# The Integration of Technology into Public Ministries

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## Abstract

Multiple authors have come to view Africa as a victim of the fourth industrial revolution (4IR). It is viewed as a continent which has not been able to take part as one of the driving forces of technological advancement. This perspective came into realisation upon the dawn of the fourth industrial revolution. This is a result of the continent's state during the first, second, and third industrial revolutions where Africa's role had been of a more minimal nature. This assumption is however not true when considering how multiple countries in Africa have embraced and entrenched technology into the daily operations of their government institutions during the 4IR. To this end, the paper aims to highlight whether there is an improvement in the e-government of African countries. This would in turn mean that they are taking advantage of the 4IR. Following this, it will further indicate the ability of the African continent's readiness for this revolution. It will do so by providing an observation of the development that technology has fostered within service delivery using five African states as case studies namely South Africa, Mauritius, Nigeria, Rwanda, and Tunisia. It will analyse the transformations that have occurred from 2000 to 2022, and whether there is an increase in the overall quality of the services provided. The paper uses secondary sources as a mechanism to analyse the impact that the introduction of technology has had on government systems in the five African countries. The main focus will be on the ministries of home affairs, finance, education, transport, and health. The paper will analyse how the incorporation of technology has improved the service delivery of these departments and departments that are of similar nature in the above-mentioned countries.

## Introduction

Governments worldwide share a common objective which is to foster better ways to govern their states. To this end, there has been an adoption of numerous methods including the implementation of digital technologies. These growing implementations within African states has led to the current growth in the implementation of the Digital Transformation

method (Alenezi, 2022:1). This strategic method aims to improve service delivery and customer experience through the implementation of e-government in government systems (Alenezi, 2022:1). Mechanisms such as Information and Communication Technologies (ICTs) have also been implemented in order to foster communication between the government of a country and its people. This is because governments aim to create and foster relations with their stakeholders, which involves the general public (Alenezi, 2022:1). Through the information collected from ICTs, e-government can be further applied to inform government decisions with regard to facilities that are utilised by the Republic (Alenezi, 2022:2). Therefore, this paper aims to analyse the effectiveness of Africa's ministries regarding its implementation and integration of e-government mechanisms. This will be achieved by firstly providing a methodology section to introduce the research methods that will be utilised for the paper. Secondly, it will provide a conceptual framework that will elaborate on the concepts and their relevance to the paper. This will be followed by a brief outline of Africa's digital experience in the first three revolutions. Thereafter, a literature review will be provided to elaborate on literature that has been explored with regard to the topic in the past. Furthermore, a case study analysis will provide an analysis of five African countries that represent the five regions of the continent. The case study analysis will examine the effectiveness of the ministries in the five countries regarding their e-government integration mechanisms. A conclusion will summarise the key aspects of the paper along with the provision of recommendations that will suggest ways to better the implementation and integration of e-government in African ministries.

## Methodology

The study makes use of the qualitative research method that Lim (2010:19) defines as a method that observes and compares case studies in order to arrive at a certain conclusion. Haradhan (2018:20) notes that an advantage of qualitative research is its ability to establish research frameworks with the use of available data, however, he further notes that its disadvantage is that it does not utilise statistical data sets. The use of journals, books, and document analysis from ResearchGate, Google Scholar and other academic databases will be utilised as a means of reference and of gathering data for the study. Additionally, the use of case study analysis will be adopted as the paper will track the transformation of public ministries as they have continued to integrate ICTs into their institutions from 2000 to 2022. The paper focuses on this period because from the year 2000-2010, e-Governance initiatives were launched in African countries (Rarhoui, 2024:6). The paper continues into 2022 to accommodate the current digital evolutions in the African continent. The case study countries that will be analysed will be South Africa, Mauritius, Nigeria, Rwanda, and Tunisia. These countries in particular were chosen based on a sense of providing regional representation of what e-governments look like across the continent in the respective regions.

Currently, there seems to be a debate about Africa's readiness in its totality for the 4IR which it finds itself being a participant of. Most literature, currently, highlights the lack of proper infrastructure that is needed in order to successfully integrate technology into the continent by scholars such as Kuzub (2023), Kayembe and Nel (2019:79), and African Development Bank (2019:7). The lack of necessary infrastructure is viewed as the hindrance to the successful adaptation of technology by African countries.

The ministries that will be utilised in this paper they commonly shared growth within the African continent (Vota, 2024). Countries such as Benin have adopted e-government in their Education and Transport industries where they applied e-Services such as electronic driver's licence exams and the publication of their national exam results. Kenya, on the other hand, also explores e-Services such as the online registration of birth and marriage certificates and the online application for driver's licences (Vota, 2024). Rwanda has introduced a payment engine known as IremboGov as well as e-Services that allow for the application of birth certificates and driver's licences online (Vota, 2024). Lastly, there is South Africa, which has implemented immigration control, passport registration, pension payment and bank verification that is linked to home affairs (Vota, 2024). These countries all share an improvement in similar ministries such as the health, finance, and home affairs ministries thus, these are the ministries that will be analysed in the paper.

## Conceptual and Theoretical Framework

The paper perceives and adopts the definition of what governments are that is provided by Heywood (2019:110), which states that the government refers to the institutions that make legally binding decisions in a society (Heywood, 2019:110). Furthermore, it defines governments as institutions which have the authority to govern within a country (Fasenfest, 2010:771). This idea of what a government is can be regarded as the traditional type of government. e-government, however, refers to the integration of the Information and Communication Technologies into government systems as a means of enhancing service delivery (Kolachalam, 2012:2). This new definition is also referred to as digital government. The study also notes Terrance's (2023:190) argument that even though e-government and e-governance are used interchangeably, they have different decisions. Grönlund and Horan (2005:713) indicate that this interchangeability is due to the two belonging to what is known as the e-Gov field.

### E-Government

E-government, however, observes how government information from the national and local spheres is delivered to the overall society, businesses, and other government organisations using technological means (Nokele and Mukonza, 2021:102). It is expected to increase government's efficiency in the aspects of service delivery, improvements in citizen participation, and an increase in government trust from the society (Ntulo and Otike, 2013:1). Furthermore, e-government allows for the government to communicate information to citizens, businesses, and other government agencies through the internet (Rarhoui, 2024:3). ICTs are applied in government operations in order to reduce financial costs whilst improving workflows and processes between government agencies (Rarhoui, 2024:3).

### e-Governance

e-Governance is defined as the technology induced services by the government in order to establish and facilitate the transformational relation between themselves and society (Bannister and Connolly, 2012:10). Terrance (2023:191) simplifies e-Governance as being concerned with the way in which ICTs are used in order to design policies and during the decision-making process. Nokele and Mukonza (2021:102) highlights that e-Governance focuses on the allocation, the administration, and the management of resources in an institution.

## E-Government and E-Governance

According to Hafkin (2009:2), "e-governance is the outcome of e-government done well". The adequate establishment and implementation processes of e-government and e-governance is expected to bring about more efficiency in the public domain as noted by Nokele and Mukonza (2021:103). E-governance can be utilised to assist governments in the process of reinventing themselves and building a closer relationship with their citizens (Hafkin, 2009:2). Without e-Governance, e-government would take the form of a common business (Hafkin, 2009:2).

## E-Government applications

There are three government applications namely, government to government (G2G), government to citizen (G2C), and government to business (G2B). Government to government refers to the relationship between two government agencies (Hamza, Sehl, Egide and Diane, 2011:285). A successfully implemented G2G has the required resources for collaboration ready with the intention of providing the required services for the citizens of a country (Hamza et al. 2011:285). Government to citizen refers to the shift from an administrative approach to a user-centric one that emphasises a service-oriented state (Pappa and Stergioulas, 2006:1). Additionally, government to business (G2B) involves e-Services which aim to ensure that all services required by the private sector such as tax payments, the registration of business information, and licence renewals are conveniently available when required (Stančić, Ivanjko, & Garic, 2007:3).

## Information and Communication Technology (ICTs)

Information and Communication Technologies (ICTs) refer to the utilisation of telecommunication technologies such as computers and cell phones for the provision of information (Ratheeswari, 2018:45). E-government utilises ICTs as a means of increasing the distribution of information to society through the use of the internet (Alenezi 2022:3). Additionally, the implementation of ICTs assist in making government systems and operations more efficient thus, not only improving the quality of service delivery, but also the societal experience (Alenezi 2022:3).

## Theoretical Framework

For the purpose of this study, the paper will make use of the Digital Divide Theory. The term digital divide was introduced in the middle of the 1990s and was used to define the gap between those with access to the new variations of technology and those who do not (Srinuan and Bohlin, 2011:1). The Digital Divide Theory will be used to challenge the argument that African states are not ready for the 4IR. The theory of digital divide is not only restricted to access to technical infrastructure, but also to social infrastructure which supports ICTs (Srinuan and Bohlin, 2011:8). Van Dijk (2017:1) highlights that when examining the digital divide the common factors that are identified and discussed are computers, the internet and sometimes, smartphones. The theory identifies three levels of factors which influence the digital divide (Srinuan and Bohlin, 2011:8). The first level is the technology access approach which is followed by the multidimensional approach that argues that it is not only the access to technology that matters, but also socio-economic status, skills, geography, and education (Srinuan and Bohlin, 2011:8-9). Lastly, the digital divide must be studied in multiple ways which observe different factors such as age, gender, and race (Srinuan and Bohlin, 2011:9). Additionally, the digital divide may be investigated

from the individual to the spatial/multinational level (Pick and Sarkar, 2016:3888). For this research, the digital divide will be analysed from the first level. It will look at the internet penetration and the number of smartphones within a country to determine the spread of e-government within the case study countries.

## Literature Review

The literature review will elaborate on what the industrial revolutions entail with a close reference to the fourth industrial revolution. A provision on Africa's involvement in the industrial revolutions in the past will be provided to provide context and to show the change since then.

### The Fourth Industrial Revolution (4IR)

The First Industrial Revolution (1IR) discovered the steam engine which mechanised labour (Mamphiswana and Bekele, 2020:1). The Second Industrial Revolution (2IR) introduced electricity, which led to the invention of electric motors that led to the creation of new industries (Mamphiswana and Bekele, 2020:1). Furthermore, the 2IR improved the manufacturing facilities in such a way that capacity increased (Mamphiswana and Bekele, 2020:1). The Third Industrial Revolution (3IR) introduced semiconductors such as computers which led to an increase of efficiency and speed in production (Mamphiswana and Bekele, 2020:1). The Fourth Industrial Revolution, however, is unique to its predecessors as it introduced and adopted cyber, biological, and physical technologies (Mamphiswana and Bekele, 2020:3). The technologies allow for the internet to be utilised in the process of distributing products at a cost affordable price (Mamphiswana and Bekele, 2020:3).

4IR includes aspects such as Artificial Intelligence and the Internet of Things (IoT) (Mamphiswana and Bekele, 2020:1). However, this paper will be focusing on an aspect of IoT and these are the ICTs (Abdul-Qawy, Pramod, Magesh, and Srinivasulu, 2015:71). This is because IoT technologies such as computers have an influence on ICTs (Abdul-Qawy et al. 2015:71). Moreover, IoT technologies affect different devices and expand the internet to allow for accessibility (Abdul-Qawy et al. 2015:71). Through the utilisation of IoT technology, communication and real-time message delivery is possible through cell phones and computers (Abdul-Qawy et al. 2015:76).

Governments could benefit from IoT technologies due to their ability to create innovative services or to enhance the current existing ones (Papadopoulou, Kolomvatsos and Hadjiefthymiades, 2020:99). Through the utilisation of ICTs, a number of domains in government can greatly improve (Papadopoulouet al. 2020:99). These include the health, transportation, communication, security, and defence, and even the energy related domains (Papadopoulou et al. 2020:99). Through the implementation of IoT technology, governments can benefit from improved efficiency, effectiveness, reduction in costs and improved health and safety measures, amongst others (Papadopoulou et al. 2020:100). Data privacy issues, uncoordinated data policies, uncoordinated data governance, costs, integration issues, and IT infrastructure limitations can lead to impediments on IoT application for e-government initiatives (Papadopoulou et al. 2020:101).

### *e-Government*

There is an array of debates on whether the 4IR and e-government will bring about a more prosperous globe and even continent. Generally, the correct implementation of e-government is expected to bring about a more effective government with more effective communication (Ntulo and Otike, 2013:1). Some of the advantages of the adoption of e-government are firstly that it is expected to be a more affordable way of executing service delivery (Ntulo and Otike 2013:16). This notion is further supported by Ndou (2004:8), Joseph (2015:20) and Alshehri and Drew (2010:81) with the latter indicating that the effective implementation of e-government will lead to a reduction in time, efforts, and costs incurred by customers and organisations when accessing government information and services. This is because effective and efficient service delivery leads to a decrease in overall costs (Joseph, 2015:20). Secondly, Ntulo and Otike (2013:16) indicate that it makes certain processes quicker for example, certain information can be accessed through official government websites which is quicker and more affordable than the traditional process of needing to go through multiple agents. Al Salmi and Hasan (2015:214), however, argue that the implementation of the new processes and systems are expensive. A point which Joseph (2015:31) also highlights as they argue that the necessary infrastructure is costly.

Furthermore, Ndou (2004:9) and Kamatula (2010:152) highlight that e-government brings about better government-to-citizen and government-to-business relations and less corruption. Alshehri and Drew (2010:81) explain that this is due to the increase in government transparency that will be brought on through the implementation of e-government. Al Salmi and Hasan (2015:214), however, disagrees with this notion and argues that face to face communication fosters a greater environment for transparency and accountability. Joseph (2015:29) emphasises that e-government breeds the false belief that there is accountability and transparency in government processes. Furthermore, the authors highlight that e-government leads to hyper-surveillance which explores the idea that e-government affects the security of government data such as the personal information of citizens (Al Salmi and Hasan, 2015:214). Furthermore, Joseph (2015:29) argues that the risk of cyberbullying and cybercrimes also increases as more valuable information is known to be accessible online.

In contrast, Kamatula (2010:152) provides a more optimistic view of e-government and argues that it allows for life-long learning through the use of e-Learning. Adequate implementation of e-government mechanisms is also expected to contribute to economic development as it will allow for a closer relationship between businesses and citizens, while also providing businesses with broader access to the larger international market through the use of government online tools (Kamatula 2010:152). E-government is also expected to lead to a creation of new jobs and businesses (Alshehri and Drew 2010:81). Joseph (2015:29), however, indicates that even with this there will be organisations and citizens that will be excluded due to the digital divide. Joseph (2015:29) further stipulates that this can be tracked down to the lack of access to technology. Terrence (2023:196) further elaborates that this will cause disparities because the majority of the citizens who do not have access to e-government which in turn marginalises them.

## Africa in the First, Second and Third Industrial Revolution

Shava (2022:127) provides brief definitions of the first, second, and third industrial revolutions. Firstly, he defines the first industrial revolution (1IR) as the revolution which established the use of water and steam in order to foster mechanised production. The

second industrial revolution (2IR) was then introduced as the industrialisation which ushered in mass production and manufacturing with the use of electricity, oil, and petroleum (Shava, 2022:127). Aircrafts and vehicles were some of the interventions that came out of this revolution. The third industrial revolution (3IR) introduced the use of information technology and electronics, hence it was known as the digital revolution. It led to the establishment of the use of nuclear power, telecommunications, and computers amongst other forms of electronics as a way of improving methods of production (Shava, 2022:127–128).

Noting the above, it is essential to highlight that Africa's role during the first, second, and third revolution was minimal. Generally, the revolutions fostered more trouble for the continent rather than benefits as the continent endured periods of strife more than peace. Emmanuel (2022:91) cites these periods as being one of African slavery for the 1st industrial revolution, one of colonialism for the 2nd, and the period of neo-colonialism for the 3rd industrial revolution. More specifically during the 1IR, African slaves were transported through the Atlantic ocean as Europe experienced high levels of production brought on by steam engines (Benyera, 2021:14). Furthermore, Benyera (2021:14) highlights that it was during this revolution which led to the loss of human capital in Africa as Africans were traded away as slaves to other countries. In the 2IR Africa was ushered into the colonial era, whereby it lost most of its sovereignty and natural resources. During the 3IR Africa experienced a loss of political sovereignty due to the perpetuation of colonist data (Benyera, 2021:16) since the colonists enforced their ideologies into the African countries that they had colonised thus, replacing the ideologies and knowledge of the Africans with those of their colonial powers. These issues widened the disparities between Africa and the globe therefore, leaving Africa more marginalised as cited by Emmanuel (2022:91).

## Africa's Readiness For The 4IR

Doorsamy, Paul, and Marwala (2021:91) adopt an optimistic stance and argue that Africa may not be as far off from technological advances of the 4IR because these technologies are already traced to have observed and to have an impactful and contributing role to the African continent, since the continent has already begun to take part in the global economy (Doorsamy et al. 2021:91). This view is, however, challenged by authors such as Ukobizaba, Nsabayezu, and Uworwabayeho (2022:2); Benyara (2021:129); and City Press (2016), with the latter arguing that Africa will least benefit from the 4IR.

Ukobizaba et al. (2022:2) notes that poor leadership, mismanagement, corruption and political instability form part of policy structure, cultural, and institutional obstacles faced by the continent therefore, this further makes it more disadvantageous during the 4IR. These issues are experienced on different levels by the African states, which renders them of different levels of unreadiness. Kuzub (2023) supports this by highlighting that currently, African states and cities are at a different level of readiness. Underdeveloped states are, however, noted to witness more of a struggle to adapt to the 4IR due to their ongoing struggle to adapt their systems to the 3IR (Ukobizaba et al. 2022:1–2). Countries such as Niger, Lesotho, Ethiopia, and Ghana are considered as countries that fall within this category (Ukobizaba et al. 2022:2). Study Press (2016) argues that in its current state, most of the continent has a low level of readiness with regard to meeting the required level of future production. City Press (2016), likewise with Kuzub (2023), argue that the continent has poor infrastructure and therefore needs to foster solutions to this issue before it will harness the 4IR at its best. The former further argues that there is a lack of adequately

skilled people and that the continent will not benefit from the 4IR, whereas the latter argues that the continent has the potential to drive global innovation.

Benyara (2021:129) embodies a more radical view and argues that the result of the 4IR in Africa will be a repeat of the 1st, 2nd, and 3rd revolution, except this revolution will result in the technological slavery of the African continent. Additionally, the author argues that the 4IR will lead to the recolonisation of Africa. This same ideology is fancied and elaborated upon by Mude, Maeresera, and Maramura (2022:3) who argue that the 4IR may pose a risk of historical repetition for the continent. These viewpoints highlight how certain scholars view Africa's position in the 4IR, a position which seems to deem Africa as not being ready or capable of harnessing the technologies of the 4IR without falling victim to it, since it has fallen victim to the revolution preceding this one.

ICT application in government institutions can bring a great benefit as highlighted (Papadopoulou et al. 2020:100; Ntulo and Otike 2013:16). These benefits can range from more affordable service delivery application and communication (Ntulo and Otike, 2013:1; Ntulo and Otike, 2013:16) to reduction costs for government institutions (Papadopoulou et al. 2020:100). However, as Papadopoulou et al. (2020:101) had stipulated that issues such as uncoordinated governance and data policies can impede on the application of ICTs in government. Africa, according to Ukobizaba et al. (2022:2), is in a state where corruption, political instability and poor leadership will make 4IR disadvantageous to the continent. This will then make ICTs disadvantageous and will impede on their successful applications (Ukobizaba et al. 2022:2).

## Case Study Countries

This section aims to highlight the developments that countries have undertaken to further enhance the execution of services using ICTs. It aims to highlight some of the development which states have installed and are executing as part of e-government.

### South Africa

South Africa introduced the National E-Government Strategy and Road Map in 2017 to encourage the digitalisation of government services and to establish a digital environment that will be inclusive for the whole society (Government Gazette, 2017:5). The government further aimed to place focus on infrastructure development as a way of rolling out e-government through online e-government platforms and through the government departments (Government Gazette, 2017:11). Akande and Van Belle (2019:n.p) observe a noticeable progress in South Africa with regard to its shift into the electronic era. The E-Government Development Index highlights that South Africa has moved 0.4902 out of 1 in 2004 and ranks 55 out of 193 countries to 0.7357 out of 1 with the rank of 65 in 2022 (E-Government Development Index 2004 and 2022). ICT tools such as the internet have been implemented into numerous businesses and institutions such as government departments, financial services, and hospitals (Akande and Van Belle, 2019:n.p). Therefore, making the provision of service delivery more effective and making internet access easier for most citizens. Blom and Uwizeyimana (2020:n.p) further indicate that in South Africa, the introduction of e-services has assisted in bringing more efficiency in public service delivery.

E-Learning refers to the process of educating oneself through the utilisation of digital media and related electronic tools such as cell phones and online courses (Basak, Wotto, and Bélanger, 2018:194). Through the e-Learning process, assets have been made available to allow people to educate themselves or their children when they are unable to attend school (Blom and Uwizeyimana, 2020:n.p). During the Coronavirus pandemic, both higher institutions of learning utilised online platforms in order to conduct virtual classes with students. The Department of Basic Education launched an e-learning programme in 2004, which has been transforming over the years (Blom and Uwizeyimana, 2020:n.p). Furthermore, the Department of Basic Education has made it possible for newly graduated matriculants to access and receive their final year academic results through the Department of Basic Education's website.

Government information regarding COVID-19 was shared online with the use of SMS (Blom and Uwizeyimana, 2020:n.p). The department of health introduced the e-Health service in 2012 to assist with the diagnostic and treatment of HIV clients (Blom and Uwizeyimana, 2020:n.p). E-health has led to a reduction in the number of people that are required to physically go to hospitals since they now have access to their doctors using online platforms, which allows them to receive telemedicine and telehealth and provided patients the ability to contact and consult with their doctors and nurses online (Blom and Uwizeyimana, 2020:n.p).

South Africa established the e-Natis, a system that allows for licence bookings to be conducted online as well as an e-justice system, which assists in providing citizens with access to judicial services (Blom and Uwizeyimana, 2020:n.p). Moreover, the South African Revenue Services has implemented innovative digital services that increase user experience and helps SARS to collect revenue (Ramoriting 2022). Citizens can now conduct their filing online using the e-filing platform, thus reducing the actual physical waiting time that occurs when one goes to the branch in order to file for tax returns. The elimination of paper has sped up the process of tax collection and has increased risk control (Ramoriting 2022). The effective collection of tax helps the government to be more effective in delivering services that require funds from SARS.

The ministry of home affairs has not only embarked on the digitisation of public records but has also allowed for a more digital approach for executing certain home affairs functions. For one, the department of home affairs has established a booking system known as the DHA Branch Appointment Booking System, which allows for citizens and residents to make bookings if they wish to visit home affairs branches whether it is for capturing of their biometrics, for making an application, or for booking before collecting a passport or ID amongst other things (Department of Home Affairs, 2023). Additionally, the department allows for the option for one to be an e-Citizen which allows them to use e-HomeAffairs, a website that allows members of the society to complete and submit online applications for their IDs and passports amongst other things, as well as to make payments and attach necessary documents for their applications (Department of Home Affairs, 2023b).

According to South Africa's Government Gazette (2012:48), the future policy direction is dependent on the telecommunications industry. This is due to the influence that policies have had in shaping the telecommunications industry to advance key objectives such as infrastructure development and universal access (Government Gazette, 2012:48). Through the regulatory framework, alternative service providers such as Dark Fibre Africa (DFA), Fribreco, and 8ta have been launched (Government Gazette, 2012:48). South Africa aimed

to develop its infrastructure in rural and previously disadvantaged areas in order to make services affordable in those areas (Government Gazette, 2012:49). However, the Government Gazette (2012:49) stipulates that the development in telecommunication industries across the country has led to a positive impact on the market. This is highlighted through the investments, employment opportunities, and improvement in some service delivery areas (Government Gazette, 2012:50).

A Green Paper was launched in 2000 as a framework for development of e-government in South Africa (Government Gazette, 2012:64). The objectives and framework stipulated in the Green Paper informed the Electronic Communications and Transactions Act of 2002 (Government Gazette, 2012:65). DPSA (Department of Public Service and Administration) has become the driver of e-government services in the country (Government Gazette, 2012:65).

### Mauritius

The E-Government Development Index reflected a 0.5055 out of a score of 1, and a ranked position of 51 out of 193 to a score of 0.7201 with a ranking of 75 out of 196 in 2022 (E-Government Development Index 2004 and 2022). The Digital Mauritius 2030 Strategic Plan (2018:2) stipulates that the Information and Communication Technologies Authority released its report stating that Mauritius was one of the top performing countries in the League of Nations with regard to its internet penetration that stood at over 75% in the year 2017. International rankings further emphasised the above-mentioned rankings through a report stating that Mauritius was recognised as one of the dominant players in ICT application as it has surfaced as a leader in the continent (Digital Mauritius 2030 Strategic Plan, 2018:2).

The Ministry of Technology, Communication, and Innovation introduced the Strategic Plan as a blueprint that would continue to grow its digital economy and provide employment for the youth (Digital Mauritius 2030 Strategic Plan, 2018:2). The strategy highlighted a digital government and observed ICT infrastructure, Cyber Security Talent Management, and innovation (Digital Mauritius 2030 Strategic Plan, 2018:2). Digital government was viewed as a mechanism that would further allow Mauritius to embrace the fourth industrial revolution in a way that it could be used in e-government for reengineering of administrative processes and fragmented services to better address the needs of its people and the businesses within the country- in its economy (Digital Mauritius 2030 Strategic Plan, 2018:2).

Through the utilisation of big data, smart mobile apps, data sharing, open data, and so forth, the Strategic Plan aimed to foster transparency, openness, better decision making, and an integration of services for both the businesses and the citizens (Digital Mauritius 2030 Strategic Plan, 2018:2). Thus, the government introduced the Mauritius Artificial Intelligence Council which would serve the purpose of realising the government's objective on leading Mauritius into a country of technology that would benefit both the citizens and the businesses (Digital Mauritius 2030 Strategic Plan, 2018:2).

According to the Ministry of Information Technology, Communication, and Innovation (2023), the Mauritian ICT sector is now a pillar of the economy in the country, standing as the third pillar. Mauritius has implemented a number of strategies with the aim of ensuring that their people are digitally ready and that their infrastructure is well-suited for the transition and thus, for a digital economy (Ministry of Information Technology,

Communication, and Innovation, 2023). Measures which allow the citizens of Mauritius the ability to access government services online, lower their telecommunication costs and place Mauritius at a position where they can capitalise from their good governance, infrastructure, and their knowledgeable youth, amongst other measures, were introduced.

There is an Internet Management Committee which was appointed through the Information and Communication Technologies Act of 2001 (Information and Communication Technologies Act 2001:n.p). Furthermore, the act states that the committee is tasked with "providing a forum for stakeholders to discuss issues relating to the administration of internet". This notes that its objectives are "democratise access to information taking into account the quality, diversity, and plurality in the choice of services available through the use of information communication technologies" (Information and Communication Technologies Act 2001: n.p). The act also states that its authority is to implement the policies of the government that relate to the ICT industry (Information and Communication Technologies Act 2001:n.p), policies such as the National ICT, which aims to establish an environment that encourages knowledge sharing and aims to close the digital divide (Mauritius National ICT Policy, 2007:14). This is in support of Mauritius's goal to become an ICT hub in its region and to have the ICT industry as its fifth pillar (National ICT Policy 2007:14). Its goal is seemingly achievable when observing its status as one of the top-ranking technology advanced countries on the continent.

An example of information sharing is in the Mauritius' e-Health system which provides data for hospitals and clinics to use as it manages the movement and storage of information through the Electronic Medical Record (EMR), and the Health Information System (HIS). These systems are similar to those of South Africa (SIL, 2023). Furthermore, the system allows for an interaction between clients, clinics, and hospitals from anywhere. This in turn leads to an improvement in the productivity of hospitals as departments, patients, and staff are all better managed since there is better management on the number of beds available, access to medical records, online prescriptions can be done, and patient registration amongst other things can be conducted online (SIL, 2023).

Furthermore, similarly to its African counterparts, Mauritius has an online e-filing system which allows for its citizens to file for their tax returns online and to execute the actual payment online (Mauritius Revenue Authority, 2023). Additionally, the website allows for online application of the Tax Residence Certificates, financial assistance such as child allowances, and allows for the online booking of appointments. Moreover, the Ministry of Education, Tertiary Education, Science and Technology of Mauritius established an online website for the Mauritius Examinations Syndicate. This website allows for people to complete online applications for being supervisors, assistant supervisors, invigilators and allows for examination candidates to apply for the online statement of their examination marks (Mauritius Examinations Syndicate, 2023).

The Mauritius Police Force headed by the Department of Home Affairs also incorporates e-government mechanisms. For example, the police force has the responsibility of issuing out driving licences which can be applied for through the online application (Mauritius Police Force, 2023). Furthermore, through the website, members of the society may submit online applications for driving lessons and also make payment for the lessons using the online service.

## Nigeria

Adeyemo (2011:11) highlights that Nigeria is one of the most fast developing ICTs countries in the African continent. It established the Nigerian e-Government Interoperability Framework (Ne-GIF), which has the purpose of ensuring that two or more Ministries, Departments, and Agencies (MDAs) processes that are undertaken are delivered with the use of ICTs (NITDA, 2019:3). Following this implementation, the E-Government Development Index, highlighted an increasing score from 0.3807 out of 1 in 2018 to 0.4406 in 2020 (E-Government Development Index, 2020). This is exceptionally a larger increase from 0.2485 out of 1 and ranking 141 out of 193 that it received in 2004 (E-Government Development Index, 2004). Following the 2020 increase, there was a further increase to 0.4525 and ranking 140 out of 193 countries in 2022 (E-Government Development Index, 2022). Nigeria has a similar structure as that of Rwanda, Tunisia, South Africa, and Mauritius as it also allows for the online application of visas and passports with the former also having the option that allow for one to receive their visa upon arrival (Ministry of Interior, 2023). Furthermore, the ministry allows for one to create citizenship online application, as well as to establish an online registration of a place of worship. This system which is known as the Nigeria Immigration Service (NIS) is regarded as one of Nigeria's most developed and operationalised systems (Okunola. Rowley and Johnson, 2017:3).

The federal minister of transportation/marine and blue economy has also established a system that allows for the online registration, the computerised vehicle inspection, and the registration of a licence (Federal Ministry of Transportation/ Marine and Blue Economy, 2023). The Digital Government Service (2023) provides both citizens that reside within the borders of Nigeria and those that do not with the services of executing payments to their government, of booking and being placed in the waiting line for government services, on browsing through government posted jobs, for validating whether government issued certificates and documents are from the government and for the payment of custom duties, as well as registering businesses and paying taxes. It can be considered as a one government stop that combines certain government departments for example, the ministry of the interior (visa and ID registration), the ministry of transportation (licence registration and vehicle registration), and the ministry of finance (checking tax statuses).

During the Covid-19 pandemic, the Nigerian Federal Ministry of Education partnered up with uLesson as an effort of disseminating education online across the country (International Trade Administration, 2023). Furthermore, the website has additional benefits such as assisting with preparing students for their exams in both primary and secondary schools.

According to the National ICT Policy (2012:8), Nigeria aims to fully integrate communication technologies and information into their socio-economic development. This is with the intention of transforming the country into a knowledge-based economy (National ICT Policy, 2012:8). In 2012, a new ministry was created in Nigeria and it became the Ministry of Communication Technology (National ICT Policy, 2012:8).

The telecommunications industry in Nigeria grew from 2001 and placed the country at a level where it became the fastest growing mobile market in the African continent (National ICT Policy, 2012:14). Numerous Acts including the Nigerian Communications Act 2003 and the Wireless Telegraphy Act, 1990 exist to regulate the supply of telecommunications services in the country (National ICT Policy, 2012:14). Through the National ICT Policy (2021), Nigeria aims to facilitate the development of a legal framework that will ensure the facilitation of an effective implementation of ICT related policies (National ICT Policy,

2012:24). The National ICT Policy further aims to promote digital, cyber, ICT infrastructure, and national security (National ICT Policy, 2012:24).

## Rwanda

Rwanda is one of the countries in Africa that holds e-government and ICTs in high regard (Twizeyimana, Larsson, and Grönlund, 2018:21). It has been defined as being the best low-income country in terms of online service delivery (Murenzi and Olivier, 2017:145). Its growth can be identified through the use of the E-Government Development Index, which shows an increase in the country's e-government development and the integration of technology in government systems. The index highlights an increased score from 0.2511 out of 1, and a ranking of 140 out of 193 in 2004 to 0.5489 and ranking 119 in 2022 (E-Government Development Index 2004 and 2022). Twizeyimana et al. (2018:21) further notes that in its aim to accomplish technological integration into government systems, the government has placed a notable amount of effort into implementing their strategy of merging ICTs into government institutions. This was an attempt by the government to accomplish their Vision 2020 goal (Nawrat, 2020). A vision aimed to transform Rwanda to a middle-income Rwanda as compared to its current low-income status (Twizeyimana, Larsson and Grönlund, 2018:21). The IREMBO project also known as the "one-stop government" in Rwanda is an initiative that was established by both the private sector and the public sector in order to create a space whereby various departments would be able to share information and to execute public service delivery in a single place (Bakunzibake, Klein and Islam 2019:5). Mainly, the initiative aimed to digitalise services such as driving licences, road traffic, and motor vehicle inspection amongst 100 other services (Twizeyimana et al. 2018:22).

The Rwanda Directorate General of Immigration and Emigration (2023) indicates that due to the integration of technology in government institutions, the ministry of the interior of Rwanda has advanced to such an extent that it is capable of issuing e-passports to citizens. The IREMBO encompasses most of the country's services including registering for an ID, a foreigner ID, Visa applications, and executing a Deferred Payment Arrangement (DPA)- a service that is offered by their Ministry of Interior (Twinoburyo, Munu, Vlaminck, and Dushime, 2022:45). Additionally, the Ministry of Infrastructure in Rwanda is responsible for the development of multiple aspects of government operations including the development of transport and certain human settlement factors amongst other developments (MININFA, 2023). For the sake of this article, developments regarded to transport will be provided with more observation. The ministry of infrastructure facilitates and established the Vehicle Registration System in Rwanda (MININFA, 2023b). However, the IREMBO provides citizens with the options of applying for the licence tests and licence renewals (Rwanda National Police, 2023). The Ministry of Finance and Economic Planning which facilitates the Rwanda Revenue Authority (RRA) has also allowed for the establishment of the online registration of vehicles and also manages and allows for administration of the collection of taxes and customs in the country (RRA, 2023). Electronic filing for taxes such as the submitting of payments have been encouraged in Rwanda ever since 2015 through the use of e-tax and M-declaration (Megersa, Santoro, Carreras, Mukamana, Hakizimana, and Nsengiyumva, 2023:n.p).

Twinoburyo et al. (2022:30) notes that during 2013-2019, over 24 000 patients were able to receive support using the RapidSMS, which is an online platform that establishes open clinics and medical records and has gathered a membership of 48 hospitals. Furthermore, Rwanda has established a universal primary healthcare system through establishing a partnership

with Babylon Health, which will be paid through the use of the insurance scheme known as Mutuelle de Santé and reaches over 90% of the population (Nawrat, 2020). This makes Rwanda one of the few developing countries which has managed to establish such a facility. This system assists in bringing doctors and nurses closer to citizens and citizens will be able to conduct consultations with their doctors online using the system. Moreover, the government in partnership with Partners in Health has managed to establish an electronic health record system which initially assisted in the record keeping of the HIV citizens in the country, and it currently covers the record keeping of all types of clinical records (Nawrat, 2020). This service is expected to reduce the plaguing threat of people self-diagnosing and misdiagnosing themselves as they will have access to doctors and nurses within minutes as compared to the usual longer waiting time and necessary travel. Since there will be less cases of citizens misdiagnosing themselves, there will be less complications for citizens and the government in the long-run and more effective service delivery in the country will be achieved (Nawrat, 2020).

### Tunisia

The Tunisian government introduced the initiative of e-government in 2002 (Nasri 2019:31). The unit was established under the presidency with the aim of monitoring the implementation and recommendations of projects that are related to e-government (Nasri 2019:31). Following the establishment of the unit, multiple other ministries began establishing their own networks whereby they provided easier access to services. Additionally, the Ministry of ICT launched the Tunisia National Digital Strategy 2021-2025, which aims to lead to the establishment of infrastructure and lead to a state that will be data driven (GSMA, 2023). The E-Government Development Index further showcases the e-government improvement in Tunisia, especially when observing the score that it received in 2004 as compared to its 2022 score and ranking. The index highlights an increase from the score of 0.3227 out of 1 received in 2004, and the ranking of 120 to the score of 0.6530 in 2022 and the increased ranking of 88 out of 193 countries. In 2017, the government of Tunisia announced that in the near future the country would have an e-Visa application which allows for a quicker and therefore, more time efficient online application (Tunisia e-Visa, 2023). Furthermore, the Ministry of Health also announced the establishment of the Digital Health Development Initiative which was established with the purpose of managing the flow of patients that will in turn improve the overall care that patients receive as there will be better transferability (IST Africa, 2023). Additionally, doctors will have the option of remote patient monitoring and will have the ability to provide their patients with telemedicine with the use of telemedicine tools.

In 2007, the government of Tunisia's goal was to connect all primary schools to the internet and to provide 20% of the courses through e-Learning (Hamdy, 2007:6). Furthermore, in 2020, the government advocated for the usage of e-Learning using the Moodle Distance Learning Platform (MDLP) that belongs to the Virtual University of Tunis (VUT) in their country (Sghari and Bouaziz, 2022:1).

Currently, the most used and popular e-government service is the online tax filing, which allows not only for the filing of tax returns but also calculates the tax returns that individuals and companies are to either receive or that they are required to pay (Mellouli, Bentahar, and Bidan, 2016:197-198). The ministry of finance introduced the online tax collection system, which allows for the actual payments of taxes and other duties (Ecofin Agency, 2019). The

use of bank cards in order to conduct electronic payments of taxes and fines is expected to be exercised through the use of the new system known as the Rafik (Ecofin Agency, 2019).

## Discussion

There are still hindrances to the adequate facilitation and implementation of ICTs in government departments. The lack of infrastructure to support e-government practices is a common reason behind the ineffectiveness of the hindrance of the excellent execution of e-government (Blom and Uwizeyimana, 2020:n.p). Even though there is a lack of infrastructure, African countries have been presenting an increase in the use of technology. When observing the E-Government Development Index, it can be deduced that there is progression in African states, regardless of the initial disadvantage they have due to their colonial history. In all the five case study countries, transformation and growth is observable as the scores of all countries have showed growth and indicating that there is e-governmental development in the countries. In addition, it is notable to add that Rwanda and Tunisia have not only highlighted an increase in their scores but have also increased in their rankings from 140 in 2004 to 119 in 2022, and from 120 in 2004 to 88 in 2022 (E-Government Development Index, 2004 and 2022), respectively. This highlights the ability of African states to not only adapt but to also adopt the use of technology in government institutions, which in turn fosters effective, efficient, and high-quality service delivery.

All the countries that have been utilised for the study have showcased an improvement in their penetration rate, with South Africa having an internet penetration rate of 68.2% in 2022 (Kemp, 2022a), a significant increase from 5.3% in 2000 (Uys and Pather, 2017:27) being one of the leading countries out of the five in terms of internet penetration. Although this may be viewed as a digital divide by the digital divide theory, there has been a significant improvement as more people are connected and may therefore, utilise online government services. Additionally, South Africa reached an impressive mobile cellular subscription at 167.4% in 2022, an increase from 17.81% in 2000 (Statista 2024f), as well as a smartphone penetration of 92.1% in 2022, a commendable improvement from the 3.3% in 2001 (South African Government News Agency 2023). Mauritius also revealed a prominent internet penetration rate of 64.9% in 2022 (Kemp, 2022b), an increase from 7.28% (Index Mundi, 2024a). They show an impressive cell phone penetration of 166.25% in 2022 (Observatory Mobile 2022). There are weaknesses with these figures as most are estimates and with the cell phone penetration data, one may consider that at times, members of society have more than one mobile device and this device is also counted in the data.

Tunisia also showcased a significant internet penetration of 66.7% (Kemp, 2022d), an improvement from 2.75% in 2000 (Index Mundi 2024c). Along with the internet penetration, Tunisia had a high mobile cellular subscription per 100 inhabitants of 129.3% in 2022, a large increase from 1.2% in 2000 (Statista 2024c). Nigeria and Rwanda also still with large disparities have also highlighted an improvement from an internet penetration rate of 0.06% in 2000 (Statista 2024a), to a rate of 38.73% in 2022 (Statista 2024b). They, however, have one of the largest mobile cellular subscriptions per 100 inhabitants at 222% in 2022, a significant increase from 0.03% in 2000 (Statista 2024d). Rwanda, similarly, although considered one of the most technologically advanced countries on the continent with a healthy E-Government Development Index had an internet penetration rate of 26.3% in 2022, a +3.7 increase from 2021 (Kemp, 2022c). This is lower than half the population

however, it is commendable considering that it represents an over 100% improvement from 2000 when it had an internet penetration of 0.06% in 2000 (Index Mundi, 2024b). Additionally, they have indicated an improvement from 0.48% in 2000 of mobile cellular subscriptions per 100 inhabitants in Rwanda to 79.9% in 2022 (Statista 2024e).

It is however essential to note that there are rooms for improvement in all the countries. The digital divide remains and is still larger for some countries than others. This in turn disadvantages and excludes some people in the countries from accessing certain services that are provided through e-government such as making an online booking and payment for one' visa, ID, or passport. Additionally, in the case of Rwanda, there is an issue on the e-Health service which has been indicated as being a service that is only accessible to high income earners who have access to smartphones (Twinoburyo et al. 2022:30). Furthermore, the authors note that there is a lack of trust in e-services thus making members of society more hesitant to use services that are provided online. Lack of knowledge on how to utilise the services is also brought on by e-government (Murenzi and Olivier, 2017:149), which in turn causes hesitation in society when they are expected to use the provided services. Uwizeyimana (2022:6) argues that during the Covid-19 pandemic, Rwanda's government failed to efficiently and effectively deliver services because children in some public schools were left behind in terms of education as they had no online facilities to utilise during the lockdown. In Nigeria, it is argued that it is mostly private institutions of higher learning that are able to improve the e-Learning adaption and the use of technology however, this is due to their self-financing nature as well their smaller range of students (Eze, Chinedu-Eze and Bello, 2018:6). Public schools do not also fare due to the lack of infrastructure inducing substantial technology, as well as the limited funding that they receive while catering for a larger student base.

South Africa is noted as having a notable digital divide in the country, with those on lower income levels being more disadvantaged than those in the middle- and high-income level (Murenzi and Olivier, 2017:146). Bridging the gap between the lower income, middle income, and higher income segments in African countries is essential in ensuring that adequate service delivery is delivered to the overall society. This divide is notable in all of the case studies however, even with its presence, it can be argued that Africa is not at risk of being a victim of the 4IR. This is specifically true when considering that the E-Government Development Index reflects growing scores for e-government development in the African countries that are observed in this paper. The scores are considerably higher than those of other Asian and even European countries such as India, which ranked 105 in 2022, Kyrgyzstan which ranked 81 in 2022, Iraq ranked 146, and the Republic of Moldova which ranked at 71 in 2022, a longer ranking than that of South Africa and 4 rankings higher than Mauritius (E-Government Development Index, 2022).

## Conclusion and Recommendations

This paper set out to illustrate the growing potential of digitalisation and e-government in African states and managed to illustrate this through analysing the E-Government Development Index, which highlighted improvements in the studied countries. Through this, it aimed to highlight Africa's capabilities to take advantage of the 4IR as compared to falling victim to it as it had to the 1IR, 2IR and 3IR. Firstly, the paper explained that it utilises the qualitative research method as it makes use mainly of academic sources in order to enforce its argument. Furthermore, it highlighted the definitions of e-government, e-Governance,

and ICTs before explaining the difference between e-government and e-governance which are commonly used interchangeably. It elaborated on the difference between the two by elaborating on e-government and how it refers to government information being disseminated to businesses, societies, and other government using technology (Nokele and Mukonza, 2021:102). Whereas e-Governance is noted as being the use of ICTs in order to design policies and to allow stakeholders to partake in decision-making processes (Terrence, 2023:191). The paper acknowledges and notes Africa's weakness in terms of the lack of infrastructure, which is necessary in order to promote the full integration of technology into government departments that will in turn bring out more efficient and effective service delivery. However, it argues that Africa is ready for the 4IR as opposed to contrary beliefs that it is not. The paper noted the technological advancements that ministries have adopted in the five case study countries for example, the case studies mostly highlight a more technological approach to health, which has witnessed the establishment of e-Health systems such as online medical records and consultations between patients and doctors. Additionally, most of the case studies established systems which allow for the online application of driving licences, vehicle registrations, e-filing for tax returns, online applications for e-Visas, and online applications for passports for citizens. The paper also noted some of the strategies that have been undertaken by the countries in order to foster an environment which will encourage better e-government systems in the countries.

With the above being mentioned, the paper argues that Africa is adapting to the 4IR and points to the E-Government Development Index highlighting the growth in scores of South Africa, Mauritius, Nigeria, Rwanda, and Tunisia, with Tunisia and Rwanda further showing an increase in their overall ranks out of the 193 global countries that are considered by the index. It highlights that these Africans are at higher odds than certain European and Asian countries, which in turns indicates that these countries have better adaptability and are highlighting a better development of e-government adoption than countries that belong to the more developed continents in the globe. In order to improve its adaption to the 4IR, the paper considers the following recommendations.

As argued by Murenzi and Olivier (2017:168), governments in Africa should work on promoting ICT literacy, as this will in turn lead to citizens not only being able to use the e-services that are provided by their governments but will also increase the level of trust that they have in their governments and the services that they provide using online platforms.

Moreover, countries should all work on increasing the internet penetration in their countries (Uwizeyimana, 2022:9). This will ensure that the digital divide does not increase as more people will have access to e-services such as e-Learning. This in turn will ensure that less people are left behind in trying times such as those of Covid-19. Governments should work on implementing ICTs in schools and through exposing students in the primary, secondary and tertiary levels. This will improve knowledge sharing at homes as these students share their knowledge with those around them, including the elderly. In addition, the governments should engage with more developed governments in order to enable knowledge-sharing. This will assist them with closing the gap in their knowledge on further implementing e-government techniques.

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