of humans, despite potential adverse effects for certain groups of individuals.

Immanuel Kant's worldview, deontology ethics, is a duty-based ethical theory that emphasises moral obligations and principles governing individuals' conduct as opposed to the implications of actions when ascertaining right or wrongdoings (Bednar & Spiekermann 2024). The individuals' actions are weighed on the basis of their compliance with moral obligations and principles, notwithstanding the consequences brought about by those actions. Broadly, Kant's deontological philosophical reasoning believes that particular actions are inherently and ethically binding, tolerable or intolerable, irrespective of the resulting repercussions that may arise from the outcomes of those actions (Drašček et al. 2021; Farayola & Olorunfemi 2024). That said, the driving factors of the deontological viewpoint that are eminent for providing regulation on ethical procedure, autonomous of the implications thereof, are duties, moralities, customs, respect for individuals and doctrines of justice. In the context of this study, however, a deontological stance is imperative in ensuring that adherence to ethical duties and standards is observed while aligning EDTs with the moral obligations in their development and use, such as upholding data privacy, security and fairness.

As one of the classic and widely applied theories in technological environment, Aristotle's virtue ethics is a character-based ethical theory that is fundamental in nurturing decent character attributes in individuals, such as trustworthiness, courage and compassion (Akhundov 2025). While virtues are deeply embedded in the traits and conduct of individuals, they can contribute to moral success within the entire society. Furthermore, although individuals have multifaceted intellectual capacities, they require strong personal qualities to behave well, such as empathy, joy, ambition, truthfulness, kindness and love, *inter alia* (Tsou & Walsh 2023). It is argued that considering virtue ethical concerns in the developmental stage of EDTs can profoundly expedite individuals to take advantage of those EDTs for their personal growth while maintaining the consequences thereof (Bednar & Spiekermann 2024). This assertion is consistent with the views of Akhundov (2025), who corroborates that as Aristotle's virtue ethics has been critical in reinforcing innovativeness and advancement in the technological milieu, it has robustly contributed to assimilating ethical concerns resulting from the uptake of EDTs.

The feasibility of considering these renowned normative theories in this study lies in the urgent necessity to ethically align EDTs with the processes of the South African public sector, which is vital to circumvent unethical conduct while utilising those technologies. Aside from that, with novel technologies influencing individuals' moralities and the rising ethical conundrums permeating the public sector, the integration of the big three into the systems and workflows of the South African public sector arguably becomes non-trivial for enhancing their responsible use. This can accelerate an online and efficient public services to citizens, particularly for those situated in urban and suburban areas across the country.

Emerging digital technologies in the public sector

Emerging digital technologies encompass the ubiquitous technologies (e.g. AI, big data and cloud computing) that are essential in the public sector nowadays, and their actual usage profoundly affects the socio-economic facets of users (Valle-Cruz & García-Contreras 2025). These technologies are broadly novel, and some are yet to be realised, but they may also be considered mature technologies demanding new applications (Udo et al. 2024). In South Africa, the public sector includes the three spheres of government (i.e. national departments, provincial departments and local governments) and public entities. Succinctly, the public sector strives to provide excellent services (e.g. health, education, water, municipal services, welfare, agriculture, transport, safety, human settlements, sports and roads) while ensuring greater accountability, transparency and responsibility from general public servants and executives.

Emerging digital technologies by the public sector have gained popularity in research and practice (Mergel et al. 2023; Mkhatshwa & Mawela 2023). With most public sectors across the globe adopting EDTs to serve their people, service delivery has significantly improved. For instance, public health professionals can identify health-related hazards (e.g. obesity leading to high blood pressure) and expedite patient file processing using AI-enabled systems (Alhosani & Alhashmi 2024). Most imperatively, AI has substantially enhanced healthcare services. Although most EDTs (e.g. AI) in the public sector are at the embryonic stage and opaque, particularly in emerging economies like South Africa (Baloyi 2025; Worku 2024), the advanced economy countries have reaped the potential benefits resulting from their application, such as cost savings, efficiency and transparency (Saheb & Saheb 2024; United Nations 2024).

Ethics play an integral role in contemporary business and have always been at the hub of humanity as a substantial facet of good governance. Several studies have focused on investigating the ethics guiding the implementation of EDTs in the public sector. Table 1 provides an overview of those studies.

TABLE 1: Ethical frameworks for emerging digital technologies.

Author	Objective	EDT	Ethical concerns
Valle-Cruz and García-Contreras (2025).	The study probes the integration of AI-enabled changes and intelligent data management into the value chain activities of the public administration.	AI	Data privacy, transparency, accountability, security and regulatory impact.
Ukeje, Gutierrez and Petrova (2024)	The study examines the obstacles associated with data security and privacy regarding the public sector's cloud computing adoption.	Cloud computing	Data security, privacy and transparency.
James (2024)	The study delves into the ethical and legal concerns of big data and AI in the United States public sector.	Big data	Privacy concerns, consent issues, transparency, bias, fairness and discrimination.
Abdullah Sani and Jaafar (2025)	The study investigates the enablers and constraints of the IoT in the public sector by delineating contemporary trends and patterns.	The IoT	Data security, privacy, data integrity, public trust and transparency.
Bawole and Langnel (2023)	The study explores the Ghanaian public sector reforms that strengthened business continuity in the digital realm during the pandemic era.	Virtual platforms	Data security, human threats and cybersecurity concerns.

Note: See full reference list of Baloyi, W.M., Meyer, N. & Rossouw, D., 2026, 'A conceptual framework for ethical emerging digital technologies: A South African public sector perspective', *Acta Commercii* 26(1), a1503. https://doi.org/10.4102/ac.v26i1.1503

EDT, emerging digital technology; AI, artificial intelligence; IoT, Internet of Things.

Cases of cyberattack incidents in the South African public sector

More than ever before, cyberattack activities and exploitations are becoming increasingly prevalent worldwide (Dagada 2024), not only by compromising confidential personal information but also by eroding public trust in the delivery of digital services (Baloyi 2025). While the recognition of diverse EDTs (including AI-related technologies) is proliferating at a rapid pace, cyberattacks are also increasingly penetrating the public administration in emerging economies because of the lack of robust systems (cybersecurity) that address ethical issues (Ukeje et al. 2024; United Nations 2024). Most African countries are beleaguered by persistent cybercrime events, disrupting the efficient use of EDTs (Henrico & Els 2025). That being the case, however, several cases of cyberattacks have occurred in the South African public sector, compromising service delivery at different public organisations and left those institutions in dire situation. The following serves as an example:

A study by Pillay (2024) and Cassim and Chapanduka (2024) focused on exploring ransomware (known as BlackSuit) cyberattacks targeting the National Health Laboratory Service (NHLS), a public entity within the Department of Health, in June 2024. Notably, the incident has harshly interrupted the core business function within the public entity, resulting in inaccessible patient electronic samples and, consequently, the manual processing of information. To this end, doctors were unable to access

patients' data (such as laboratory results) because of encrypted files. The public entity did not even have a contingency (backup) plan to cater for this type of cyberattack. Regrettably, this has left service delivery in a devastating and vulnerable situation across the country. As the disruptions to core mandates (i.e. staggered services) within the NHLS have been imminent, the institution has incurred a significant financial loss.

On the other hand, Henrico and Els (2025) conducted research on the legal repercussions of cyberattacks happening in the South African context. Their study critically evaluated the legal obstacles and geopolitical issues associated with cyberattacks related to digital technologies while reflecting on the most recent cyberattacks that have occurred in the South African public sector. For example, they stated that prominent cyber events targeting the public sector and entities including 'City of Johannesburg, Transnet and the Department of Justice and Constitutional Development [DoJCD]' have been subjected to constant ransomware attacks, thus becoming a playground for cybercriminals and technocrats in the digital environment. The authors suggested a resilient system of cybersecurity and binding regulatory frameworks to not only enhance the sustainability of digital technologies but also alleviate the perils associated with recurring cyber terrorists emanating from both local and global domains. Although the State Security Agency of South Africa initiated the development and implementation of the National Cybersecurity Policy Framework in 2015, with the intention of holistically advancing cybersecurity procedures, there are still flaws in the effective application of the policy (Henrico & Els 2025).

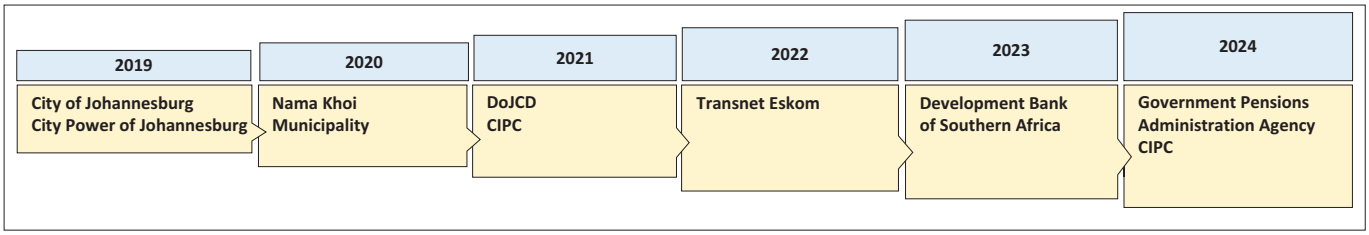
In addition to cyberattack incidents, Siphambili et al. (2024) conducted a systematic review of the South African public sector's capacity to tackle ransomware cyberattacks. Their study comprehensively assessed the country's readiness for cyberattacks and proposed remedial actions to address the persistent challenge. The study found that, despite measures taken to address persistent cyber threats, the South African public sector and entities have remained vulnerable to multiple ransomware attacks, thereby derailing the delivery of effective public services to citizens. Altogether, their study has identified approximately ten incidents of cyberattacks that have occurred in the South African public sector since 2019, as illustrated sequentially in Figure 1.

Research methods and design

Underpinned by an interpretivist philosophy, this study applies a qualitative approach using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) strategy (Page et al. 2021) to probe ethics for EDTs in the public sector. Although the PRISMA strategy has been popularly employed in health research (Page et al. 2021), it has also been extensively used in social sciences research, especially in the technology context (Ashok et al. 2022; Madan & Ashok 2023; Ukeje et al. 2024). The purpose of the PRISMA was to perform a thematic analysis of the existing theory to achieve saturation on the ethical EDTs in the public sector. Briefly, the scholarly debates on EDTs (i.e. peer-reviewed journal articles, conference papers and book chapters) and the grey literature, which implies synthesising government publications, were also considered in this study. To this effect, as a most reliable research technique and constructive process, the PRISMA method enables researchers to derive the fundamental meanings and themes from the studies consulted. The advantages of using systematic analysis as identified from the literature include: (1) it enables researchers to save time and costs associated with conducting the field research, (2) it provides constancy of the data gathered, (3) it ensures credibility and reliability of data and (4) as the method is unobtrusive, it circumvents interviewer prejudice as the data are readily available in the public realm (Morgan 2022).

Identification

While the PRISMA strategy was deemed pertinent to this study, the primary search of the studies commenced with a wide-ranging detection of the topical matter (i.e. ethics and EDTs in the public sector) aligned to the study purpose. This study considered peer-reviewed journal articles, conference papers, book chapters and government reports. The literature was extracted from the Web of Science (WoS) and ScienceDirect databases. The keywords 'ethics', 'emerging digital technologies', 'emerging technologies', 'ethical framework', 'public service', 'service delivery', 'public sector' and 'public administration' were searched on these reliable databases. The rationale for considering these renowned databases is their extensive coverage of information systems (IS) research. Only the studies (peer-reviewed journal articles, conference papers, book chapters



Source: Siphambili, N., Mahlasela, O., Baloyi, E. & Mukondeleli, E., 2024, 'A review of the South African public sector's capability in combating ransomware', in *2024 4th International Multidisciplinary Information Technology and Engineering Conference (IMITEC)*, pp. 493–499, IEEE

CIPC, Companies and Intellectual Property Commission; DoJCD, Department of Justice and Constitutional Development.

FIGURE 1: Timeline of ransom attacks on public sector organisations.

and grey literature) published within 4 years (ranging from 2022 to 2025) were considered in the study.

Screening

After a comprehensive search on the WoS and ScienceDirect databases, the studies were rigorously reviewed by reading the abstract to determine their relevance and contribution to this study. Moreover, a thorough and systematic analysis was conducted to detect relevant themes and patterns. Although themes were extracted and inferred based on scholarly debates and recurrent terminologies from the literature, the authors ensured alignment with the primary aim of this study. It is argued that while the researcher scrutinises the extracted literature of information (e.g. journal articles), they can authenticate the results by exploring meticulously and, as such, mitigating the repercussions of potential prejudice that can arise in that study (Morgan 2022). To enhance the reliability of the data collected in the screening process, two independent assessors were assigned to appraise the studies as a strategy to diminish bias in the selection process. Furthermore, studies were analysed to detect relationships and discrepancies that may exist between the recognised themes and findings that were produced in this study.

Ethical considerations

The Department of Business Management Research Ethics Committee at the University of Johannesburg has granted ethical clearance on 01 November 2024 for a period of 3 years. The ethics waiver number is 24SOM/BM82, and the procedures in this study were aligned with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

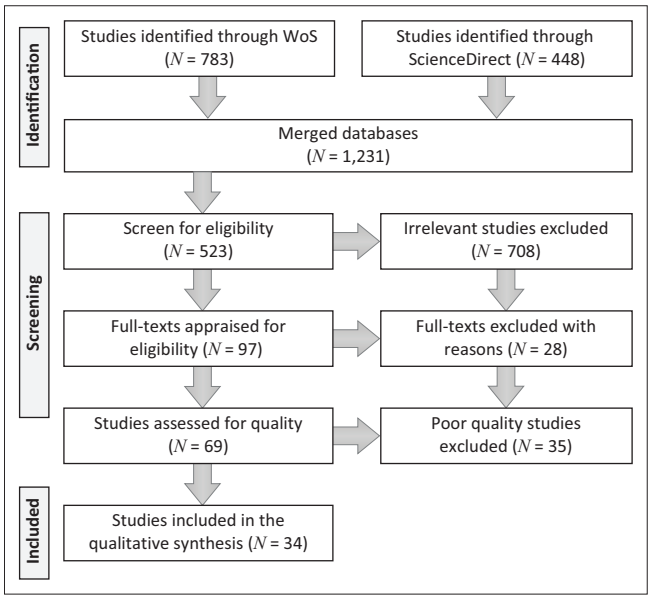
Results

The comprehensive search process yielded a total of 1231 studies. The outcome from the PRISMA reflects WoS (N = 783) and ScienceDirect (N = 448) as depicted in Figure 2. Of the 1231 studies detected, the authors noted that the eligibility criteria were necessary. They processed the existing data by eliminating non-abstract, non-English, identical and unsuitable studies, therefore leading to 34 studies being eligible for the systematic analysis (see the stages below), excluding grey literature. Most importantly, only studies on EDTs (i.e. AI, the IoT, big data, cloud computing and virtual platforms) that are dedicated to the public sector context were included in the analysis to ensure data accuracy. To this end, although, most of the studies contemplated were peer-reviewed journal articles.

Data synthesis and quality assessment

After the study selection process, the authors evaluated the selected literature by reading the titles and abstracts to determine their quality. The process has helped the authors to consider studies that could make a meaningful contribution to the study. Additionally, the activity further enabled authors to evaluate the pertinence and quality of the selected studies. As pinpointed earlier, duplicates and non-English literature were excluded from the systematic analysis. Each abstract was scrutinised by two authors, apart from independent reviewers. Slight disagreements of thoughts were deliberated and resolved, finally reaching a concurrence. This resulted in 34 studies excluding grey literature being considered for systematic analysis, as depicted in Figure 2. The EndNote Reference Manager was used to effectively administer the replicated citations and produce a more comprehensive file. At the end, the split of the retrieved studies analysed through citation category indicates 31 (78%) are peer-reviewed journal articles, whereas two (5%), one (3%) and 6 (15%) were book chapters, conference paper and grey literature, respectively. All in all, the total studies, including grey literature in the systematic analysis, were 40. The eligibility requirements, as described in Table 2, were verified during the review process. Considering the eligibility criteria, the steps followed in the systematic analysis are delineated as follows:

- **Step 1**: Studies identified through the WoS and ScienceDirect databases were 1231, ranging from 2022 to 2025 academic years.
- **Step 2**: After the deletion of non-English, non-abstract and identical studies, 523 studies remained, leading to the deletion of 708 studies.
- **Step 3**: While the screening process has unfolded, 426 full-text studies were excluded based on irrelevance.
- **Step 4**: After that, 97 studies were vitally appraised for eligibility requirements to strengthen rigour in the study.
- **Step 5**: Out of 97 studies, 29 were excluded based on the eligibility requirements of the topic.



Source: Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D. et al., 2021, 'The PRISMA 2020 statement: An updated guideline for reporting systematic reviews', *Research Methods and Reporting* 10(89), 1–11. https://doi.org/10.1136/bmj.n71

WoS, Web of Science.

FIGURE 2: Preferred reporting items for systematic reviews and meta-analysis flow diagram.

TABLE 2: Eligibility criteria.

Item	Description
Sector	Only studies that focus on the public sector were included in the review.
Sources	This systematic analysis included peer-reviewed journal articles, conference papers, book chapters and grey literature (e.g. government publications).
Key concepts	The search for key concepts was limited to 'ethics', 'emerging digital technologies', 'emerging technologies', 'ethical framework', 'public service', 'service delivery', 'public sector' and 'public administration'.
Time frame	The systematic analysis considered studies available between 2022 and 2025 to ensure the recency of the academic discourses.
Research methodology	Qualitative and quantitative research were included in the systematic analysis.
Language	Only studies written in English were eligible for inclusion. Studies written in other languages were omitted based on the complexity of accessing translators.

- **Step 6**: Out of 69 studies, 35 were eliminated based on not meeting the assessment for quality.
- **Step 7**: Thereafter, 34 studies, consisting of peer-reviewed journal articles, book chapters and conference papers (excluding grey literature), were deemed eligible for inclusion in the systematic literature review.

A synopsis of studies included

A concise Table 3 highlights information of the studies included in the PRISMA technique. Succinctly, it provides information about authors, title, year of publication, primary objective and research methodology.

TABLE 3: A synopsis of the features of 34 studies.

Number	Author(s)	Title	Year	Primary objective	Research
1.	Baloyi	'A Systematic analysis of ethical and governance concerns relating to artificial intelligence adoption in the South African public sector'	2025	To propose an integrated conceptual framework for ethical and governance concerns of AI in the South African public sector.	Systematic literature review.
2.	Ukeje et al.	'Information security and privacy challenges of cloud computing for government adoption: A systematic review'.	2024	To probe the dimensions affecting cloud computing service in the public sector.	Quantitative.
3.	Mtuze and Morige	'Towards drafting artificial intelligence (AI) legislation in South Africa'.	2024	To identify the legislative and regulatory framework governing AI in South Africa.	Systematic literature review.
4.	Abdullah Sani and Jaafar	'A bibliometric and content analysis of Internet of Things (IoT) in the public sector'.	2025	To provide an explicit roadmap for comprehending the challenges and prospects of IoT in the public sector.	Bibliometric and content analysis.
5.	Dhirani et al.	'Ethical dilemmas and privacy issues in emerging technologies: A review'	2023	To investigate ethical concerns relating to emerging technologies.	Systematic literature review.
6.	Koohang et al.	'Internet of Things (IoT): From awareness to continued use'.	2022	To suggest a research framework for the IoT.	Quantitative.
7.	Marienfeldt	'Does digital government hollow out the essence of street-level bureaucracy? A systematic literature review of how digital tools foster curtailment, enablement and continuation of street-level decision-making'.	2024	To evaluate empirical research on the effect of 'digital tools on street-level work'.	Systematic literature review.
8.	Akhundov	'The role of ethics in modern technology development'.	2025	To 'critically examines how ethical principles shape modern technology, focusing on areas such as artificial intelligence, biotechnology, surveillance, and digital platforms'.	Case studies.
9.	Dagada	'The advancement of 4IR technologies and increasing cyberattacks in South Africa'.	2024	'To assess the impact of these 4IR technologies on cyberattacks in South Africa'.	Qualitative.
10.	Komna and Mpungose	'Investigating the impact of digital transformation in the public sector: A case study of the State Information Technology Agency (SITA), South Africa'.	2024	To appraise the effect of digital transformation on public services, focusing on SITA.	Qualitative.
11.	Mahalingam	'The power behind cloud adoption in healthcare digital government'.	2024	'To provide an in-depth analysis of the key drivers, challenges and opportunities associated with cloud adoption in Malaysia's digital government landscape'.	Systematic literature review.
12.	Worku	'The benefits of artificial intelligence for enhancing the quality and efficiency of service delivery in South Africa'.	2024	To identify the rewards of AI in enhancing public services in South Africa.	Systematic literature review.
13.	Alhosani and Alhashmi	'Opportunities, challenges and benefits of AI innovation in government services: A review'.	2024	To detect the rewards of adopting AI innovations in the public sector.	Qualitative.
14.	Diallo et al.	'Case studies of AI policy development in Africa'.	2025	To undertake case studies related to AI policy-making in the African continent.	Qualitative.
15.	Mkhatshwa and Mawela	'Cloud computing adoption in the South African public sector'.	2023	'To investigate the factors influencing cloud computing adoption within the South African public sector'.	Mixed-methods.
16.	Alkhasawneh et al.	'Cloud computing adoption in government organisations in developing countries: A systematic literature review and future research directions'.	2025	'To examine the adoption of cloud computing in e-government services'.	Systematic literature review.
17.	Ionescu	'Adopting cloud computing and big data analytics to enhance public sector transparency and accountability through artificial intelligence'.	2025	'To explore the synergy of these technologies in reshaping public administration'.	Systematic literature review.
18.	Ashok et al.	'Ethical framework for artificial intelligence and digital technologies'.	2022	To examine the ethical use of AI in digital transformations beyond high-level AI principles.	Systematic literature review.
19.	Valle-Cruz and García-Contreras	'Towards AI-driven transformation and smart data management: Emerging technological change in the public sector value chain'.	2025	'To explore AI-driven transformation and smart data management in the public sector value chain'.	Systematic literature review.
20.	Bajpai and Singh	'Ethics in a modern technological world'	2024	To investigate the ethical conundrums (privacy issues) pertaining to the EDTs.	Qualitative.
21.	Udo et al.	'Conceptualising emerging technologies and Information and Communication Technology (ICT) adoption: Trends and challenges in Africa-US contexts'.	2024	'To explore the adoption trends, challenges and opportunities surrounding ICT and emerging technologies in the Africa-US contexts.	Systematic literature review.

Table 3 continues on the next page →

TABLE 3: A synopsis of the features of 34 studies.

Number	Author(s)	Title	Year	Primary objective	Research
22.	Bawole and Langnel	'Administrative reforms in the Ghanaian public services for government business continuity during the COVID-19 crisis'.	2023	'To examine public sector reforms implemented in the Ghanaian public sector to ensure public service continuity during the COVID-19 pandemic'.	Qualitative.
23.	Saheb and Saheb	'Mapping ethical artificial intelligence policy landscape: A mixed method analysis'.	2024	'To methodically identify common themes throughout these policy documents and perform a comparative analysis of the ways in which various governments give priority to crucial matters'.	Qualitative.
24.	Bednar and Spiekermann	'Eliciting values for technology design with moral philosophy: An empirical exploration of effects and shortcomings'.	2024	'To explore whether normative ethical theories can contribute an ethical foundation to the value elicitation phase in technology design'.	Systematic literature review.
25.	Prathomwong and Singsuriya	'Ethical framework of digital technology, artificial intelligence and health equity'	2022	'To synthesise an ethical framework for analysing issues related to the promotion of health equity through digital technology and AI'.	Systematic literature review.
26.	Brzozowska-Rup, Nowakowska and Zdradzisz	'Cloud computing in the Polish public administration: Current state and development prospects'.	2024	'To examine the scale and determinants of cloud computing adoption in Polish public administration'.	Panel data analysis.
27.	Olorunfemi et al.	'Towards a conceptual framework for ethical AI development in its systems'.	2024	'To present a comprehensive conceptual framework aimed at fostering ethical AI development within IT systems'.	Systematic literature review.
28.	Entsie, Hurson and Vaz	'Assessing the mediating role of top management support in the adoption of cloud computing in the public sector: The case of Ghana'.	2025	'To provide insights into potential factors that could influence cloud computing adoption decisions in the public sector within the Ghanaian context'.	Quantitative.
29.	Nkgapele	'The usability of e-government as a mechanism to enhance public service delivery in the South African government: Lessons from practices'.	2024	'To identify current barriers, successes and areas for amelioration in the execution of digital government in South Africa'.	Qualitative.
30.	Frey and Bloch	'Using Microsoft Teams to facilitate asynchronous online focus groups'.	2023	'To reflect on the use of Microsoft Teams to facilitate multiple asynchronous online focus groups'.	Qualitative.
31.	Milukutu and Siachisa	'Assessing the impact of digital transformation on employee performance in the public sector: A Case Study of Zambia's Ministry of Health Headquarters (2017–2022)'.	2023	'To assess the impact of DT on employee performance in Zambia's Ministry of Health Headquarters'.	Mixed-methods.
32.	Igwama et al.	'Big data analytics for epidemic forecasting: Policy frameworks and technical approaches'.	2024	'To explore the intersection of big data analytics and epidemic forecasting, highlighting both technical approaches and policy frameworks'.	Systematic literature review.
33.	James	'The ethical and legal implications of using big data and artificial intelligence for public relations campaigns in the United States'.	2024	To delve into the ethical and legal implications of using big data and artificial intelligence for public relations campaigns in the United States.	A desktop methodology.
34.	Mergel et al.	'Implementing AI in the public sector'.	2023	To explore the implementation of AI in the public sector.	Systematic literature review.

Note: See full reference list of Baloyi, W.M., Meyer, N. & Rossouw, D., 2026, 'A conceptual framework for ethical emerging digital technologies: A South African public sector perspective', *Acta Commercii* 26(1), a1503. https://doi.org/10.4102/ac.v26i1.1503

Discussions

This section discusses the research findings emanating from identified themes in the literature.

Benefits of assimilating ethics into emerging digital technologies

This section describes the advantages of integrating ethics into EDTs based on the themes derived from the systematic literature review: reduced cyberattacks, diminished bureaucracy, enhanced performance and increased productivity.

Reduced cyberattacks

While the globe has experienced the burgeoning application of EDTs in providing services, cyberattacks have also increased in emerging economies (Masilela & Nel-Sanders 2023). For example, South Africa has also encountered alarming cyberattacks that have disrupted services, particularly in the public sector (Dagada 2024). To this effect, many cyberattack incidents in the South African public sector and public entities have been reported to the Information Regulator. These alarming activities stem from the policy gap on EDTs that necessitate the development of stringent legal and regulatory frameworks guiding the country's 4IR technologies, as they adversely impact the country's economic growth (DCDT 2024a). Although legal and regulatory frameworks are designed (e.g. *PoPIA* and ECTA), they are not meant for EDTs; hence, some departments and public entities fail to implement those technologies fully (Mtuze & Morige 2024). Despite that, South Africa is at the forefront of enacting and implementing relevant prescripts to prevent cyberattacks from occurring compared to other African countries (Masilela & Nel-Sanders 2023). One of the benefits of incorporating ethics into EDTs is the enhancement of internal processes and public sector administration by strengthening ethics policy frameworks and complying with all applicable ethics laws, which can lead to a reduction in cyberattacks (Nkgapele 2024). Additionally, investment in sound regulatory impact regarding cybersecurity, through collaboration with the private sector and other international stakeholders, can enable the South African public sector to mitigate cyberattack risks (DPSA 2024).

Diminished by bureaucracy

Bureaucracy is characterised by engagement in politics and is closely associated with hierarchical organisational structures. Whereas bureaucracy plays an adverse role in the uptake of EDTs and innovative practices, it has been viewed as a stumbling block to the public sector's effective adoption and

implementation of digital technological initiatives (Marienfeldt 2024; Mergel et al. 2023). Scholars confirm that EDTs have thrived in the traditional bureaucratic paradigm and, to a great extent, digital technologies have improved decision-making processes and, thus, curtailed face-to-face contact (United Nations 2024). For instance, the use of virtual platforms (e.g. Microsoft Teams) by the South African public sector has profoundly improved the channel of communication and the implementation of organisational strategies, thereby enhancing the flexibility of information sharing and accelerating the internal processes that surpass the conventional *modus operandi* (i.e. bureaucracy). In this sense, these platforms have expedited interactions among public services while convening online meetings and workshops. Most imperatively, while the traditional paradigm has been linked to corrupt and fraudulent activities by public servants, the digital government has been said to mitigate those contradictory activities, leading to increased efficiency and productivity (Marienfeldt 2024; Nkgapele 2024). From this vantage point, this study argues that while digital government has exceptionally improved public administration and ensured transparency and accountability by public officials, bureaucracy has been considerably streamlined.

Increased efficiency

Literature suggests that EDTs in an ethically driven environment have increased operational efficiency and value creation to citizens (Alhosani & Alhashmi 2024; Madan & Ashok 2023). When social trust is enhanced and warranted through data privacy and security, citizens can feel safe to utilise digital technologies to access essential services and *vice versa*. For example, because of the social trust developed between the South African government and its people, nowadays, there is a proliferating number of citizens who utilise the SARS e-filing platforms to submit their tax returns (Adegbayibi & Ajape 2025). Consequently, this has drastically reduced long queues, thus leading to increased efficiency and seamless public services (Jakoet-Salie 2020). More notably, for people earning less than R500 thousand per annum, SARS has introduced an initiative that automatically files their tax returns. That being said, citizens have surmounted the geographic distance and unnecessary travel to government buildings to access public services, which has significantly minimised the costs associated with transportation. Generally speaking, several scholars opine that aside from other benefits brought about by the EDTs, increased operational efficiency has been evident in ensuring cost-effective and streamlined public services to the citizens (Abdullah Sani & Jaafar 2025; Ionescu 2025; Valle-Cruz & García-Contreras 2025). Additionally, while EDTs augment administrative efficiency in rendering public services, they also diminish possible human errors that can be encountered and, as such, increase accountability (Komna & Mpungose 2024).

Enhanced productivity

Accordingly, ethical EDTs have enabled the public sector to reap economic rewards apart from increased productivity (Alhosani & Alhashmi 2024). This is supported by Mkhatshwa and Mawela (2023), who cite that the uptake of EDTs (e.g. cloud computing) by the public sectors has radically improved the productivity of public employees, enhanced the decision-making procedure and fast-tracked the digital government substantially. Moreover, a corpus of literature corroborates that ethical EDTs (e.g. AI) have imperatively alleviated the workloads of public servants, thereby increasing their employee morale and productivity (Bajpai & Singh 2024; Madan & Ashok 2023; Saheb & Saheb 2024). It is argued that despite challenges encountered in the public sectors (including the lack of digital infrastructure and digital expertise) to operate in the digital domain, specifically in emerging economies, digital technologies have boosted the degree of public servants' engagement and, by so doing, intensified their performance and productivity (Milukutu & Siachisa 2023). Furthermore, this argument is consistent with the views of Bawole and Langnel (2023), who articulate that emerging economies like Ghana have been plagued with continuous hindrances (such as costly data, unreliable Internet connectivity and inadequate digital competencies), which derailed the implementation of public sector reforms through digitalised public services. Bawole and Langnel (2023) assert that these hindrances have negatively affected public servants' productivity and the provision of services to the citizens.

Ethical concerns pertaining to various emerging digital technologies

This section presents ethical concerns and issues related to different EDTs in this study in response to the second research objective.

Ethical dilemmas in artificial intelligence

Research on the connection between ethics and AI has gained popularity in the literature (Bajpai & Singh 2024; Valle-Cruz & García-Contreras 2025), making AI well known in the public sector. Recently, ethical frameworks for AI in the public sector have been developed to respond to ethical conundrums faced by the public (Akhundov 2025; Ashok et al. 2022). The reason is that emerging AI-based technologies raise ethical dilemmas, such as data privacy and user security. More to this, it is critical to indicate that AI depends not only on algorithms requiring data but also on diverse digital technologies (e.g. face recognition, virtual assistants, robotics and machine learning) that dominate service delivery (Dhirani et al. 2023). To this end, these digital technologies necessitate binding legislative and regulatory frameworks governing ethics for smooth navigation, a foremost hurdle in most emerging economies, especially in Africa. As AI adoption in the public sector in South Africa is at a nascent stage and opaque, policies governing AI initiatives (including ethics) are still lacking. To this end, there is an urgent call for prioritising a clear-cut policy framework to guide AI in the public sector. Even though AI improves human capabilities on one hand, it is said to raise ethical quandaries (accountability, bias, fairness and transparency) on the other (Alhosani & Alhashmi 2024; Worku 2024).

Ethical concerns on the Internet of Things

In this era, the IoT has been at the forefront of EDTs. The IoT is a system of tangible tools or sensors that can transmit data from one device to another without human interference (Koohang et al. 2022). Notwithstanding other IoT devices (e.g. wearable technologies, smart devices and connected cars, *inter alia*), the most prevalent IoT devices used in the public sector in South Africa are smartphones. These devices have been prevalent in offering public services to the citizens. However, like other EDTs, the IoT poses ethical challenges (e.g. privacy and security) to its users (United Nations 2024). It is argued that even though IoT can help resolve complex predicaments in individuals' lives and go beyond application in distinct phenomena, it can raise peculiar legal and ethical conundrums between the users and the IoT service providers (Koohang et al. 2022). For example, there is a growing ethical concern that individuals' data in South Africa are unlawfully shared with other organisations without their consent. To support this point, the societies in South Africa are frequently inundated with irritable phone calls from disparate organisations (e.g. insurance companies, retailers, etc.) seeking to recruit them. Seemingly, this shows that the PoPIA, as legislation governing personal data, is not in force.

Ethical issues in big data

Big data is significantly reforming the public sector (Igwama et al. 2024). Governments, including South Africa, are substantially using big data technology to administer enormous amounts of data in various public sector departments and entities. For example, while Statistics South Africa employs digital technologies (the IoT) to conduct a census (i.e. counting of the population) in the country nowadays, the paper-based processes have been completely eradicated. Yet, as with other EDTs (e.g. AI and the IoT), big data presents ethical and legal issues that require urgent attention, as security breaches are rampant (James 2024). Additionally, big data involves ethical matters such as privacy and consent in gathering and interpreting massive amounts of data. In South Africa, for example, even though regulatory and legal frameworks such as the *PoPIA of 2013*, Minimum Information Security Standards (MISS) of 1996, Minimum Interoperability Standards (MIOS) of 2018, *SITA Act of 1998*, ECTA of 2002 and other laws have been enacted to deal with citizens' personal data and privacy infringement, they are not compatible with EDTs.

Ethical concerns pertaining to virtual platforms

Virtual meetings have become the epicentre and a regular part of the daily running of the strategic intentions of the public sector (Bawole & Langnel 2023). Although there is a burgeoning academic discourse in research on virtual teams and the application of virtual platforms (such as Microsoft Teams, videoconferencing, Zoom and Google Meetings) in the workplace, it is contended that the internal processes, operations, decision-making and efficiency have considerably improved (Karl, Peluchette & Aghakhani 2022) while on the other hand raising ethical challenges. However, regardless of moral dilemmas that are faced, online meetings are said to diminish social interaction between the participants (Bawole & Langnel 2023). Most significantly, the implementation of work-from-home initiatives by diverse organisations has resulted in the growing use of virtual (online) meetings. Notwithstanding this, although ethics on virtual platforms has received minimal attention in the literature, virtual meetings are also linked to ethical challenges affecting their application, such as the privacy and security of participants' information (Frey & Bloch 2023).

Ethical concerns relating to cloud computing

Recently, cloud computing has gained momentum in the literature and practice in the public sector (Mahalingam 2024; Ukeje et al. 2024). As cloud computing is increasingly utilised to process vast amounts of data, it has been susceptible to ethical issues such as privacy and security. Further to that, even though the policy and regulatory frameworks (including ethics regulations) in the public sector are critical in managing and governing cloud computing technology, most studies revealed that these are still lacking (Brzozowska-Rup, Nowakowska & Zdradzisz 2024; Entsie, Hurson & Vaz 2025; Mkhatshwa & Mawela 2023). With that being the case, for example, the public sector in emerging economies like South Africa continues to struggle with integrating ethical principles (security and privacy) in EDTs such as cloud computing (Mkhatshwa & Mawela 2023), regardless of the attempts made to develop policy, such as 'National Data and Cloud Policy Framework' (DCDT 2024a). That being said, with governments constantly adopting cloud platforms worldwide (e.g. Microsoft OneDrive and Microsoft Azure) to store and administer massive data sets, they also inherit threats pertaining to ethical conundrums (Ionescu 2025).

The conceptual framework

Given the foregoing scholarly debates, there is a need to develop an ethical framework for navigating EDTs in the South African public sector. The following serves as the components of the framework.

Transparency

Transparency plays a crucial role in developing ethical EDT frameworks, and governments must explicitly and fairly disseminate information on how these EDTs are designed and applied. Transparency makes the ICT friendly and understandable, enabling users to comprehend its functioning (Baloyi & Beyers, 2019; Olorunfemi et al. 2024). While transparency is still a significant obstacle to the development of IT systems, particularly in emerging economies, it is applauded for its capability to increase trust and accountability among the users of digital technologies (Ionescu 2025; United Nations 2024). Besides that, it is argued that even the most advanced countries, such as the United States of America (USA) and the United Kingdom (UK), have enunciated transparency as an obstacle to the adoption of

EDTs (e.g. AI) (Mergel et al. 2023). To this end, although EDTs can considerably lessen data transparency, they form the foundation for citizens to comprehend and monitor how these technologies deliver services.

Accountability

With the growing application of ICT, accountability becomes a cornerstone for informed decision-making processes through which public sector officials are held liable for using those EDTs (Akhundov 2025; Baloyi & Beyers 2019). According to the United Nations (2024), accountability is at the heart of the public space, and the public sector's improvement of EDTs (e.g. AI) can leverage the security facets of ethics. To this effect, accountability techniques such as the Ethical Committees and other governing bodies can contribute to ensuring that EDTs comply with the legislative frameworks and ethical principles of the public sector. While accountability for EDTs remains the most significant ethical concern in enhancing the internal algorithms of the public sector, its significance in leveraging the application of those technologies cannot be ignored (Ionescu 2025). This is consistent with Saheb and Saheb (2024), who advocate that accountability issues pose obfuscations when inappropriate algorithms obstruct the efficient functioning of EDTs. Thus, introducing punitive measures against perpetrators can influence responsible conduct by public officials (Alhosani & Alhashmi 2024).

Fairness

Fairness is regarded as an essential facet of the ethics of EDTs, focusing on the importance of curbing prejudices and discrimination against their application (Dhirani et al. 2023). Succinctly, fairness involves impartial treatment of EDT users, even with their demographic variables (such as culture, traditions and sex), which can positively or adversely influence these technologies. It plays a central part in decision-making procedures and the development of ethical EDTs. Although inequalities and the digital divide may exist, the government must take practical and reasonable steps to diminish these contrary factors, thereby maximising access to EDTs for the citizens (Olorunfemi et al. 2024). By implication, ensuring fairness in using EDTs shall not be treated as a once-off activity but should involve a continuous nurturing and appraisal process by devising proactive strategies for dealing with such.

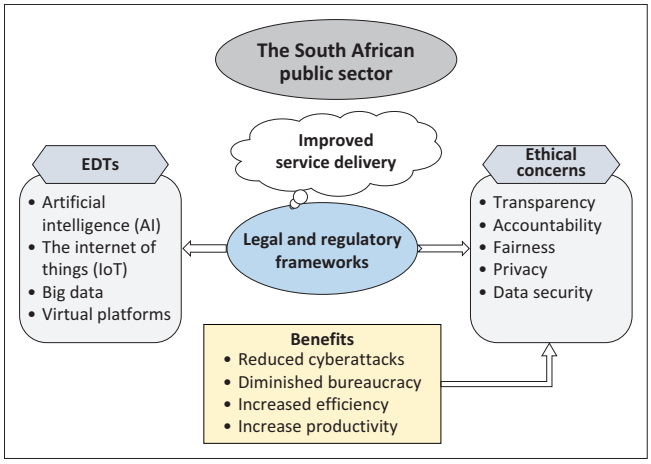
Privacy

Privacy issues occur when ICT systems and repositories gather, handle, manage and store the most critical data (e.g. personal, educational and employment) for individuals. As one of the most significant and persistent ethical concerns, privacy in EDTs (e.g. AI) presents drawbacks (such as the lack of trust) in relation to their usage by citizens, which then negatively impacts governments (Madan & Ashok 2023). Generally, scholars' development of ethical frameworks iterates the implication of safeguarding the users' rights to privacy while endorsing that EDTs shall abide by the pertinent legislative and regulatory frameworks governing the entire process (Alkhasawneh, Cob & Latif 2025; Obinna & Kess-Momoh 2024; Ukeje et al. 2024). With that being the case, as the application of EDTs proliferate in the everyday lives of citizens, governments must enhance data privacy to prevent any potential harm that may arise because of improper security (Prathomwong & Singsuriya 2022).

Data security

Data security refers to 'the protection of data from unauthorised access or modification or deletion or theft' (Duggineni 2023:29). Data security is an ethical concern driving the adoption of public sector's EDTs in terms of affirming confidentiality, honesty and integrity of collected data based on *standards* to circumvent any security breach (Alkhasawneh et al. 2025; Madan & Ashok 2023). Security standards entail the process of establishing and enforcing a security regulatory framework and practices that intend to guard against any organised or illegal acts associated with the EDTs to ensure the safety of data from any possible attacks (e.g. cyberattacks) (Olorunfemi et al. 2024). To this end, however, it is cardinal for governments to impose regulations guiding how data should be secured and managed digitally. Further to this, consistently reviewing security measures and strategies and conversing with security changes and enhancements globally is fundamental to avoiding any wicked acts affecting the EDT application (Akhundov 2025; Mkhatshwa & Mawela 2023). While governments exploit data security, it boosts citizens' trust and confidence in utilising digital technologies (Prathomwong & Singsuriya 2022).

The following conceptual framework for the South African public sector (Refer to Figure 3) is suggested based on the above findings.



EDTs, emerging digital technologies.

FIGURE 3: A conceptual framework integrating ethics into emerging digital technologies.

Managerial implications and recommendations

The primary objective of this study was to present a conceptual framework for ethical EDTs (mainly AI, the IoT, big data, cloud computing and virtual platforms) of the South African public sector. Given the absence of ethical frameworks for navigating EDTs in the South African public sector, this study proposes a conceptual framework to guide the public sector's policymakers, designers, practitioners, strategists and ICT developers in ensuring that ethical principles and standards are embedded into EDTs. The ethical principles include transparency, accountability, fairness, privacy and security. To this end, however, the implications of this study can enable the three spheres of government (national, provincial and local) in South Africa to devise strategies and propose policy development initiatives that are crucial for addressing ethical concerns regarding EDTs in rendering public administration and providing public services to the citizens and manifold stakeholders.

While the study has identified the benefits of incorporating ethics into EDTs, it also sheds further light on the ethical issues associated with disparate EDTs, which are prevalent in improving public services to citizens. More concretely, this study contributes to the body of knowledge in the IS and public administration research disciplines by critically delving into the ethical conundrums and dilemmas impacting EDTs in the public sector, culminating in the development of a conceptual framework. The conceptual framework offers a valuable understanding and new insights regarding ethical principles that can be of paramount significance to other scholars in academia, particularly in the South African context and other emerging economies facing similar challenges. It is proposed that the South African public sector adopt the conceptual framework in the process of assimilating EDTs into the value chain while also investing in skills development, digital infrastructure and reliable Internet connectivity, especially in rural areas where marginalised and designated groups are located.

Conclusion

Despite the ethical concerns raised above, EDTs play a prominent role in streamlining public services. Therefore, the critical evaluation of literature has led to the discovery of the benefits of incorporating ethics into EDTs, such as reduced cyberattacks, diminished bureaucracy, increased efficiency and enhanced productivity. These factors are the outcome of the study's findings and are pivotal in providing direction to the public sector regarding ethical EDTs. Although there are laws (e.g. PoPIA, MISS, MIOS, ECTA and SITA) governing ethics in the South African public sector, the precise regulatory frameworks that administer EDTs remain blurry. Using the PRISMA technique, this study presents a conceptual framework for ethical EDTs, offering guidelines to the South African public sector. The conceptual framework outlines the most significant ethical determinants (e.g. transparency, accountability, fairness, privacy and security) that underpin the development of a framework for the South African public sector.

The consideration of ethical principles in adopting EDTs has been crucial not only in enhancing their application but also in fostering citizens' trust and improving public services. Consequently, normative theories (utilitarianism, deontology and virtue ethics) have been prevalent in directing this study and are also significant in policy-making regarding the EDTs within the South African public sector. In essence, this will also help take into cognisance the accountability and transparency of their usage by holding responsible individuals accountable while simultaneously reducing bias and unethical activities that may occur in the future. Additionally, the South African public sector can benefit immensely by building citizens' trust, promoting stakeholder involvement and ensuring legal compliance, which in turn adheres to data privacy and security standards in the digital landscape.

Future research

As the study focused on systematic analysis using the PRISMA technique, future studies can conduct empirical research using both quantitative (e.g. survey questionnaires) and qualitative methods and materials (e.g. focus groups, in-depth interviews and case studies) to gather primary data directly from participants. This can enable the validation of the study's findings. More to this, while considering a larger sample for a quantitative approach can offer generalisability of research findings, in-depth interviews, on the other hand, can provide insight into the ethical application of EDTs in the public sector. Furthermore, the suggested conceptual framework developed in this study can be tested through the underlying approaches stressed above (quantitative and qualitative).

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

CRediT authorship contribution

Wiston M. Baloyi: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Visualisation, Writing – original draft, Writing – review& editing. Natanya Meyer: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Software, Visualisation, Writing – original draft, Writing – review and editing. Dirk Rossouw:

Conceptualisation, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Software, Visualisation, Writing – original draft, Writing – review & editing. All authors reviewed the article, contributed to the discussion of results, approved the final version for submission and publication and take responsibility for the integrity of its findings.

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The data that support the findings of this study are available within the article and its listed sources.

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