




# Digital orientation and service delivery in Africa: A post-COVID-19 epoch perspective



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**Background:** Globally, the proliferation and widespread use of information and communication technology (ICT) have reformed service delivery. Hitherto, the COVID-19 pandemic has disrupted the delivery of those services in the African continent. Although the public sector's application of emerging digital technologies (EDTs) has improved efficiency, transparency, citizen participation and service delivery, the African emerging economies still need to overcome impediments that obstruct their full potential.

**Aim:** This study investigates the effect of digital orientation on the service delivery of public sector organisations (PSOs) in Africa in the post-COVID-19 epoch.

**Setting:** This study focused on the African continent.

**Methods:** This study delves into a qualitative approach, utilising the systematic literature review and applied Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) to investigate the effect of digital orientation on the service delivery of PSOs in Africa in the post-COVID-19 epoch.

**Results:** The results reveal that the digital divide, inadequate digital infrastructure, lack of digital competencies and unreliable networks remain the most common contextual determinants experienced by African economies post-COVID-19.

**Conclusion:** The main obstacles to adopting and implementing digital technologies in Africa are bureaucracy and the lack of appropriate funding.

**Contribution:** This study may assist managers, decision-makers, policymakers and practitioners of PSOs reshape service delivery and develop sound legislative mandates regarding EDTs. Moreover, to contributing by providing an overview of the present theoretical and application insights of digital orientation, that is, the Internet of Things (IoT), artificial intelligence (AI), big data, virtual platforms and cloud computing by the African public sector.

**Keywords:** digital orientation; service delivery; post-COVID-19; public administration; Africa.

## Introduction

### Background

Globally, the rampant diffusion of information and communication technology (ICT) has reformed the provision of service delivery to the citizens (Baloyi & Beyers 2019). With the emergence of new and distinct digital technologies, the public sector administration has been revolutionised substantially. That said, the coronavirus disease 2019 (COVID-19) pandemic has accelerated the African public sector's adoption of emerging digital technologies (EDTs) (Onwuegbuna, Etim & Fatile 2022). As such, research in the Information Systems (IS) discipline has gained popularity in the literature and practice. As EDTs have been claimed as a potential panacea for economic growth, their uptake cannot be overstated (Udo et al. 2024). Additionally, research points to the advent of the EDTs as a mechanism that modifies the public sector administration by replacing the traditional (bureaucratic) paradigm of operations (Agostino, Arnaboldi & Lema 2021; Jejenywa, Mhlongo & Jejenywa 2024; Layton-Matthews & Landsberg 2022). The EDTs include the Internet of Things (IoT), artificial intelligence (AI), big data, cloud computing, social media and virtual platforms, among other things. As the globe becomes tremendously interwoven, EDTs' significance in shaping Africa's socio-economic disparities (e.g. poverty, inequality and high unemployment rate) cannot be overemphasised (Baku 2022). Further, it is argued that Africa's capacity to enhance innovative practices in public sector administration strategically depends not only on the capacity to adopt EDTs but also on the practical implementation.

With governments increasingly redesigning and rethinking the delivery of services, the application of EDTs has become habitual to serve the demands of its citizens better (Baku 2022; Baloyi & Beyers 2019; Olaitan, Issah & Wayi 2021; Sihotang et al. 2024). For instance, while public engagement and collaboration with myriad stakeholders at the time of the COVID-19 crisis were cardinal, most governments in advanced economies (e.g. the United Kingdom, the United States [US] and Australia) have swiftly transformed their business paradigms to cater for the EDTs (United Nations 2024). Having said that, the IoT (e.g. smartphones) was employed to track individuals' COVID-19 status online. However, the growing body of academic discourse corroborates that most governments in emerging African economies have struggled to provide essential services (Muridzi, Meyer & Masengu 2021; Rivalani, Mabasa & Nethavhani 2023; Shava & Vyas-Doorgapersad 2022). To this effect, the COVID-19 predicament has implicated health services (Minartz et al. 2024) and public education (Al-Sharafi et al. 2023; Chomunorwa, Mashonganyika & Marevesa 2023; Mmakola & Maphalala 2023; Uwizeyimana 2022).

Despite the notable barriers (e.g. digital infrastructural deficit), governments in the African continent are progressively using the e-government model as a vehicle that provides online services to their citizens (Baku 2022; Ehimuan et al. 2024; Jejenywa et al. 2024; Plantinga 2024). For example, countries such as South Africa and Mauritius have considered improving their digital government competencies, providing digital services and acquiring infrastructure (United Nations 2024). Research advocates that the growing application of ICT (e.g. e-government) has effectively improved people's social and well-being aspects in emerging economies (Baloyi & Beyers 2019; Mekawie & Yehia 2021). As such, the e-government model has been cherished for its capacity to increase efficiency, improve citizen engagement and enhance service delivery (Carter, Yoon & Liu 2022; Jejenywa et al. 2024; Muridzi et al. 2021). Considering the global United Nations E-Government Development Index (EGDI) 2024, South Africa, Mauritius, Morocco, Seychelles, Tunisia and Egypt have been at the forefront of the e-government projects and digital transformation in the African context, with ratings among the 100 top performers throughout the globe (United Nations 2024).

While IS research has regarded digital orientation (i.e. the capacity to uptake and implement digital technologies) as the most significant strategic orientation in the digital realm (Kindermann et al. 2024), it remains unclear whether African public sectors cope with the adoption of EDTs in the post-COVID-19 era. Up to date, however, few studies have analysed the condition of the public sector in the African continent on the application of EDTs in the post-COVID-19 epoch. Given these arguments, more research is required to determine how African countries cope with adopting and implementing EDTs to ensure the provision of quality service delivery in the post-COVID-19 era. The state of digital orientation in African economies and their capacity to apply digital advances (e.g. IoT, AI and big data) to boost citizen participation and enhance service delivery in the post-

COVID-19 epoch is unclear. Against this background, the study employs a systematic literature review (SLR) to address this gap. Most imperatively, this study contributes to the academic discourse by providing an overview of the present theoretical and application insights of digital orientation, that is, the IoT, AI, big data, virtual platforms and cloud computing, that can influence the service delivery in the African public sector context.

The primary objective of this study is to investigate the effect of digital orientation on the service delivery of public sector organisations (PSOs) in Africa in the post-COVID-19 epoch.

To attain the primary objective, this study addresses the following research questions:

**Research question 1:** *What is the status quo of the African public sector's digital orientation and service delivery in the post-COVID-19 epoch?*

**Research question 2:** *What are the categories of EDTs for adoption by the African public sector to enhance service delivery in the post-COVID-19 epoch?*

## Literature review

This section provides literature related to digital orientation and service delivery in the public sector. It commences with the discussion of the theoretical lens underpinning the study.

### The technology acceptance model

This study adopts the technology acceptance model (TAM) as an underlying theoretical stance to examine the link between digital orientation and African service delivery in a post-COVID-19 epoch perspective. Fred Davis initially designed the TAM primarily to navigate IS research (Davis, Bagozzi & Warshaw 1989). Scholars have extensively used TAM as a framework to predict the adoption of technology (Kraiwanit & Terdpaopong 2024; Mkhathshwa & Mawela 2023). While TAM determines whether individuals accept or reject digital transformation, it presents the theoretical perspective for understanding individuals' social actions and behavioural intentions whenever they are faced with the adoption of ICT initiatives (Davis, Granić & Marangunić 2024). Technology acceptance model is underpinned by two interwoven theoretical concepts: *perceived ease of use* and *perceived usefulness*. These theoretical concepts are vital to exploring public servants' preferences, intentions and attitudes towards adopting ICT systems (Davis et al. 2024), including the EDTs. Perceived ease of use, according to Davis et al. (1989:26), is defined as 'the degree to which an individual believes that using a particular system would be free of physical and mental effort', while perceived usefulness is 'the degree to which an individual believes that using a particular system would enhance his or her job performance' (Davis et al. 1989:26). It is argued that public servants' behavioural intentions to embrace digital technologies derive not only from the public sector's readiness but also from their

beliefs, preferences and attitudes towards accepting or rejecting the digital revolution.

### Digital orientation and service delivery

Generally, in this context, digital orientation is vital to enhancing service delivery to the citizens and myriad stakeholders. As a strategic orientation concept, digital orientation has been defined in the literature, and most studies have been conducted in the private sector context. The definition of digital orientation customised for the public sector remains to be seen in the literature. For instance, Kindermann et al. (2021:649) conducted a study to conceptualise and operationalise this strategic orientation concept as 'an organisation's guiding principle to pursue digital technology-enabled opportunities to achieve competitive advantage'. Alternatively, Liu et al. (2024) define digital orientation as the organisation's capacity to initiate digital technologies and to assimilate them into the internal business processes to achieve strategic objectives. Additionally, digital orientation is defined as 'the deliberate strategic positioning of an SME to take advantage of the opportunities presented by digital technologies' (Quinton et al. 2018:430). Although the definitions of digital orientation are not limited to those highlighted above, for simplicity and alignment with this study (i.e. the African public sector) and contribution to the literature, this study suggests the following definition: digital orientation can be defined as *the uptake and implementation of 4IR technologies by integrating resources (human, technical and financial) into processes and systems to enhance service delivery to the citizens and diverse stakeholders*. Given this definition, this study argues that despite the appropriate orientation, digital technologies can enable the African public sector to embrace digital practices and exploit novel 4IR technologies, advancing service delivery.

According to Kindermann et al. (2024), digital orientation is segregated into four main factors: digital orientation scope, digital capabilities, digital ecosystem coordination and digital architecture configurations. The first dimension of digital orientation is *technology scope*, which means distinct technological advances that ascertain the scope adopted by the organisation to serve its clientele's needs best (Kindermann et al. 2024). The second dimension of digital orientation is *digital capabilities*, which refers to the internal resources (including the workforce) that enable the organisation to realise the uptake of 4IR technologies (Kindermann et al. 2021). The organisation's strategic intention to adopt a particular digital orientation commences from identifying the technology (*technological scope*) and allocating resources (*digital capabilities*). The third dimension of digital orientation is *digital ecosystem coordination*, which entails the interconnection between organisational designs (including digital platforms) and the digital ecosystem for enhanced decisions (Kindermann et al. 2024). The final facet of digital orientation is *digital architecture configurations*, an internal perspective involving the generation of systems (e.g. cybersecurity) that improve the organisation's workflow (Kindermann et al. 2021).

Studies on digital orientation in the African public sector have been conducted, accentuating the opportunities and challenges (Baku 2022; Plantinga 2024). Countries in the African milieu are at different phases of embracing EDTs and are improving, aside from lagging ones. For example, countries such as Rwanda, Ethiopia and Kenya have integrated digital government systems into the water supply to efficiently monitor the distribution of water services to the vulnerable citizens (Baku 2022). Further, while Tanzania has introduced an online tax system that allows citizens to access tax-related services such as tax payments, assessments and returns (Juma, Kateule & Tunga 2024), Kenya has, in 2014, deployed the electronic services (called e-citizen) platform to improve services to the citizens, including the application of identity documents, driving licences and marriage certificates (Maina & Otieno, 2024). On the contrary, the Ethiopian government has digitalised about 65% of its public services, including but not limited to health care, education, employment and social services (Baku 2022). Additionally, to circumvent financial loss in public hospitals, the Kenyan government has implemented a digitalised cash record to inhibit public servants from embezzling funds (Baku 2022).

However, apart from the success stories experienced by some African countries, most of these countries are still overwhelmed by the concept of 4IR technologies. A study by the United Nations confirms that although the African continent comprises 54 countries, only 19 countries have been recognised for e-government improvement and digital transformation in the global high EGDI ranking, leading to the rest not being reflected in the outcome of the survey, mainly because of limited resources (e.g. digital competencies, funding and infrastructure) (United Nations 2024). It is further emphasised that there are seven African countries (i.e. Burundi, Niger, Chad, Eritrea, Somalia, South Sudan and the Central African Republic) classified under low EGDI cluster, mainly because of huge gaps in terms of digital infrastructural deficit, limited digitalised services and the absence of digital capacitation (United Nations 2024). To this effect, the United Nations Economic Commission for Africa (ECA) has instigated an initiative to boost other vulnerable African countries (e.g. Benin, Gambia, Botswana, Ghana, Zambia, Namibia and Côte d'Ivoire) in establishing 4IR strategies, which are well matched with the digital transformation strategy.

Several EDTs, such as cloud computing, big data, AI and the IoT (Adeleye et al. 2024; Al Mudawi, Beloff & White 2022; Chilunjika, Intauno & Chilunjika 2022; Mergel et al. 2023; Selten & Klievink 2024; Tavares, Joia & Fornazin 2021), have been demonstrated to have streamlined internal processes to improve the efficiency of the public sector, leading to accelerated service delivery to the citizens. Even though the limited application of those EDTs, particularly in most emerging economies in Africa classified under least developed countries (e.g. Somalia, Sudan, Central African Republic, Niger, Chad, Mali, Burundi, Burkina Faso, Sierra Leone and Mozambique), is persisting (United Nations 2024), developed countries are growingly exploiting them to provide efficient, transparent, accountable and cost-effective

electronic services to their citizens and other stakeholders (Ehimuan et al. 2024). Accordingly, it is worth indicating that the successful linkage between digital orientation (e.g. big data, cloud computing, AI, the IoT and virtual platforms) and service delivery is derived not only from a leadership perspective (i.e. enthusiasm to drive digital orientation) but also from the investment in digital competencies, digital infrastructure, reliable internet and network connectivity and cybersecurity (Abd Al Ghaffar 2024; Plantinga 2024; United Nations 2024). Keeping that in mind, the full potential of digital orientation can only be recognised if the African public sector at large can take advantage of these driving factors. Table 1 is cited portrays pertinent studies on digital orientation in the public sector.

While service delivery is at the heart of every government, the dire need for public health, education, transportation, agriculture, safety, housing, etc., regarding the citizens cannot be overemphasised. For example, even though governments across the world strive for the capacity to

ensure that these basic needs are met, African countries in general have been besieged with limited resources and financial maladministration, which leads to unnecessary service delivery protests (Baloyi & Beyers 2019; Galushi & Malatji 2022; Ringson & Matshabaphala 2023; Worku 2024). Additionally, scholars attest that the acceptance of EDTs by the public sector has not only improved efficiency in public service but also diminished corrupt activities by public servants, specifically in emerging economies (e.g. Gambia, Ghana and South Africa, *inter alia*) where service delivery remains the major obstacle (Baku 2022; Bojang 2021; Nokele & Mukonza 2021; Thorpe & Pokhrel 2024). It is worth noting because the utilisation of the EDTs' platforms (e.g. e-government) by citizens and other stakeholders has been significant in enabling them to access online services irrespective of geographical distance, and this has been commended for saving costs (Al Mudawi et al. 2022; Olaitan et al. 2021; Rivalani et al. 2023). For instance, citizens need not travel to the government premises to access services; rather, they can make use of digital technologies.

**TABLE 1:** Summary of studies on digital orientation in the public sector.

Author	Study objective	Methods	Results
Sihotang et al. (2024)	To ascertain the dimensions that impact the uptake of village information system (VIS) in Indonesia	A quantitative approach using survey research	The results show that a village can uptake the e-government VIS only with the enthusiasm of a transformational leader
Thorpe and Pokhrel (2024)	To examine and detect the common obstacles of e-government in emerging economies	Systematic literature review	Insufficient information communication and technology (ICT) infrastructure, limited digital capabilities and scarce resources (eg., financial)
Rivalani et al. (2023)	To investigate the extent to which the public sector (in competing with the private sector) retains critical skills regarding digitalisation to improve service delivery in the post-COVID-19 era	A qualitative approach, integrated literature review	The study provides an understanding of the new mechanisms that can be applied to foster human capital in the digital world
Ouwnegbuna et al. (2022)	To probe the pros and cons of the effect of post-COVID-19 stimulated by digital transformation on service delivery in Nigeria	Review of existing literature	The study contributes to policy development in the public sector regarding 4IR technologies (i.e., digital transformation)
Tavares et al. (2021)	To comprehend the effect of 4IR advances during COVID-19 that divulge the post-COVID-19 certainty	A qualitative, multiple longitudinal mini-case studies	The existing digital divide has escalated. Inadequate ICT infrastructure hampers the 4IR progress
Mousa and Abdelgaffar (2023)	To explore the repercussions of the post-COVID-19 hurdles of remote work in the public sector	Review of existing literature	Remote work has been vital to increasing public servants' efficiency and work-life balance
Nokele and Mukonza (2021)	To examine the facets that impact the uptake of e-government in the Department of Home Affairs in South Africa	Review of existing literature	The study finds the common facets affecting the uptake of e-government as limited ICT infrastructure and language barriers, among others
Shibambu and Ngoepe (2024)	To investigate the process of how the public sector in South Africa can improve the provision of services (i.e., service delivery) to the public using digital transformation	A qualitative research strategy using semi-structured interviews	The outcome of their research revealed that the absence of appropriate legislative frameworks governing digital transformation in the public sector in South Africa remains the stumbling block impeding improved service delivery
Bojang (2021)	To detect critical dimensions that allow citizens to adopt e-government service in a community	A quantitative approach using survey research and collection of secondary data	Awareness programmes and enhanced service delivery inspire citizen's willingness to use e-government services
Muridzi et al. (2021)	To ascertain the citizens' application of ICT instruments in accessing municipal services in South Africa	A qualitative approach using face-to-face interviews	The study uncovers that municipalities are executing an e-governance model while investing in ICT
Onyango and Ondiek (2021)	To explore the role of ICT, digital platforms, internet connectivity, and digital competencies of public servants in Kenya's public sector	A qualitative approach using the descriptive case study	Need for more digital competencies, adequate digital platforms and unreliable networks, <i>inter alia</i> .
Phuthong (2022)	To evaluate the order of significant dimensions affecting cloud computing in Thailand's public sector	A quantitative approach using survey research	The study suggests a framework for assessing the organisation's capacity to choose software compatible with cloud computing
Olaitan et al. (2021)	To assess the position of South Africa's preparedness for the uptake of 4IR technologies	Analysis of literature	They found that the country needs higher technology capacity, a lack of digital skills and a limited ICT infrastructure
Chomunorwa et al. (2023)	To investigate the obstacles encountered by the South African basic education system and devise tactics that can be employed to overcome those obstacles	Narrative literature review	The South African education system needs to be revised, and steps should be taken to comply with global requirements
Mmakola and Maphalala (2023)	To probe the evolving landscape of combined learning and education in South African high schools in the post-COVID-19 epoch	Extensive literature review	The findings discovered that the digital divide and inequalities are the main concerns that hamper online learning and education progress
Nalubega and Uwezeyimana (2024)	To probe how the government in Uganda employs AI digital technologies to improve the delivery of services to its people	A mixed-methods using an explanatory research design	The study finds that the government in Uganda adopted AI digital technologies in different spheres of government to ensure cost-effectiveness and increased efficiency. Moreover, the study delineates the ethical issues associated with the uptake of AI technologies

Note: Please see the full reference list of this article, <https://doi.org/10.4102/apsdpr.v13i1.953>, for more information.

## Overview of COVID-19's implications on digital orientation and service delivery

The COVID-19 pandemic has severely impacted the lives of people across the globe, and service delivery has deteriorated. At the pandemic's early stage, however, both emerging and advanced economies have struggled to contain the consequences caused by the virus. Despite this, the enactment of lockdowns by various governments in March 2020 has triggered the use of EDT, mainly social media platforms (such as WhatsApp, Facebook and Twitter), as a means to ensure the exchange and flow of information between governments and citizens (Agostino et al. 2021; Muridzi et al. 2021; Shava & Vyas-Doorgapersad 2022). Whereas the pandemic has quickened the use of these EDTs, emerging economies are confronted with many hurdles compared to advanced economies. These include the non-readiness to adopt EDTs and the need to revise business frameworks and technical knowledge to operate those technologies (Galushi & Malatji 2022; Mmakola & Maphalala 2023; Olaitan et al. 2021). All these factors have adversely impacted the provision of services to the citizens.

Many African countries have been entangled with service delivery issues even before the arrival of COVID-19. Apart from the limited resources experienced by these countries, particularly least developed countries (e.g. Sudan, Burkina Faso, Mali, etc.) as a common hurdle, leadership has been a barrier to the effective adoption of EDTs, particularly in the public sector milieu (Ringson & Matshabaphala 2023; United Nations 2024). For instance, most African countries are characterised by the bureaucratic approach to leadership, which hinders innovative ways to improve public engagement in delivering services to citizens and diverse stakeholders. To support this, although most African countries have not yet experienced the full potential of digital technologies, it is argued that the acceptance of EDTs by the public sector has been keen to reduce the conventional (bureaucratic) method of running daily activities (Baku 2022; Thorpe & Pokhrel 2024; Worku 2024). For example, citizens can access essential services via digital technologies such as municipal, pedagogical and health services, and more remarkably, these have also improved the decision-making process (automated) of the public sector, resulting in reduced bureaucracy. Keeping that in mind, governments in Africa must embrace and implement these EDTs to circumvent service delivery protests by society.

## Comparative analysis between Africa and the United States

Contextual variations such as political, economic, social, technological and ecosystem situations considerably impact how EDTs are implemented in the African continent and the US. Although Africa has made great strides and experienced swift progress regarding internet connectivity and the realisation of the IoT-related technologies (e.g. smartphones), particularly in urban areas, the adoption speed of EDTs, such as AI, big data and cloud computing, still falls behind that of the US. Despite the fact that both regions notice digital

transformations in diverse sectors such as education, transportation, social services, healthcare services and agriculture, among others, the rate at which the US executes trailblazing and state-of-the-art solutions in rendering those services differs substantially from Africa (Udo et al. 2024). For instance, while the US has enormously invested in advanced digital infrastructure, reliable internet networks and enacted sound legislative and regulatory frameworks, the EDTs have been deployed effectively. In comparison, however, the African continent is still inundated with impediments (e.g. digital illiteracy and the lack of technological regulatory frameworks) obstructing the realisation of the potential brought about by EDTs and thus intensifying the socio-economic disparities (e.g. inequality) (Jejenywa et al. 2024).

Apart from factors delineated earlier, the funding for digital initiatives has been considered a driving factor enabling the adoption of EDTs (United Nations 2024). For example, while the US has different funding plans for digital technologies in collaboration with the private sectors, that is, research and development grants, venture capital, the corporate partnerships, philanthropic funding and the connect America fund, *inter alia* (Udo et al. 2024), Africa is beleaguered with technological funding challenges dragging the adoption of various EDTs in the digital landscape (Plantinga 2024). It is corroborated that sustainable funding structures and reliable funding sources (i.e. partnering with the private sectors and international alliances) become imperative to accelerating digital orientation to enhance service delivery (Kuteesa, Akpuokwe & Udeh 2024).

## Research methods and design

Guided by the constructivist paradigm, this study employs a qualitative approach using an SLR, particularly the most widely used Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Knobloch, Yoon & Vogt 2011), to investigate the effect of digital orientation on service delivery in Africa in the post-COVID-19 era. The rationale for adopting PRISMA methods was to enhance a clear, comprehensive and rigorous identification and selection of the literature on the topic (Moher et al. 2010; Page et al. 2021) and cultivate thematic analysis on the academic discourses to achieve theoretical saturation on the subject of digital orientation on service delivery in Africa in the post-COVID-19 era. The advantages of utilising PRISMA as an SLR include the following: (1) as the technique emphasises readily available data, it necessitates the minimal attainment of ethical considerations; (2) the technique relies on the data available, and thus, it ensures time and cost savings; (3) the technique enables an atmosphere where scholars can gain insights into conducting investigations that would be complex to do; and (4) the technique can moderate interviewer bias when collecting and transcribing data, therefore enhancing rigour (Page et al. 2021).

The PRISMA process encompasses the four stages: identification, screening, eligibility and inclusion (Knobloch et al. 2011). These stages were considered in conducting the SLR as follows:

## Identification

The keywords were utilised using concepts relating to the topic to identify the pertinent sources in the literature on digital orientation and service delivery in Africa in the post-COVID-19 era. The data collection for this study was obtained from the Web of Science and ProQuest search engines with the keywords such as 'digital orientation', 'service delivery', 'public services', 'post-COVID-19', 'public administration' and 'public sector'. The reason for choosing these databases lies in the quality of data published (i.e. peer-reviewed journal articles) and the vast spectrum of literature coverage of the public sector. At the outset, the extensive selection approach was employed to gain access to the comprehensive literature on digital orientation and service delivery. The initial search resulted in 1235 sources being identified in the literature for the period ranging between 2021 and 2024. The EndNote Referencing Manager (version 21.1) was used to arrange the citations.

## Screening, eligibility criteria and inclusion

The literature screening process took the inclusion and exclusion requirements into cognisance. To improve the explicitness and transparency regarding the detection and selection of sources through the Web of Science and ProQuest databases, the following steps were considered (see Figure 1):

**Step 1:** The data search of the sources (i.e. peer-reviewed articles, conference papers and academic book chapters) amounting to 1235 using the keywords was obtained from the Web of Science and ProQuest databases. The data ranged between 2021 and 2024.

**Step 2:** The exclusion requirements of the sources, that is, non-English, non-abstract and duplicates, were undertaken. After the deletion of those sources, this study remained with 526 documents, leading to the elimination of 709 papers.

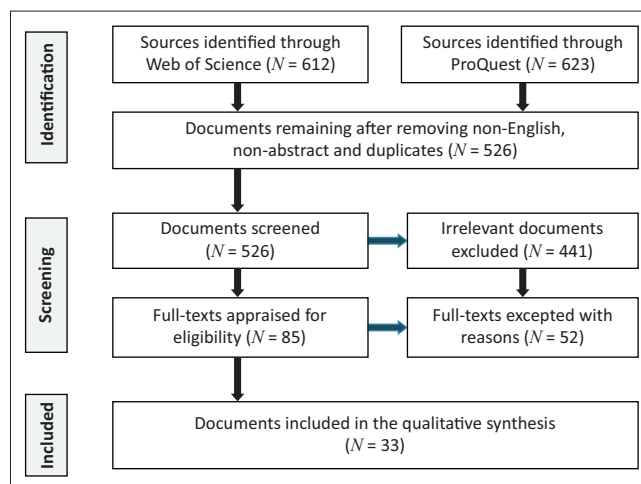
**Step 3:** During the screening process, 441 full-text documents were removed based on their irrelevancy, leaving 85.

**Step 4:** Afterwards, 85 documents were critically analysed to determine the eligibility requirements and inclusion in the study.

**Step 5:** Out of 85 documents, 52 sources were rejected based on the study's eligibility requirements.

**Step 6:** Finally, the entire sample of 33 peer-reviewed journal articles, conference papers and academic book chapters was deemed appropriate for inclusion in the PRISMA systematic review (see Table 2).

The quality of the sources was evaluated by reading and repeatedly interpreting the full text of those sources. The data quality was improved by designating two independent reviewers who solemnly assessed the sources to ascertain their appropriateness on the effect of digital orientation and service delivery in Africa in the post-COVID-19 epoch.



Source: Adapted from, 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.

**FIGURE 1:** Preferred Reporting Items for Systematic Reviews and Meta-Analysis flow diagram.

Furthermore, an Excel spreadsheet was used to extract data, including significant data such as author, year of publication, study title, purpose, research approach and main findings. Aside from the steps delineated in conducting the PRISMA systematic review above, the study also describes the eligibility requirements for collecting data. The following factors were considered in ensuring the eligibility requirements:

- **Research field:** Because of the paucity of research on digital orientation in the public sector, particularly in the African economies, this study also considered research from the private sector.
- **Topic:** Academic discourses with a focus on mainly digital orientation (i.e. the IoT, AI, big data, cloud computing and virtual platforms) in the public sector, despite minimal studies on the private sector milieu, specifically on defining digital orientation.
- **Research methods:** All sources (the peer-reviewed journal articles, conference papers and academic book chapters) that employed qualitative and quantitative approaches were included in the study. To ensure data reliability, this study focused on the empirical evidence as required by PRISMA guidelines for conducting SLR (Page et al. 2021). Additionally, theoretical sources were also considered to establish scholarly debates with researchers who conduct theoretical and critical thinking on digital orientation and service delivery in the post-COVID-19 epoch.
- **Publication category and period:** Apart from the grey literature (i.e. government reports and policy documents published on governmental websites and databases), this study considered peer-reviewed journal articles, academic book chapters and conference papers published between 2021 and 2024. Non-peer-reviewed journal articles were excluded from this study.
- **Language:** All the sources written and published in English were suitable for inclusion in the study, which is ordinary for SLR, taking into account the practical complexities of translation from other languages to English.

**TABLE 2:** Sources consulted.

Categories	Counts	Percentage contribution (%)
Journals	25	76
Conference papers	5	15
Book chapters	2	6
Reports	1	3
<b>Total</b>	<b>33</b>	<b>100</b>

- **Keywords search:** The following keywords were included in the search stream of Web of Science and ProQuest databases: ‘digital orientation’, ‘service delivery’, ‘public services’, ‘post-COVID-19’, ‘public administration’ and ‘public sector’.

## Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Johannesburg’s Department of Business Management Research Ethics Committee (ethical clearance no:24SOM/BM82) on 01 November 2024. Procedures in this study were aligned with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

## Results and discussions

These sections discuss research findings from the literature.

### Digital orientation and service delivery in Africa

The United Nations has surveyed EGDI in Africa, and only 19 countries were among the competing rankings in the global analysis. Although some emerging economies like South Africa, Mauritius, Tunisia, Morocco and Tunisia might have made a great stride with the adoption of the 4IR advances by being rated among the 100 top performers in the world in harnessing digital government and digital transformation compared to the rest of the countries in the African continent (United Nations 2024), these countries are still faced with impediments such as power outage (load shedding of electricity), unreliable internet network, digital competencies, inequalities, digital divide and limited digital infrastructure (Chomunorwa et al. 2023; Mmakola & Maphalala 2023; Olaitan et al. 2021; Shava & Vyas-Doorgapersad 2022;). These accentuated obstacles are similar to those in most African countries (Udo et al. 2024). That being said, the lack of ICT funding models has been the focal obstruction hampering the success of digital technology initiatives in Africa (Ehimuan et al. 2024; Kuteesa et al. 2024). Further, broadly speaking, while EDTs have brought about several advantages (e.g. increased efficiency, cost savings and enhanced service delivery) in advanced economies (Abied, Ibrahim & Kamal 2021; Adeleye et al. 2024; Jejenywa et al. 2024; Minartz et al., 2024), the African economies are still lagging, and these drag service delivery progress to the citizens (Baku 2022; United Nations 2024). Additionally, whereas most of the governments in the African continent continue to invest in the uptake of EDTs, digital bottlenecks highlighted above persist in transpiring, which encumbers progress and the realisation of its potential.

**TABLE 3:** Top countries for e-government in Africa.

Country	Region	Global ranking	EGDI 2022	EGDI 2024	Rating level
South Africa	Southern Africa	40	0.7357	0.8616	V2
Mauritius	Eastern Africa	76	0.7201	0.7506	V1
Tunisia	Northern Africa	87	0.6530	0.6935	HV
Morocco	Northern Africa	90	0.5915	0.6841	HV
Seychelles	Eastern Africa	92	0.6793	0.6773	H3
Egypt	Northern Africa	95	0.5895	0.6699	H3
Ghana	Western Africa	108	0.5824	0.6317	H2
Kenya	Eastern Africa	109	0.5589	0.6314	H2
Cabo Verde	Western Africa	111	0.5660	0.6238	H2
Botswana†	Southern Africa	112	0.5495	0.6118	H2
Eswatini†	Southern Africa	113	0.4498	0.6081	H2
Namibia	Southern Africa	114	0.5322	0.6007	H2
Algeria	Northern Africa	116	0.5611	0.5956	H2
Rwanda	Eastern Africa	118	0.5489	0.5799	H2
Gabon	Middle Africa	121	0.5521	0.5741	H2
Côte d’Ivoire	Western Africa	124	0.5467	0.5587	H1
Libya†	Northern Africa	125	0.3375	0.5466	H1
Zambia	Eastern Africa	130	0.5022	0.5424	H1
Senegal†	Western Africa	135	0.4479	0.5162	H1

Source: United Nations, 2024, *E-government survey 2024: Accelerating digital transformation for sustainable development with the addendum on artificial intelligence*, viewed from <https://publicadministration.un.org/en/publicadministration.un.org/egovkb/en-us/>

EGDI, E-Government Development Index.

†. These countries have made progress from middle EGDI in 2022 to the high EGDI categories in 2024.

To provide a picture of digital orientation (i.e. e-government) by African governments, the United Nations surveyed the development, implementation and performance of e-government systems in the global context. The survey aims to critically evaluate the value of e-government in providing and delivering services to the citizens and detect patterns in the application and performance of the e-government system (United Nations 2024). For example, it was discovered that only 16 African countries were exceptionally clustered under the high EGDI. The rationale for reflecting on the EGDI rankings is to shed light on the progress concerning the adoption of digital technologies in Africa. Table 3 illuminates the African countries with the highest EGDI values chronologically and progressively.

While the countries marked with an asterisk (\*) in Table 3 – that is, Botswana, Eswatini, Libya and Senegal – have made progress from middle EGDI in 2022 to the high EGDI categories in 2024, the first six countries (i.e. South Africa, Mauritius, Tunisia, Morocco, Seychelles and Egypt) have made it to the top 100 countries in terms of entire EGDI ranking across the globe, with the values transcending the worldwide average of 0.6600. Thus, South Africa advanced to first place in 2022 with a 0.7357 and in 2024 with a 0.8616 rating, respectively. The country remains the top performer in Africa, with a very high (V2) rating category on the EGDI, and it is the first progressor of e-government development initiatives on the continent. It is followed by Mauritius, which remains in second place in 2022 with a 0.7201 high rating (HV) and in 2024 with a 0.7506 very high (V1) rating value. Therefore, South Africa and Mauritius are the first African countries to be classified under the very high EGDI cluster and are leading the continent with the adoption of e-government initiatives (United Nations 2024). Despite the slight improvement in ratings taxonomies, Tunisia, which was

in fourth place, has improved to third place with rating groups of 0.6530 in 2022 and 0.6935 in 2024, respectively. Further, Morocco, which was in fifth place, has progressed to fourth place with a rating category of 0.5915 in 2022 and 0.6841 in 2024, respectively. While Egypt has made it to the top 100 in 2024 with the EGDI rating division of 0.6699, Seychelles, which was in third place in 2022 with a 0.6793 rating, has regressed to fifth place in 2024 with a 0.6773 rating, being overtaken by Tunisia and Morocco. Given these statistics, evidence proves that most African countries in the high EGDI group are enhancing digital transformation. It is argued that the primary trend has been driven by the countries' capacity to capitalise on ICT or digital infrastructure and the delivery of diverse online services.

From the above analysis, one can surmise that notwithstanding the rapid expansion and outstanding improvement made regarding the uptake of EDTs, evidence suggests that African countries, in the broad sense, are still encountering confrontations such as minimal digital expertise to operate in the digital world (United Nations 2024). It is, therefore, argued that if financial malpractice can be remedied while enhancing the adoption of ICT and e-government applications by the public sector (Baloyi & Beyers 2019), the African continent can narrow down these multifaceted obstructions and commence to experience an embellishment of EDTs and remain sustainable in the digital world.

### Emerging digital technologies for the African emerging economies

Generally, scholars have suggested various kinds of EDTs that can be considered in public administration (Abied et al. 2021; Maneesri 2022; Selten & Klievink 2024), namely: the IoT, AI, virtual platforms, big data and cloud computing. Additionally, while the provision of public services continues to demand online services (e.g. in education, health and agriculture, *inter alia*) because of the repercussions of COVID-19 and the changing business environment, policymakers in Africa strive to assimilate some of these EDTs into business frameworks (Adeniyi et al. 2024; Plantinga 2024). It is worth noting that these cutting-edge EDTs are intertwined and dependent on one another.

The subsequent sections describe the key themes of digital orientation derived from the literature.

### The internet of things

Koohang et al. (2022) defined IoT as the series of devices that electronically gather, synthesise and disperse data to ensure a smooth flow of information among diverse stakeholders. Before the pandemic, the IoT (e.g. mobile devices – smartphones) was the most used and preferred digital technology globally. For example, most governments employ diverse social media platforms (e.g. mobile apps like WhatsApp and Facebook) using the IoT to convey COVID-19-related information (e.g. statistics) to the general public. The IoT incorporates a variety of EDTs, including but not limited to smartphones, smart cities, sensors, smart manufacturing

and wearables. By implication, this study focuses on mobile devices (particularly smartphones) as the most used and affordable technological advance by people in Africa.

Additionally, while access to mobile technologies provides varying opportunities to people in the digital environment, the diffusion of smartphones has been imperative to ensuring digital connectivity in the African context, notwithstanding limited access, especially in remote areas (Adeleye et al. 2024; Kuteesa et al. 2024). Broadly speaking, smartphones are significant in facilitating and advancing communication in education (e.g. e-learning platforms), municipal services (e.g. smart meter readings) and the healthcare services sector (e.g. mobile health) (Udo et al. 2024). It is argued that the pervasive and burgeoning application of mobile devices has been keen to exchange digital information between various governments and citizens in Africa, thereby recognising underprivileged communities and, thus, stimulating digital inclusion (Jejenywa et al. 2024).

### Artificial intelligence

According to Mergel et al. (2023:2), AI refers to 'systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals'. Recently, research on AI in the public sector has gained recognition in the corpus of knowledge (Attard-Frost, Brandusescu & Lyons 2024; Chilunjika et al. 2022; Selten & Klievink 2024), and AI is linked to automated algorithms in rendering quality delivery of services to the citizens (Jejenywa et al. 2024). Even though Africa is still dragging compared to the rest of the world in the adoption of AI, progress can be noted in some regions. For example, countries such as South Africa, Nigeria, Egypt, Mauritius and Kenya have shown greater momentum on AI-driven technologies (Cloete 2024). Although AI (e.g. facial recognition and machine learning) is still in its nascent stage, particularly in the African economies (Plantinga 2024), research suggests the enactment of stringent policy and regulatory frameworks governing AI technologies (Worku 2024). Although some countries like Egypt, Kenya, Nigeria, Rwanda and Mauritius have drastically coerced the development and execution of AI-related policies and regulations, Ghana, South Africa and Ethiopia are said to be at the embryonic phase (Cloete 2024). Notwithstanding this, the gradual adoption of AI-enabled technologies can fast-track service delivery and ensure cost-effectiveness (Mergel et al. 2023). For example, whereas advanced economies (e.g. the United Kingdom, the United States and Japan) across the globe have reaped the rewards of the usage of AI, such as reliable, efficient and reasonable public service (Worku 2024), there has been a significant enhancement in the uptake of AI by the public sector in Africa (Plantinga 2024). Additionally, regardless of its multifaceted perspective, AI has been lauded for its capacity to mushroom the issues associated with accountability, transparency and good governance in the public service (Attard-Frost et al. 2024; Selten & Klievink 2024). Generally, there is still more that needs to be done in Africa to realise the full benefits of AI.

## Big data

With the pandemic's intensification of digital services, research on big data has gained prominence in the body of knowledge (Maneesri 2022). Big data is defined as a digital technology that 'encapsulates the vast and complex datasets generated in the digital age' (Adeleye et al. 2024:86). Lately, the rapid application of ICT tools has been pivotal to disseminating information between governments and citizens. Big data has significantly transformed governments' policies and models and plays a substantial role in delivering services to the people, such as healthcare services, municipal services and educational systems in Africa. Notably, for example, the South African government has successfully applied big data in conducting its fourth census survey using EDTs in 2022 for the first time ever. In most cases, big data plays an integral role in public health services and the development of smart cities in Africa. Further, the information for patients is handled through big data. Adeleye et al. (2024) corroborate that despite common hurdles (e.g. low internet connectivity and limited data storage) faced by many African countries (e.g. Zimbabwe, Uganda, Gambia and Zambia, among others), some countries in North Africa (e.g. Egypt and Morocco) have invested in digital infrastructure and reaped the benefits of adopting EDTs (including big data). Adeleye et al. (2024) further assert that South Africa and some other countries in Sub-Saharan Africa (e.g. Kenya, Mauritius, Seychelles and Rwanda) have also been at the forefront concerning the development of the digital landscape. Additionally, as most African countries depend on agriculture, big data has modernised the industry. For example, drones have been used in agriculture to observe the state of crops and livestock.

However, like other EDTs, big data not only creates opportunities for the public sector but also poses some threats, especially in the African continent. Despite its capacity to manipulate massive data sets and benefit the public sector, adopting big data has been challenging for African governments. In public hospitals, for instance, patients' files are stored and retrieved in steel cabinets. The manual management of those files often leads to the loss of important information and even the distortion of documents. Therefore, even in the post-pandemic era, some African countries still need to fully adopt big data analytics to store their data in public health (Adeleye et al. 2024). Given this, it is critical for governments in the African context to develop and implement policies relating to big data and ensure comprehensive integration of ethical standards (privacy, trust and security). The reason is that big data has been applauded for its capacity to increase citizen participation, bolster efficiency, augment transparency and boost economic growth (Maneesri 2022).

## Virtual platforms

EDTs have profoundly relinquished the face-to-face methodology in most contemporary organisations in both the public and private sectors. Recently, the growing use of virtual platforms has significantly revolutionised public service administration. Since the pandemic, many governments in Africa have partially gotten rid of face-to-face

practices, and some have adopted remote work (telework) for their employees, which enhanced the recognition of virtual platforms (for instance, in the education sector) (Sims 2024). To a great extent, official meetings, public participation and job interviews with the public sector are held using virtual platforms such as Microsoft Teams, Skype and Zoom. Furthermore, most African countries have integrated virtual platforms and other related strategies into their business models to enhance the internal processes aiming at advancing service delivery to the citizens.

Generally speaking, the repercussions of COVID-19 have implicated essential service sectors such as health and education. In the education sector, however, virtual learning has gained popularity in most African countries (Adeniyi et al. 2024; Chomunorwa et al. 2023; Mmakola & Maphalala 2023). Besides that, virtual learning has been associated with global inequality (Sims 2024). Through ICT initiatives, most African countries in public higher education have gained access to e-learning (also called virtual teaching and learning) platforms, intensifying access to attributable pedagogy (Udo et al. 2024). Despite the renowned predicaments (e.g. non-reliable electricity supply) faced by the African continent regarding the adoption of EDTs (Sims 2024), the uptake of e-learning by various public universities has been appreciated for its capacity to increase flexibility in pedagogy even in the post-COVID-19 era, particularly in advanced economies (Adeniyi et al. 2024). Apart from the challenges underscored above, instructors' need for digital skills to design virtual courses that are susceptible to operating in the digital world remains (Sims 2024). In other words, up to date, Africa has not yet reached the desired stage regarding the adoption of online learning in public higher education.

## Cloud computing

Cloud computing is defined as 'a model which enables secure access to a set of flexible computing resources' (Mkhatshwa & Mawela 2023:538). Cloud computing allows governments to transmit data storage and administration into the cloud, employing internet connectivity (Kalampokis et al. 2023). A study by Mekawie and Yehia (2021) conducted in Egypt advocates that cloud computing has been valuable in storing vast amounts of data and is consistent with the flow of electronic information in the public sector. There are three cloud computing deployment models: public, private and hybrid (Abied et al. 2021). These cloud computing models are prevalent in deploying digital data storage in the public sector. Firstly, the public cloud refers to the cloud technology whereby the public (clients) are afforded the opportunity to acquire services (Mkhatshwa & Mawela 2023) through the Pay-As-You-Go approach, for example, Google Cloud and IBM Cloudburst. Secondly, the private cloud entails an on-site provision of cloud services within the organisation (Abied et al. 2021). Lastly, a hybrid cloud means integrating the characteristics of two or more cloud computing forms, for example, public and private (Abd Al Ghaffar 2024). Consequently, despite the African economies venturing into cloud computing, it is argued that many governments in

Africa (including South Africa) still struggle to assimilate cloud solutions to enhance their data storage (Mkhatshwa & Mawela 2023), while cloud computing has been tightly associated with the cost-effectiveness and the lack of need to acquire digital infrastructure (Abd Al Ghaffar 2024; Al Mudawi et al. 2022).

### Limitations and future research

This study shed light on the effect of digital orientation on the service delivery in Africa in the post-COVID-19 era by delving into EDTs (i.e. the IoT, AI, cloud computing, big data and virtual platforms). Primarily, this study focused on secondary data collection (i.e. peer-reviewed journal articles, conference papers, reports and book chapters) from Google Scholar to respond to the research problem and objectives. Future research can conduct empirical studies (quantitative and qualitative) with emphasis on primary data collection (e.g. in-depth interviews, case studies or structured questionnaires) to ensure better insights from the respondents and lead to the validation of research findings. For instance, larger samples for quantitative investigation can enable future researchers to generalise the research results. Alternatively, interviews can provide an in-depth explanation of the importance of EDTs in service delivery. As digital changes continue to occur in the digital economy, future researchers must probe how the African public sector endures EDTs by devising strategies and developing models to assist and facilitate their adoption. Furthermore, it is worth advising that digital orientation (i.e. IoT, AI, big data, virtual platforms and cloud computing) may differ across various African countries in terms of contextual factors such as cultures, values, age and norms; therefore, the tailored EDTs can be significant to the success of digital projects.

### Conclusion and recommendations

The primary objective of this study was to probe the effect of digital orientation on the service delivery in the African public sector in the post-COVID-19 epoch. This study systematically reviewed literature on digital orientation and service delivery in Africa in the post-COVID-19 era, enunciating the present theoretical and application insights of EDTs such as the IoT, AI, big data, virtual platforms and cloud computing by the African public sector. The study finds that despite the significant improvements made in technological development by the African countries, the continent still experiences many contextual challenges in the post-COVID-19 epoch. For example, issues such as inadequate digital skills, insufficient digital structures, digital divide, non-reliable network connectivity, poor electricity supply and bureaucracy are the standard digital bottlenecks that adversely impact citizens' socio-economic status, encumbering the realisation of benefits the EDTs provide (United Nations 2024). Additionally, these findings are consistent with the EGDI survey for 2024 conducted by the United Nations, focusing on expediting digital transformation for sustainable development with a supplementary emphasis on AI. Apart from these, this study further discovers that the

lack of appropriate funding for digital projects by governments in Africa has been evident in most countries' leading failures in digital technology initiatives. Broadly speaking, citizens' application of EDTs has been crucial to enhancing engagement and service delivery.

Based on the above conclusions, this study makes the following recommendations for the African public sector:

- The African continent and more specifically the public sector must reprioritise and redirect their existing approved annual funding (via budgetary processes) to cater to digital technology initiatives.
- Roadshows and awareness campaigns (programmes) can be facilitated to mentor the citizens and other stakeholders about the use and significance of digital platforms (i.e. e-government systems).
- Collaboration and partnership with the advanced economies (i.e. the United Kingdom, Japan and Australia) and private sectors within the African continent can help acquire customised digital infrastructures and digital competencies that enable the African countries to accelerate the utilisation of digital technologies and changes brought by them.
- The African countries must strengthen their energy sectors by investing in the generation of ample and reliable power supply (electricity) to augment the functioning of the 4IR technologies in the digital environment. Alternatively, these countries can opt for solar panel or wind turbine plantations and harvesting to boost their energy sectors to thrive in the global economy.
- Given the gradual acceptance and adoption of the 4IR technologies in the public sector, it is recommended that the African continent purposively manage the adoption of EDTs to replace the conventional mode of operation (bureaucracy) and become sustainable in the turbulent business setting.
- The restructuring and redesigning of ICT initiatives (i.e. digital infrastructures, software, internet network connectivity, skills acquisition, outsourcing activities, etc.) and the uptake of cloud computing become essential for smooth operation in the African public sector.
- The development and enactment of binding legislative and regulatory frameworks can help the African public sectors effectively manage the adventure and prevalence of EDTs and speed up the implementation process.

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## Authors' contributions

W.M.B., D.R. and N.M. contributed equally to the conceptualisation, writing, and editing of the manuscript and share first authorship. All authors contributed to the article, discussed the results, and approved the final version for submission and publication.

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## Data availability

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

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