

A comparative analysis of e-government services in ten African countries

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Abstract: Governments strive to enhance citizen services by leveraging the Internet to communicate policies effectively. Researchers have examined e-government initiatives across African nations, highlighting challenges, enablers, and regulations shaping their implementation. This study explores the prospects of e-government in Africa by analyzing efforts in high EGDI-level countries (Mauritius, South Africa, Tunisia, Ghana, and Gabon) and low EGDI-level countries (South Sudan, Lesotho, Sudan, Niger, and the Central African Republic). Key challenges identified include limited digital infrastructure, insufficient competencies, digital inclusion issues, data privacy, and cybersecurity threats. Enablers such as leadership, collaboration, ICT growth, and government strategies are also noted. Additionally, regulations on information provision, data openness, and e-inclusion are discussed. The findings reveal that most African countries lag behind developed and developing nations in e-government services, emphasizing the need for future research to identify strategies for advancement in this direction.

Keywords: Africa, E-governance, E-government, E-government-services, Enabler

1. Introduction

E-government refers to the transmission of government services and information to citizens via the Internet (Almarabeh & AbuAli, 2010). The establishment of e-government services that people may access online is at the heart of e-government growth in many nations (Abusamhadana et al., 2021). Around the world, the growth of e-government differs greatly (Yildiz, 2007). Many African countries still struggle to adopt e-government for effective public services and governance, although the majority of developed countries have made significant strides in implementing and using e-government to improve public-sector service delivery (Rarhoui, 2024; Tassabehji et al., 2019). Many African nations have yet to reach this point (Tiika et al., 2024). Instead of sticking to an unbending, rigid hierarchy that concentrates on the consolidation of processes and services into particular establishments and organizations, such as the private industry, African nations are increasingly embracing customer-centric e-government policies (Nokele & Mukonza, 2021). Accordingly, e-government growth needs a holistic strategic policy that encompasses all businesses, public organizations, segments, and governmental divisions (Naraidoo & Sobhee, 2021). One could argue that there is a significant logical and conceptual misalignment in e-government research, given that almost all authors who have looked into the adoption and e-government penetration have produced significant strides in adopting technology as the leading determinant of the maturity of e-government evolution (Benaida, 2024). While technologies are important for e-government, other factors may also be essential to the development of e-government services, and as a result, they should be examined (OECD, 2021).

Many African governments have shown an interest in incorporating Information and Communication Technology (ICT) into their open associations; yet, the majority of governments are now in a new acute stage. The network's authority is dwindling as it approaches the governance baseline (Owusu & Penu, 2022). The lack of growth, caused by poor living conditions, inability to maintain online services, and low levels of human capital, is a major impediment to the growth of e-government in these nations (ITU, 2021; Mengesha et al., 2020). Furthermore, the communication gap between people and governmental agencies is another major issue in the development of e-government services, according to the literature (Abdulnabi, 2024). It's tough to assign procedures and rules. It has been stated that the governments in charge of e-government solutions are insufficient (Thela et al., 2025). In addition, Africa's lack of access to ICT infrastructure increases the gap between wealthy and poor nations (ECA, 2022). Comparing Africa to the rest of the world, the Internet penetration rate was the lowest, coming in at only 43.1% in 2022 (InternetWorldStats, 2022). To have the possibility of effectively adopting e-government, a clear understanding of the difficulties, enablers, regulations, and successful development in the most successful nations implementing e-government services is required. The goal of this research is to gain a deeper knowledge of these e-government norms in African nations by addressing the research questions below.

RQ1: What challenges do African nations encounter when it comes to establishing e-government?

RQ2: What are the unique enablers of African e-government?

RQ3: What are the unique aspects of e-government governance in Africa?

We reviewed the literature to find answers to the aforementioned research questions. Academic publications, government reports, websites, and international Internet databases such as the World Bank and UN reports are all examples. This paper's contributions are listed below. To begin, this paper examines the most pressing challenges to successful e-government service adoption in African nations. Lack of digital infrastructure and resources, insufficient competencies or capabilities, digital inclusion, data privacy and security, and cybersecurity threats are the major challenges. Moreover, this paper highlights the primary facilitators that improve e-government adoption in African nations that have effectively adopted a variety of e-government services. Leadership and collaboration, e-Government Development Index (EGDI) level, government strategies, and ICT growth are all examples of enablers. This paper also discusses the most effective strategies, policies, and regulations that these nations have implemented to govern e-government services, including information provision, data openness, and e-inclusion. Finally, this paper explores some of the successful e-government services and initiatives that these nations have developed, such as investment in cybersecurity and adoption of new technologies like Artificial Intelligence (AI) and the Internet of Things (IoT).

The remainder of the paper is laid out as follows. The research background is presented in Section 2. The research methodology is presented in Section 3. Section 4 discusses the findings of this paper by answering the research questions. The implications, limitations, and future directions of this paper are discussed in Section 5. The paper is concluded in Section 6.

2. Background

E-government, according to academics, combines fundamental elements of organizational sectors and specialization and focuses on administration conveyance (Mishra & Mishra, 2012). While e-government is widely used, it is more difficult to employ in the chaos that computer technology creates (Solomon & van Klyton, 2020). As the world evolves with breakthroughs in information and ICT, it is evident that we must adjust to these changes. Given the lack of standards for e-government, professionals attempt to define it in terms of their own implementations and circumstances. The stages of e-government models' maturity are typically information availability, interaction, information exchange, and information integration, which are detailed here (Mahlangu & Ruhode, 2020; Mensah, 2019; Zhang & Kimathi, 2022).

- Information availability: This feature contains information regarding the authority or government department and its services. The client has read-only access to that information.
- Interaction: The engagement among these authorities and the public takes a variety of forms. People can utilize the search engines on that site or send inquiries to the authorities via e-mail or a real-time chat facility. Forms, applications, and other documents can be downloaded to their PCs. This gives them the flexibility in reading and completing these forms in their own free time.
- Information exchange: The amount of contact between individuals and the website is increased in this scenario, resulting in a more holistic function. Several transactional services, including passport renewals, visa applications, and tax payments, may be completed online with no need to attend a governmental department.

- Information integration: In this phase, various information and services from various enterprises, government departments, and people systems are connected through a single virtual user interface, leading to increased customer convenience and decreased cost for both governments and the general public.

African governments actively embraced e-government usage in business from the middle of 2005. Despite obstacles, several African nations have tried to implement e-government services (Ambira et al., 2019). Although the number of academic papers about e-government in Africa is not many, primarily, in nations like the Central African Republic, South Sudan, Somalia, and so on, the literature on e-government in Africa, focused on studying the challenges of e-government implementation, some of the components necessary for e-government, such as online payment, registration or permissions, and consumers, have been discovered by other studies (Bwalya, 2018). Also, the effectiveness, significance, and high quality of e-governance in Africa have been emphasized in several studies, studying possession and use of ICT, and the technical design of systems for the effective execution of e-government projects was covered in the literature (Mishra & Akman, 2010). Though critics have made only sporadic attempts, African countries' knowledge of e-government research has not yet been thoroughly examined (Osah & Pade-Khene, 2020; Owusu & Penu, 2022). Accordingly, in order to provide a comprehensive framework for e-government in Africa, this study attempts to in-depth examine problems, enablers, and successful e-government services.

3. Research methodology

This study employs a combination of literature review and comparative analysis as its research approach (McKim, 2017). We began by searching Internet databases: academic (e.g., conference proceedings and journals), governmental websites, and international resources such as the World Bank and UN publications. Second, we narrowed our focus to answering the research questions. We used an exploratory technique that was well-suited to the study's goal of answering questions such as "who" and "what." The literature study methodology was adopted since it facilitates data collection and analysis (Alzoubi & Gill, 2021). It also helps when engaging with complicated problems (McKim, 2017). This was also necessary to establish how individuals, companies, and governments in each country are developing and utilizing e-government services. The selection process and the nations selected for comparison in this study are discussed in the sections below.

3.1. Countries' selection process

We split the sample of chosen studies into five regions to create a comprehensive comparison of e-government services in African countries: North Africa, South Africa, West Africa, East Africa, and Central Africa. We also identified the highest and lowest EGDI nations from each region, using the statistics provided by the UN e-government survey 2020 (United Nations, 2020). As a result, 10 countries were selected for this study. In order to do our comparison, two groups were created: high EGDI nations and low EGDI nations. The advantage of categorizing nations was to emphasize what kind of activities and, as a result, what types of assistance are appropriate (European Commission, 2019). The ability to detect recognized aspects of differences and similarities on which to construct

the different levels was used to create the choice of the groups and group divisions. Simultaneously, we want to emphasize that the divide is created only for the sake of this study. It is not intended to constitute a comprehensive classification of African nations for any other reason. The EGDI is an average value of standardized values on the three e-government indexes: Telecommunication Infrastructure Index (TII), Online Service Index (OSI), and Human Capital Index (HCI) (United Nations, 2020). The EGDI values, African rank, and global rank of the selected states are shown in Table 1. In terms of e-government advancement, Mauritius ranks first on the EGDI index. Seychelles, South Africa, and Tunisia are next. South Sudan ranks last.

Table 1: EGDI index, world rank, and African rank (source: adopted from (United Nations, 2020))

Country	EGDI Value	EGDI Rank/ Africa	EGDI Rank/ Global	African Region	Country	EGDI Value	EGDI Rank/ Africa	EGDI Rank/ Global	African Region
Mauritius	0.719	1	63	East	Angola	0.384	28	159	Central
Seychelles	0.692	2	76	East	Congo	0.378	29	160	Central
South Africa	0.6891	3	78	South	Libya	0.374	30	162	North
Tunisia	0.652	4	91	North	Mozambique	0.356	31	163	East
Ghana	0.596	5	101	West	Burkina Faso	0.355	32	164	West
Namibia	0.574	6	104	South	Malawi	0.348	33	165	East
Morocco	0.572	7	106	North	Burundi	0.322	34	168	East
Cabo Verde	0.56	8	110	West	Sudan	0.315	35	170	North
Egypt	0.552	9	111	North	Mali	0.309	36	171	West
Gabon	0.54	10	113	Central	Madagascar	0.309	37	172	East
Botswana	0.538	11	115	South	Sierra Leone	0.293	38	174	West
Kenya	0.532	12	116	East	Mauritania	0.282	39	176	West
Algeria	0.517	13	120	North	Comoros	0.279	40	177	East
Zimbabwe	0.501	14	126	East	Ethiopia	0.274	41	178	East
Eswatini	0.493	15	128	South	Djibouti	0.272	42	179	East
Rwanda	0.478	16	130	East	Gambia	0.263	43	181	West
Lesotho	0.459	17	135	South	Liberia	0.26	44	182	West
Uganda	0.449	18	137	East	Guinea	0.259	45	183	West

Cote D'Ivoire	0.445	19	139	West	Democratic Congo	0.258	46	184	Central
Nigeria	0.44	20	141	West	Equatorial Guinea	0.25	47	185	Central
Cameroon	0.432	21	144	Central	Guinea-Bissau	0.231	48	186	West
Togo	0.43	22	147	West	Niger	0.166	49	188	West
Zambia	0.424	23	148	East	Chad	0.155	50	189	Central
Senegal	0.421	24	150	West	Central African	0.14	51	190	Central
Tanzania	0.42	25	152	East	Somalia	0.129	52	191	East
Sao Tome/Príncipe	0.407	26	155	Central	Eritrea	0.129	53	192	East
Benin	0.403	27	157	West	South Sudan	0.087	54	193	East

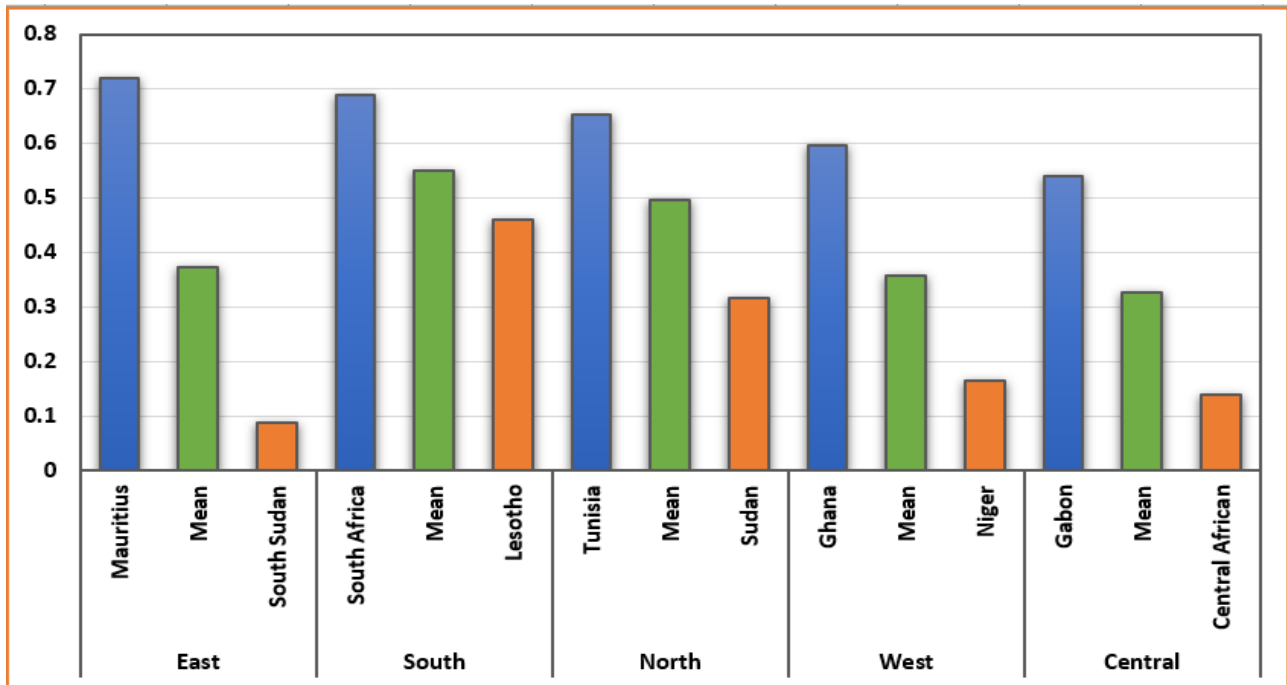
3.2. E-government in selected countries

Based on the above selection criteria and the values provided in Table 1, the nations included in this study are divided into two groups: the high EGDI group (i.e., Mauritius, South Africa, Tunisia, Ghana, and Gabon) and the low EGDI group (i.e., South Sudan, Lesotho, Sudan, Niger, and the Central African Republic). Only the highest and lowest nations, in each of the five regions, were selected. Figure 1 shows basic statistics regarding the countries chosen for this investigation. In each African region, the figure depicts the country with the highest and lowest EDGI. It also shows the mean EGDI value across all nations in that region. The difference between the highest and lowest EGDI scores versus the mean value is what we're aiming for here. These differences are most noticeable in the East, West, and Central regions. This represents the growing difference across countries in terms of OSI, TII, and HCI. When comparing Mauritius to South Sudan, for example, this is evident. The difference between the North and South regions is insignificant. This suggests that there is little difference between these countries. This is especially true in North Africa, where all countries' EGDI ratings are close to the mean (Benaida, 2024).

For example, the OSI, TII, and HCI indices for Mauritius are 0.7, 0.667, and 0.791, respectively, and it is among the upper-middle-income nations, but the indices for South Sudan are 0, 0.0652, and 0.1973, respectively, and it is among the low-income countries (United Nations, 2020). This suggests that the differences in e-government services supplied in different nations are accounted for by these indices. Moreover, when comparing South Africa (0.7471, 0.5832, 0.7371) to Tunisia (0.6235, 0.6369, and 0.6974), which has a very similar EGDI score (see Figure 1), the same findings are obtained. Niger (0.2941, 0.0737, 0.1304) and the Central African Republic (0.1294, 0.038, 0.2539), which have

almost similar EGDI values, likewise get the same findings (United Nations, 2020). Other factors or enablers that may be crucial in the growth of e-government services will be explored in Section 4.2.

Figure 1: EGDI among selected African nations



Source: Based on (United Nations, 2020)

In addition, Figure 1 depicts a significant disparity in e-government services between Southern and Northern African countries as compared to Eastern, Western, and Central African countries. In other words, the disparity between the lowest-ranked countries in the South and North is significant when compared to the lowest-ranked countries in the rest of Africa. Lesotho, for example, while having the lowest EGDI in the South, outperformed the East, West, and Central African countries. East African digital start-ups receive USD 1.2 billion in investment capital annually to generate local jobs in the digitalization. In domains such as education, consumer services, finance, and healthcare, they also stimulate economic growth and operating models. The province has rather good communications infrastructures, with about 75% of the population currently having access to the fourth-generation (4G) telecommunication service (African Union Commission, 2021). Table 2 shows some of the key statistics on Internet and mobile phone penetration in the countries studied.

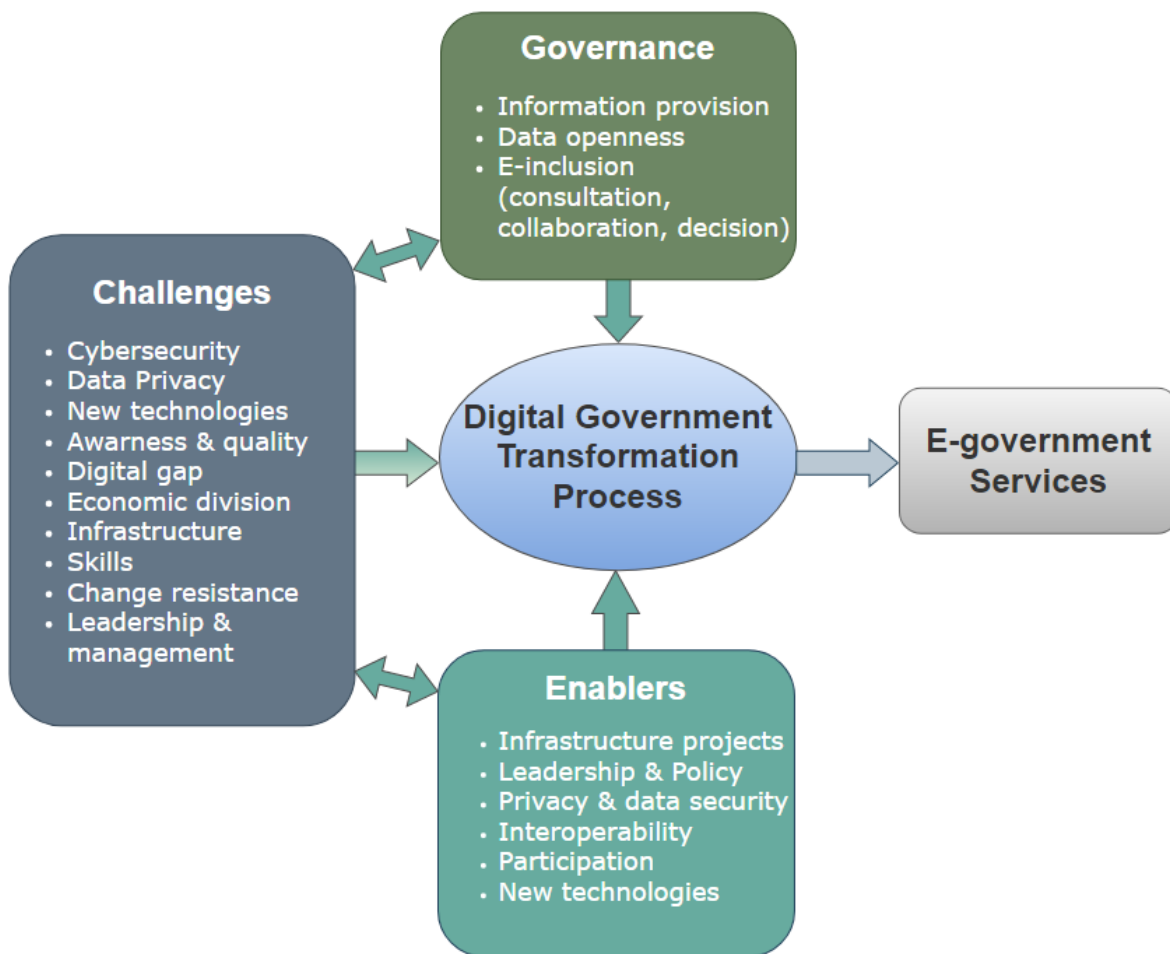
Table 2: Internet and mobile phone penetrations (Source: Based on (DataReportal, 2022; GSMA, 2022; United Nations, 2020))

Country	High EGDI Countries					Country	Low EGDI Countries				
	HCI	Internet penetration/population	Internet penetration/increased from 2021-2022	Mobile phone penetration/population	Mobile penetration/increases 2021-2022		HCI	Internet penetration/population	Internet penetration/increased from 2021-2022	Mobile phone penetration/population	Mobile penetration/increases 2021-2022
Mauritius	0.7911	65%	0.1%	154.3%	1.4%	Lesotho	0.5753	51.9%	10.8%	118.1%	10%
South Africa	0.7371	68.2%	1.2%	179.8%	4.6%	Sudan	0.3559	30.8%	2.4%	78.6%	3.4%
Tunisia	0.6974	66.7%	1%	135.9%	-3.8%	Niger	0.1304	13.6%	10.8%	47.2%	5.2%
Ghana	0.5930	53%	2.1%	140%	6.2%	Central Africa	0.2539	7.1%	20.8%	33.1%	10.2%
Gabon	0.6719	62%	2.3%	135.4%	2.3%	South Sudan	0.1973	10.9%	17.3%	28.4%	16.9%

4. Results

According to (United Nations, 2020), processes, governance, challenges, and delivered services are all important aspects of understanding e-government. Hence, the focus of this research is on analyzing in-depth the following: e-government challenges, enablers, governance, and outcomes or services offered in order to comprehend the e-government environment in ten African countries. Section 4 will cover these pillars by answering the research questions. The *Unified Model of Information Software Development Success* (Siau et al., 2010) was used for organizing and assessing the findings of the chosen countries. This model takes into account aspects that aid in the adoption of new technologies. This model is appropriate for this work since it adequately covers the e-government process input factors and output components (Bwalya, 2018). The findings of this article are summarized in Figure 2.

Figure 2: E-government transformation framework in Africa



The process of changing administration methods and approaches for engagement of community, authorities, businesses, services, and government policies via the use of digital technology describes the digital government transformation process notion (Yildiz, 2007). It places a strong emphasis on fulfilling the demand of people, minimizing the risks involved with using technology, and aligning people, businesses, information, resources, and technologies to support needed changes for the creation of public value (Chipeta, 2018). The transformation to e-government should be revolutionary in the notion that it supports a substantial shift rather than just little adjustments (Gebremichael & Jackson, 2006). It should make use of local expertise whilst still considering best practices from other nations. Since offering comprehensive online services necessitates a high level of cooperation between ministries and organizations, the digital transformation process should be collaborative (United Nations, 2020). The transformation process also entails luring and keeping the best digital skills a nation has to offer, as well as the capability of businesses and individuals (Buss, 2018; Solomon & van Klyton, 2020). Moreover, a necessary prerequisite of the transformation process is legislative engagement at the highest levels of government (European Commission, 2019). Digital transformation involves iterative steps, such as information availability, interaction, exchange, and integration among all actors in e-government services.

4.1. RQ 1: Challenges of e-government in Africa

This section goes deeper into the challenges of delivering successful e-government in Africa. To give these challenges more weight and to provide more precise guidance to different countries, we discussed challenges in both high EGDI countries and low EGDI countries individually. According to the European Commission report (European Commission, 2019), the fundamental aspects of e-governance include the government portal, secure data interchange, ICT infrastructure, digital databases, sectoral solutions, secure digital identification, and digital signature.

4.1.1. E-government challenges in high EGDI countries

As indicated by the metrics, the high-level EGDI countries identified in this article are the African leaders in e-government readiness. These countries' governments have consolidated the presentation of official websites so that individuals, companies, government employees, and tourists may access a vast number of services and information in one location. In addition, these countries have a comparatively high level of literacy. However, as discussed below, e-government services in these nations encounter some challenges. Table 3 summarizes these challenges.

Table 3: Challenges of e-government in high EGDI African countries

Challenge	Reference	Description
Cybersecurity	(Abusamhadana et al., 2021; Adu et al., 2018; European Commission, 2019)	<ul style="list-style-type: none"> • Lack of coordination and interoperability of e-governance implementation • Several ID numbers and methods are used
Data privacy	(Adu et al., 2018; Aluko, 2019; Bayaga & Ophoff, 2019; Bwalya, 2018)	<ul style="list-style-type: none"> • Individuals lack trust in e-government because of the lack of privacy • Lack of data protection legislation
New technology	(Abdulquadri et al., 2021; AfricanUnion, 2022; Blom & Uwizeyimana, 2020; InternationalFinance, 2019)	<ul style="list-style-type: none"> • Lack of flexibility and dynamic policies as more new technologies evolve • Lack of integration between new and legacy systems
Awareness & Quality	(Abusamhadana et al., 2021; EuropeanCommision, 2019; Owusu et al., 2022; Rorissa & Udoh, 2020)	<ul style="list-style-type: none"> • Lack of awareness among citizens • Lack of quality of service provided
Digital divide	(Abusamhadana et al., 2021; Adu et al., 2018; Amegavi et al., 2018; Bakon et al., 2020; Blom & Uwizeyimana, 2020; UN, 2020)	<ul style="list-style-type: none"> • Gap in infrastructure between urban cities and rural areas • Gap in technology adoption between urban people and rural area people

4.1.1.1. Cybersecurity

The reliability of e-government services heavily relies on robust cybersecurity (Mishra, Alzoubi, Anwar, & Gill, 2022). Attackers can exploit vulnerabilities to access sensitive information (Alzoubi et al., 2021; Buja, 2021), posing risks such as deception, theft, and data destruction (Shah et al., 2022). Although many countries are developing cybersecurity frameworks, the lack of a centralized e-governance coordination body remains a barrier (European Commission, 2019). To mitigate these threats, governments need integrated legislation and resilient technical tools (Abusamhadana et al., 2021). Yet, the continued need for physical visits to government offices due to incomplete digital integration wastes valuable citizen time.

4.1.1.2. Data privacy

Data privacy concerns discourage citizens from engaging with e-government platforms. Improper data handling can expose personal information to misuse (Alzoubi et al., 2022), with risks stemming from hypervisor attacks and device-level targeting (Bayaga & Ophoff, 2019). A perceived lack of guaranteed privacy further weakens trust (Bwalya, 2018). As services become more complex, the collection of personal data intensifies privacy challenges (Adu et al., 2018), despite the presence of data protection regulations. Hence, safeguarding digital identities and ensuring privacy remain vital (Mishra, Alzoubi, Gill, & Anwar, 2022).

4.1.1.3. New technologies

Adopting emerging technologies demands flexible frameworks and policy readiness (Abdulquadri et al., 2021). Although big data, IoT, and blockchain hold transformative potential for sectors like education and healthcare (African Union, 2022), their full implementation is limited by policy gaps and integration issues (International Finance, 2019). Challenges also arise from legacy systems, as seen in South Africa, and from a lack of skilled ICT personnel (Blom & Uwizeyimana, 2020). External pressures to quickly adopt new systems without readiness compound the issue (Bwalya, 2018).

4.1.1.4. Awareness and quality

Public awareness and perceived service quality significantly affect adoption. Without user understanding and trust, even well-funded e-government systems go underutilized (European Commission, 2019). Low uptake, despite major investments, results in dissatisfaction and service rejection (Abusamhadana et al., 2021; Rorissa & Udoh, 2020). To improve engagement, services must be tailored to user needs and promoted through citizen-inclusive strategies (Adam, 2020; Owusu et al., 2022). Barriers such as poor service quality, frequent power outages, and inadequate infrastructure outside major cities continue to hinder access (Abusamhadana et al., 2021; Rorissa & Udoh, 2020).

4.1.1.5. Digital divide

The digital divide persists due to socioeconomic disparities, insufficient infrastructure, and limited digital skills (Abusamhadana et al., 2021; Bakon et al., 2020). In high EGDI countries, rural areas often lag in ICT access and capability (UN, 2020). For example, South Africa experiences notable digital inequality between urban and rural populations (Blom & Uwizeyimana, 2020). Local governments struggle when addressing these issues independently, highlighting the need for collaborative strategies that draw from successful regional models (Adu et al., 2018).

4.1.2. E-government challenges in low EGDI countries

In addition to the challenges outlined for Africa's high EGDI countries, including cybersecurity, data privacy, new technology adoption, awareness and quality, and the digital gap, low EGDI countries face significant challenges in e-government services. These challenges may be divided into four categories: economic division, electricity disruption, limitations in digital infrastructure and ICT skills, resistance to change, and bureaucratic management. Table 4 summarizes these challenges.

Table 4: Challenges of e-government in low EGDI African countries

Challenge	Reference	Description
Economic division	(Abusamhadana et al., 2021; European Commission, 2019; United Nations, 2020)	<ul style="list-style-type: none"> • Low HCI and income are negatively related to the e-government services provided • Mobile phone penetration increases access to e-government services
Infrastructure limitations	(African Union Commission, 2021; ITU, 2020; Owusu & Penu, 2022; United Nations, 2020)	<ul style="list-style-type: none"> • Lack of ICT infrastructure and support systems • High cost and weak signal of the Internet
Electricity disruption	(Abusamhadana et al., 2021; DataReportal, 2022)	<ul style="list-style-type: none"> • Disruption in electricity hinders e-government services
Skill limitations	(Abusamhadana et al., 2021; Blom & Uwizeyimana, 2020)	<ul style="list-style-type: none"> • Lack of skilled labor • Lack of users' computer skills
Change resistance	(Abusamhadana et al., 2021; Bakon et al., 2020; Nokele & Mukonza, 2021; White et al., 2019)	<ul style="list-style-type: none"> • High resistance to changing culture • Lack of trust and satisfaction with new technology
Leadership management &	(Adam, 2020; African Union Commission, 2021; Mosehlana, 2019; United Nations, 2020)	<ul style="list-style-type: none"> • Political precepts slow down the development of e-government policies • Private investors and corruption decrease e-government success

4.1.2.1. Economic division

Low-EGDI countries struggle with affordability gaps that limit access to ICT. The economic divide refers to differences in income between those who can access digital devices and the Internet and those who cannot (United Nations, 2020). While low-cost smartphones help bridge this divide, disparities remain significant, especially when comparing mobile phone penetration and infrastructure across countries (Abusamhadana et al., 2021; European Commission, 2019). For instance, although Gabon is expected to outperform Ghana economically, Ghana's EGDI score is higher due to better digital reach and infrastructure.

4.1.2.2. Digital infrastructure limitations

Despite some infrastructure development, many low-EGDI countries lack the systems and investments necessary to support e-government (Mosehlana, 2019). Key limitations include inadequate broadband access, weak telecom investment, and high technology implementation costs (DataReportal, 2022; United Nations, 2020). Rural areas are especially affected by unstable internet connections and low availability of ICT services (ITU, 2020; Owusu & Penu, 2022).

4.1.2.3. Electricity disruption

Frequent power outages severely hinder digital public services (Tassabehji et al., 2019). Without electricity, governments and service providers cannot function effectively (Mukamurenzi et al., 2019; The World Bank, 2020). In 2022, only 6.7% of people in South Sudan and 14.3% in the Central African Republic had access to electricity (DataReportal, 2022). Even high EGDI countries like South Africa and Ghana occasionally face power shortages that limit e-service accessibility (Abusamhadana et al., 2021).

4.1.2.4. Skills limitations

E-government success depends on the availability of digitally skilled personnel (AfroSai-E, 2020). In many low-EGDI countries, staff training and user literacy remain inadequate. Partnerships with the private sector and regional knowledge exchange are crucial for capacity building (Verkijika & De Wet, 2018). Furthermore, low literacy and limited access to computers significantly constrain citizen participation. For example, South Sudan has a literacy rate of 34.5%, and only 6% of its population has access to computers (DataReportal, 2022).

4.1.2.5. Change resistance

Despite the introduction of digital ID systems and other initiatives, many citizens and officials in low EGDI countries remain reluctant to adopt new technologies. Cultural resistance and trust issues drive continued preference for paper-based processes (Nokele & Mukonza, 2021; Tiika et al., 2024). This hesitation is rooted in concerns over ambiguity, service quality, and unfamiliarity with digital systems (Abusamhadana et al., 2021; European Commission, 2019).

4.1.2.6. Leadership and management

Institutional capacity, leadership structures, and governance frameworks present persistent barriers. In countries like Sudan and the Central African Republic, issues such as corruption, informal markets, and policy delays complicate digital reforms (African Union Commission, 2021; Gao et al., 2023). Stronger support for public-private partnerships, better regulation, and clear governance mechanisms are essential to support sustainable e-government development (Adam, 2020; Mosehlana, 2019).

4.2. RQ 2: Enablers of e-government in Africa

According to the UN survey (2020) (United Nations, 2020), Africa has the largest percentage of nations that have shifted to a stronger EGDI score. Based on the ten nations examined, this section outlines the most important facilitators of e-government in Africa. Table 5 summarizes the enablers.

Table 5: Enablers of e-government in African countries

Enabler	Reference	Description
Infrastructure	(African Union Commission, 2021; ECA, 2022; European Commission, 2019; Evans, 2018; United Nations, 2020)	<ul style="list-style-type: none"> • High HCI isn't always related to improved e-government • A high degree of e-government is linked to a high level of infrastructure
Leadership & policy initiative	(Bwalya, 2018; Matsieli & Sooryamoorthy, 2021; Maumbe et al., 2008; United Nations, 2020)	<ul style="list-style-type: none"> • Leadership is crucial in promoting digitization and long-term prosperity • Policies for utilizing e-services, using the IT network, and engaging in illegal behavior, among other things, should be defined
Privacy & data protection	(Bayaga & Ophoff, 2019; Bwalya, 2018; Mutimukwe et al., 2019; Soutter et al., 2019; United Nations, 2020; Verkijika & De Wet, 2018)	<ul style="list-style-type: none"> • Using methods for data protection, administration, privacy, and security to exchange data • Individuals and businesses should be included in the evaluation of privacy and security concerns
Participation	(Adam, 2020; Bayaga & Ophoff, 2019; Maumbe et al., 2008; Nokele & Mukonza, 2021)	<ul style="list-style-type: none"> • Promote the individuals and businesses to modify or suggest changes to e-government services • Promote transparency, trust, and self-monitoring values
Innovative technologies	(African Union Commission, 2021; Bwalya, 2018; United Nations, 2020)	<ul style="list-style-type: none"> • Utilizing the new technology can enhance e-government services • Provide required training and self-learning utilizing forums, professional websites, and portals

4.2.1. Infrastructure projects

Robust infrastructure, both ICT and physical, remains fundamental to e-government development, especially in lower EGDI nations (Okan, 2024). High-income countries with stronger HCI and TII scores are better positioned to expand Internet services and advance e-government systems. Initiatives like the African Information Society Initiative support sector-specific digital strategies, while Agenda 2063 includes 114 ICT projects aimed at improving Internet exchange points and expanding fiber networks (African Union Commission, 2021; ECA, 2022). Investments in Internet availability must be matched with efforts to enhance digital literacy and infrastructure capacity (European Commission, 2019). Still, infrastructure alone is not sufficient; countries like Niger have shown that strong government commitment can help overcome resource and development gaps (United Nations, 2020).

4.2.2. Leadership and policy initiative

Visionary leadership and effective policy frameworks are critical enablers of digital transformation. Reform-oriented leadership helps remove roadblocks related to e-government and ICT strategy implementation (Abdulnabi, 2024). Regional collaborations like Smart Africa highlight the growing recognition of digitalization as a shared responsibility (United Nations, 2020). Governments must implement policies that protect users and digital systems, while balancing regulation to avoid stifling small enterprises (African Union Commission, 2021; UNECA, 2019). Multi-level governance often requires inter-agency cooperation (Matsieli & Sooryamoorthy, 2021). African-wide charters and conventions, including those addressing democracy, cybersecurity, and governance, provide a legal and policy foundation for accelerating digital development (European Commission, 2022).

4.2.3. Privacy and data protection

As e-government services generate vast data assets, safeguarding digital privacy is essential. Proper use of this data can improve service delivery and public value. However, rising cyber threats necessitate strong protections (Alzoubi et al., 2022; Bayaga & Ophoff, 2019). While some countries like Mauritius have implemented encryption policies and public privacy declarations, 22 African nations still lack basic cybersecurity legislation (United Nations, 2020). National objectives increasingly include risk management, open data, and citizen-centric service evaluation (Benaïda, 2024). Enhancing security features, promoting cybersecurity awareness, and ensuring training and reporting mechanisms are key for sustained trust in digital governance (Verkijika & De Wet, 2018).

4.2.4. Participation

Public engagement fosters trust and accountability in digital governance. Participation also increases service utilization and ensures that e-government tools are responsive to citizen needs (Zhang & Kimathi, 2022). For instance, Ghana's e-government strategy emphasizes transparency and curbing corruption (Adam, 2020). Citizens value the opportunity to verify how their information is handled, even if they are not actively participating (Nokele & Mukonza, 2021). Some governments encourage user-generated service design and feedback loops, while countries like

Tunisia promote regulations that support citizen access and collaborative development of services (Abdulnabi, 2024; Bayaga & Ophoff, 2019). Performance monitoring and public-private partnerships also support effective service rollout (Bwalya, 2018).

4.2.5. Innovative technologies

Emerging technologies such as blockchain, machine learning, and AI offer new ways to improve e-government services. These tools enhance data management, reduce duplication, boost privacy, and streamline service delivery (Bwalya, 2018; United Nations, 2020). Regional platforms like the Science, Technology, and Innovation Forum and the Commission on Science and Technology for Development support knowledge exchange and training for government officials, promoting informed adoption of innovative tools (African Union Commission, 2021).

4.3. RQ 3: Governance of e-government in Africa

The terms e-governance and e-government are often used interchangeably; however, they are not identical. E-governance, like e-government, lacks a completely agreed-upon worldwide definition (Bwalya, 2018). E-government aims at providing governmental services and information to enterprises and people via ICTs, while e-governance aims at managing e-government services (Okan, 2024). E-governance's goal is to improve services and information delivery to the public and businesses, boost the efficiency and openness of government services, and encourage citizen engagement in decision-making. Moreover, E-governance entails new leadership strategies, new service delivery methods, educational, policy, and investment decisions, as well as citizen coordination and engagement (e.g., their needs, responsibilities, and empowerment) (Tiika et al., 2024). Communication and collaboration, problem-solving, information literacy, digital content production, and safety are the five characteristics of digital competence identified by the European Digital Competence Framework for Citizens (DigComp) (European Commission, 2022). The UN report 2020 (United Nations, 2020), on the other hand, listed three components of e-governance: e-participation (decision-making, consultation, and information supply), e-transparency (open government data (OGD)), and inclusion (e-inclusion). Accordingly, this study will investigate e-governance through three pillars: information provision, the openness of e-government, and e-inclusion. Table 6 summarizes these pillars.

Table 6: Governance of e-government in African countries

Governance aspect		Description
Information provision (European Commission, 2022; Lapõnin, 2018; Nunes et al., 2017; United Nations, 2020)		<ul style="list-style-type: none"> • Delivery of services that are accessible to the public • Wireless connection in public areas increases e-participation
Data openness (Lapõnin, 2018; United Nations, 2020)		<ul style="list-style-type: none"> • Government data available openly to the public • Transparency
E- Inclusion (Adam, 2020; Baxter, 2020; Bayaga & Ophoff, 2019; Bwalya, 2018; ECA, 2022; Kazim, 2021; Lapõnin, 2018; United Nations, 2020)	Consultation	<ul style="list-style-type: none"> • Services' consultation and planning • Feedback, participatory planning, voting device applications
	Collaboration	<ul style="list-style-type: none"> • Collaboration in production • Tools to enhance collaboration, such as social media
	Decision-making	<ul style="list-style-type: none"> • Empowerment of the public to contribute to decision-making • Trust between the government and the public is a key factor in decision-making

4.3.1. Information provision

The focus on the management elements of providing services and information to the public is the first pillar of e-governance (Rarhoui, 2024). There is now a phenomenon forward into offering a single portal where businesses and individuals can obtain documents, data, and information, fulfill the statutory duty, conduct transactional services, and engage in more governance participation. Furthermore, consumers may personalize their integrated electronic range of services depending on individual requirements (Thela et al., 2025). The way forward is to develop integrated digital strategies that combine local, global, and regional concerns. At the regional and national, and local levels, a large number of African nations have indeed implemented digital transformation initiatives, such as the e-governance academy in Mauritius and the development of ID systems in more than 50% of African nations by 2020 (United Nations, 2020). In addition, the African Union Convention on Cyber Security and Personal Data Protection, and the African Charter on Democracy, Elections, and Governance. Also, the PRIDA was launched in 2019 to resolve Internet service demand and supply issues are other initiatives supporting this goal (European Commission, 2022).

4.3.2. Openness of e-government

E-governance, on the other hand, focuses on encouraging openness, responsibility, and transparency to build proactive governance. Various studies suggest that 50–73 billion USA dollars are unlawfully smuggled from Africa every year (e.g., taxes not paid to the government) (Tiika et al., 2024). Establishing an e-tax platform, for example, will undoubtedly help in such a situation. Open government data is becoming more popular as new patterns in government data emerge, as well as the associated dangers and obstacles. The number of nations that have established open government data platforms has risen dramatically, from 46 in 2014 to 153 in 2020 (United Nations, 2020). Therefore, data governance is necessary to guarantee that data is managed professionally and

strategically to allow data-driven decisions (Asamoah, 2019). Balancing the politics and economics of managing data, as well as the governance of the developing data privacy and security, is required to extract public benefits of big data. Governments must take a whole-of-government approach to build an overall data governance mechanism that is backed up by great leadership and a data strategy, since data governance involves even more than specific skills (Adam, 2020). The African Union Convention on Cyber Security and Personal Data Protection, which is also known as the Malabo Convention on Cyber Security and Personal Data Protection, is a form of data governance that was signed by a voluntary agreement of 18 African countries in 2014. Moreover, all African leaders accepted the Smart Africa initiative, which was driven by the Smart Africa Manifesto, at a meeting in Addis Ababa in January 2014. The Manifesto suggested an emphasis on ICT infrastructure, e-government services, the openness of e-government data, and private enterprise strengthening (United Nations, 2020).

4.3.3. E-inclusion

The use of ICT to involve people and companies in public consultation, administration, and decision-making is known as e-inclusion (Bwalya, 2018). Inclusion is an important aspect of governance as well as one of the cornerstones of long-term growth. According to the 2030 Sustainable Development Agenda, e-inclusion may play a critical role in improving policy quality, responsiveness to users' demands, government accountability, and trust in government (ECA, 2022). Table 7 shows the E-Participation Index (EPI) and Open Government Data Index (OGDI) scores based on (United Nations, 2020), as well as the governmental links, for each of the ten countries studied in this article. The EPI examines how the authority utilizes Internet service to provide the public with information in three ways: cooperation, consultation, and decision-making. The OGDI, on the other hand, looks at how open government data can be used (OGD). Three important characteristics are identified by the OGDI: policies and regulatory frameworks, platform (presence of OGD site and features), data accessibility in diverse areas like education and health, and data usage (e.g., organizing hackathons) (United Nations, 2020). Although Mauritius and Ghana have the most publicly accessible data on their websites, their e-inclusion score is in the middle. South Africa, on the other hand, fared higher on the rate of e-inclusion despite having a lower OGDI. Gabon fared poorly on both the OGDI and the EPI, and the authorities of the Central African Republic and South Sudan do not provide open government data on their websites, resulting in very low EPI scores.

Table 7: EPI and OGD in selected nations (source: based on (United Nations, 2020))

Country	High EGDI Countries			Country	Low EGDI Countries		
	OGDI	EPI	Links		OGD	EPI	Links
Mauritius	0.931 high	0.642	www.csu.mu	Lesotho	0.358 low	0.345	http://www.gov.ls/
South Africa	0.896 high	0.750	http://www.gov.za/	Sudan	0.068 low	0.214	https://esudan.gov.sd/
Tunisia	0.793 middle	0.690	https://www.epeople.gov.tn/main.do	Niger	0.152 low	0.297	http://www.gouv.ne/
Ghana	0.931 high	0.631	http://www.ghana.gov.gh/	Central African Republic	0.000 low	0.142	https://www.gouv.cf/
Gabon	0.200 low	0.273	http://www.gouvernement.ga/	South Sudan	0.000 low	0.023	https://www.eservices.gov.ss/

5. Discussion

This paper intends to address three research questions: What challenges do African nations encounter when it comes to establishing e-government? (RQ1) What are the unique enablers of African e-government? (RQ2), and what are the unique aspects of e-government governance in Africa? (RQ3). RQ1 was answered in Section 4.1, RQ2 was answered in Section 4.2, and RQ3 was answered in Section 4.3.

In this paper, e-government was investigated in ten African nations that represent the highest and lowest nations with e-government services indicators according to the UN report 2020. All high nations have demonstrated strength and effectiveness in the use of e-government, while the majority of low nations still lag. The findings show that while both low and high groups confront a myriad of challenges, the low nations have more difficulties than the high nations. So, while the high group may confront technological and strategic challenges relating to security and privacy, the low group also faces similar concerns on top of their fundamental infrastructure and poor human capital challenges.

Although nations in Africa still fall behind other nations in other regions like Europe, there are encouraging indicators of faster development of e-government. The majority of nations that have shifted to a stronger EGDI classification between 2018 and 2020 are in Africa (28% or 15 countries) (United Nations, 2020). Africa continues to confront several ICT-related issues, which have been

made worse by the COVID-19 epidemic. Rapid advancement is mostly hampered by a lack of substantial and inexpensive Internet connections. The percentage of people with access to phone service was about 88.4% in 2021, with 3G service at 77.4% and 4G service at only 44.3% (ITU, 2021). Personal Internet usage is below 30%, just 7.7% of families have computer access, and 14.3% of homes have an Internet connection (ITU, 2021). This demonstrates that there is a substantial usage divide, with people who reside in areas that have good network coverage may not utilize the Internet due to a lack of accessibility, price, or capabilities (Ejemeyovwi et al., 2021). 33.1% of people had access to the Internet through mobile broadband, while relatively few still use fixed broadband. The age group of 15 to 24 years old used the Internet at a rate of 39.6% (ITU, 2021). The unstable and unpredictable supply of power, the low level of skilled people, the low levels of literacy, and the degradation are further causes (Rarhoui, 2024).

There is indeed a lot of promise in ICT infrastructure improvement, as well as incorporated innovations like Cloud computing, IoT, and AI. This depends on improvements in the adoption of these technologies, customer growth, and significant restructuring of data management and governance models. In the fields of the financial sector, agriculture, and medical services, there have been some substantial AI implementations (Tiika et al., 2024). The COVID-19 epidemic has had a significant influence on Africa and has forced companies, individuals, and authorities to embrace online services. This has accelerated digitalization and altered attitudes toward cutting-edge communication networks like 5G (Bosman, 2021). The findings demonstrate a significant increase in the number of services that may be executed by several e-government websites in African countries. This does, in essence, show that e-government is moving in the right way. Moreover, there have been several existing and planned projects to govern the e-government system in Africa. In order to improve services or participate in decision-making, several African countries encourage OGD, consultation, and feedback from their inhabitants and businesses. Although there are just nine of these nations, the future looks promising as more nations are pursuing this objective.

Beyond infrastructure deficits, low-EGDI countries also suffer from weak political commitment, fragmented institutional leadership, and bureaucratic inertia, all of which hinder digital transformation (Asamoah, 2019). In several cases, overlapping mandates among government agencies result in poor coordination, delayed policy implementation, and inefficient resource allocation (Mahlangu & Ruhode, 2020). Moreover, cultural resistance to change and low public trust in digital systems pose additional challenges (Aluko, 2019). Many citizens in these regions prefer traditional, paper-based transactions due to limited digital literacy and fear of data misuse. The absence of consistent awareness campaigns and citizen-centric service design exacerbates this issue, making e-inclusion difficult to achieve. Therefore, addressing managerial inefficiencies, enhancing leadership accountability, and fostering public engagement are just as critical as improving infrastructure. A more holistic, human-centered approach is essential for inclusive and sustainable e-government advancement in Africa.

5.1. Recommendations and future directions

There is a sizable skill shortage in Africa throughout all specialties, according to data from a small number of nations, with substantial regional variance. Many nations, however, do not compile statistics on ICT proficiency. Future attempts to close the shortfall must focus on stepping up data collection. Some success has been achieved in the regulatory underpinning of cyberspace, with most African nations having implemented cybersecurity regulations (Assay, 2019).

The bulk of e-government-related efforts was launched by Western nations or organizations and intended to match Western strategies that are typically viewed as unrealistic for African circumstances. To be more realistic in judgments, rational and thorough debates about Africa and how to implement e-government must provide strong conclusions (Tiika et al., 2024). This perspective could imply that Africa has made little progress in e-government overall and that there is doubt about the veracity of these efforts, especially when it comes to bringing Western machinery and skills to Africa. Due to the mishandling of e-government funding by dishonest project leaders, several poor countries are finding that e-government is more of a fantasy than a reality (Blom & Uwizeyimana, 2020). In an ideal scenario, it seems that African e-government projects may lead to an extension of the stated conditions for e-government, which, in comparison to the Western countries and the reality of the situation in Africa, are substantial (Rarhoui, 2024). As a result, the situation is difficult to identify and even more challenging to compare to Western settings. When discussing and conceptualizing e-government across Africa as a whole, one should be cautious when drawing broad conclusions regarding commonalities and variances (United Nations, 2020). There is little question that many African nations share the observed sociopolitical commonalities in reality, similar to any other mainland. Consequently, it is difficult to tell one from the other. However, there are also significant differences within and across nations. Therefore, e-government setups that function in one nation might or might not function for others. Future efforts may expand the number of African nations included as well as investigate other aspects and characteristics of African e-government services (United Nations, 2020).

In Africa, a lot of initiatives, programs, and projects have been started, and constructive ICT breakthroughs have also been supported and complemented by constant advancements in the legislative framework that is more centered on collaborative governance (Rorissa & Udoh, 2020). The traditional governmental conception cannot effectively handle the digital economy in the twenty-first century (European Commission, 2022). A modern management architecture is therefore required to reform the nation. Because the majority of economic, medical, and educational services are now provided by private companies, autonomous entities often strive to create e-government services. A national e-governance plan can speed up and improve productivity in the workplace (Okan, 2024). However, all actors in the community must contribute to the digital transformation's success. The country won't be able to participate in digitalization, which includes both communication and data evolution, if the essential reorganization for e-governance cannot be completed. E-government presents significant potential since the technological reorganization that will take place in the new government structure will also accelerate socio-economic growth. Future considerations must be paid to swiftly integrate the e-government system and create the required legislation to avoid informational and economic deprivation (Bwalya, 2018).

Authorities have integrated and streamlined procedures using ICT to enhance the delivery of services. Nevertheless, due to the quick development of new technology and the shifting demands of contemporary society, authorities may have to reconsider, update, or indeed completely overhaul how they provide services and engage with the general public (Benaïda, 2024). Authorities are aware of how data and technology may change business procedures, customer interactions, and delivery of services in supporting more intelligent e-governance. To guarantee that all areas of governance are managed effectively and are harmonized within the governance process, the evaluation of an enormous quantity of data has become essential. For instance, such models may manage the investments and activities necessary to generate the anticipated returns while incorporating all the legislative, sociological, and economic components of a country (United Nations, 2020). Essential goals should serve as the foundation for the digitized government plan, and all intended objectives must be handled comprehensively. The establishment of e-governance, the creation of a centralized coordinating body, an integrated service model approach, and systems thinking are all requirements.

To ensure actionable progress, future initiatives should prioritize targeted investments in capacity-building, digital literacy programs, and legal frameworks for data protection and cybersecurity, especially in countries where data is scarce or absent (Assay, 2019). Governments could also leverage regional programs such as the *Smart Africa* initiative and form public-private partnerships to bridge the digital divide. Future research might include case studies in underrepresented low-EGDI countries to capture diverse realities. Moreover, integrating e-government with democratic goals—such as participatory governance, citizen feedback mechanisms, and open government data—can foster transparency and strengthen e-democracy (Rorissa & Udoh, 2020). This alignment would shift the focus from mere digital service delivery to empowering citizens and enhancing accountability. As digital infrastructure grows, national strategies must embed inclusivity and trust-building to ensure that technology adoption also advances democratic engagement and equitable access across African societies (Aluko, 2019).

5.2. Limitations

Despite the efforts made in this paper to cover various African regions and the highest and lowest EGDI countries, we encountered a severe lack of academic references (journals and conferences) on a number of the selected countries (i.e., central Africa, South Sudan, Lesotho, Gabon, Sudan, Tunisia). The majority of findings of this paper are based on reports from reputable institutions, including the World Bank, UN, ITU, and European Commission. Although these publications give an in-depth insight into the state-of-the-art of e-government in Africa, academic research is crucial to giving a further understanding of each country, particularly from sociotechnical perspectives. Additionally, there is relatively little research on the many types and features of websites in the African context, particularly in Sub-Saharan nations. Thus, this need should be covered in future research. Future research may also be required to comprehend how authorities resolve issues to enhance ICT systems and promote the provision of sustainable e-government services.

Another key limitation of this study is the focus on only the highest and lowest EGDI-ranked African nations, which may introduce selection bias and limit the generalizability of the findings. Excluding mid-tier countries means the analysis may not fully capture the diversity and transitional dynamics of e-government development across the continent. Future research could address this gap by including a broader range of countries and employing stakeholder surveys or interviews to gain a more representative understanding of challenges, enablers, and user perspectives across different EGDI levels.

6. Conclusions

African governments are increasingly adopting e-government services to improve citizen engagement and service delivery. However, the effectiveness of e-government implementation across the continent remains uneven. This study analyzed the state of e-government in ten African countries, contrasting those with high EGDI scores (Mauritius, South Africa, Tunisia, Ghana, Gabon) and low EGDI scores (South Sudan, Lesotho, Sudan, Niger, Central African Republic). These nations were selected to represent diverse regional and economic contexts. The findings reveal significant progress in e-government adoption, though disparities persist. Advanced e-government services are often linked to higher economic levels, yet some low-income nations have also achieved success. Key challenges include outdated digital infrastructure, extreme poverty, and limited technical expertise, which hinder broader adoption and improvement. Conversely, enablers like leadership, ICT growth, and strategic government policies play a critical role in fostering development. For e-government to thrive, a comprehensive strategy addressing these disparities and involving stakeholders across all sectors is essential. This study provides valuable insights into the enablers, challenges, and governance of e-government, offering a foundation for African nations to enhance their digital services. Tailored strategies that consider these complexities are crucial for driving progress in the digital era.

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Conceptualization, YA & AM; methodology, YA; validation, AM; analysis, YA&AM; writing—original draft preparation, YA & AM; writing—review and editing, YA & AM. All authors have read and agreed to the published version of the manuscript. All authors have read and agreed to the published version of the manuscript.

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