# 4IR-Based Capacity-Building Interventions: A Need To Improve Service Delivery In South African Municipalities

Mncedisi Ncamphalala<sup>1</sup> and Shikha Vyas-Doorgapersad<sup>2\*</sup>

<sup>1</sup>Postgraduate Student, School of Public Management, Governance and Public Policy; College of Business and Economics University of Johannesburg, South Africa Email: mncedisin@uj.ac.za
<sup>2\*</sup>Corresponding Author: Professor, School of Public Management; Governance and Public Policy; College of Business and Economics; University of Johannesburg, South Africa, Email: svyasdoorgapersad@uj.ac.za
ORCID: https://orcid.org/0000-0002-8146-344X

#### ABSTRACT

This study explored capacity-building measures (focus) required for South African municipalities and the City of Ekurhuleni Metropolitan Municipality (locus) to prepare for the Fourth Industrial Revolution (4IR) and, hence, offer better service delivery. The study adopted a gualitative approach and utilised literature and document review to gather relevant information. The data was assessed using conceptual and document analysis. The findings highlight the need to conceptualise capacitybuilding for the 4IR and why 4IR capacity in municipalities will have a transformational impact when adequately developed and implemented. The findings in the context of CoE indicate that while there are good 4IR initiatives, the municipality has not fully embraced these to maximum effect; hence, challenges persist. One challenge identified is the partial adoption of 4IR programmes, mainly due to limited capacity. Hence, institutional capacity is directly tied to infrastructural capabilities, and its absence or low uptake determines the level of embracing and utilising 4IR information communication technologies (ICTs). Another significant impediment is the skills capacities of the current staff contingent concerning 4IRcapacity level requirements. Based on the findings, the study proposes practical recommendations regarding capacitybuilding measures required for South African municipalities and the City of Ekurhuleni to equip for the 4IR and, hence, offer better service delivery.

# INTRODUCTION

The definition of technology is the process through which scientific knowledge advances to produce goods and services or to accomplish objectives by enhancing human skill sets using tools and techniques (Skilton & Hovsepian, 2018:3). The limits of human automated power and the inventions of fire, iron smelting, and illumination, among many others, gave the world the development and advancement of implements to augment human effort, thereby increasing production (Skilton & Hovsepian, 2013:3). The study notes that the 4IR is impacting communication and other life spheres through digitalisation, which, to a great extent, has brought positive benefits to the quality of life. Even though they may appear explicit, the features of the 4IR are still a subject of debate and are quite contested by scholars and practitioners. Evidently, it is not easy for scholars to reach a consensus regarding the characteristics of the 4IR; however, it is best understood as a rapid revolution that is premised on AI and cyber-physiological ecosystems that hinge on digitalisation and the infusion of both parallel and perpendicular value chains towards meeting and giving customers excellent value for money and businesses that are customer-centred (Xing & Marwala, 2017:11).

Therefore, the 4IR marks a significant and drastic shift from standard societal ways of doing things to a more advanced, wellknit society. The preceding definitions indicate 4IR prerequisites like infrastructural apparatuses and technological enablers that drive government innovation, productivity, and advancement of living standards for local communities. Prominently, a government's nimbleness has a reciprocal effect that regulates the extent to which it can embrace and benefit from the 4IR. Skilton and Hovsepian (2018:10) provide a divergent view of the 4IR, which they refer to as 'Industry 4.0'. They posit that the 4IR encompasses much more than just intelligent and networked devices and systems; there are waves of new discoveries in fields like nanotechnology, gene sequencing, renewable energy, and quantum computing that are happening simultaneously (Skilton & Hovsepian, 2018:10). Therefore, the 4IR is holistic and broad and includes numerous technological and other inventions that have transformed how things are undertaken, including inventions in education, healthcare, aerospace, scientific research, and economics.

Additionally, such a definition and perspective places the 4IR as the agenda for industrial transformation, which is linked to capital accumulation and global trade, which are some areas in which the 4IR has shown drastic advancement. In the context of the study,

the industrial focus of the 4IR regards a transformation agenda where profit creation and satisfied residents become the core local government focus. The study explored the need to invest in capacity-building initiatives to effectively implement 4IR in South African municipalities for improved service delivery.

#### CONCEPTUAL FRAMEWORK OF CAPACITY-BUILDING

Siders (2019:573) construes that capacity is a practice that involves long-standing and multifaceted modifications in behaviour patterns, understanding, inspiration, abilities, and approaches. In addition, capacity can be regarded as some dynamic process that is key for any advancement of society (Borras & Edquist, 2019:49). In the context of South Africa, this thus encompasses municipalities' capacity to realise local economic and community development.

According to Chimhowu, Hulme and Munro (2019:80), capacity depends on the utilisation of forecasting, organisation, execution, and accountability so that policies and initiatives have sufficient capacity to attain predetermined outcomes. The direct implication is that capacity is not some ubiquitous material that can naturally emerge but requires intervention by municipalities to pool resources and processes that will work towards realising their vision, mission, and goals. Similarly, Swanson (2022:37) posits that capacity is essential to any entity since proficient individuals, ecosystems, and other apparatuses are prerequisites for all successful development and societal transformation (Swanson, 2022:37). In this regard, smart governance needs such capacity to ensure that all autonomous units within the local government system work cooperatively towards effective service delivery. Nonetheless, capacity-building can be based on improving existing systems and human abilities for better productivity. The study refers to this concept as augmenting existing smart governance practices into more robust and effective ones for South African local government.

De Smet, Lurie and St George (2018:5) note that, in the quest to address societal challenges such as endemic poverty and inequality, capacity-building regards the creation of critical human, organisational, and institutional abilities for public entities to design, implement, and sustain programmes or policies that bring desired change or transformation. Thus, from the preceding, the concept of capacity-building is three-pronged and addresses all the necessary aspects of organisational success. The study proposes local government (municipalities) as the vehicle for delivering smart governance solutions throughout South Africa.

Moreover, according to Analoui and Danguah (2017:15), while institutional development is included in capacity-building, it extends beyond specific institutions and organisations to more extensive networks, systems, and coalitions of entities. Deductively, capacity-building is a holistic approach encompassing all possible units or aspects that can lead to organisational transformation. Principally, it does not leave out any necessary piece of the organisational success jigsaw puzzle, as argued above. The United Nations Environment Programme (2006), as cited in Manyara, Amunga and Ondigi (2015:206), aptly describes capacitybuilding as a comprehensive process where actors like individuals in their personal capacities, teams, entities, institutions, and communities improve their proficiencies to undertake fundamental functions, resolve challenges, and determine and attain goals. Bwire, Nyagisere, Masingila and Ayot (2015:206) emphasise that capacity-building includes these stakeholders' ability to comprehend and address their unique development expectations in a generic context and in a viable and efficient way.

Foremost, the implication of human capacity to organisational efficacy is related to possessing the requisite skills, attitudes, attributes, emotions, and competencies required for the job. The International Labour Organisation (ILO) (2017:2) views a skill as the ability of an individual to execute tasks and duties within the confines of a given occupation. In other words, employees must possess the skill/ability to function at a job effectively, and these are typically knowledge-based. Upskilling has become the focal point of modern-day capacity-building programmes and initiatives in entities and organisations.

Bolisani and Bratianu (2018:19) describe knowledge as a state of awareness that can be accumulated and harnessed within entities for success. Therefore, knowledge is one facet of capacity development that, through education, can be improved. By education, this researcher refers to what Barrow and Woods (2008:6) view as 'upbringing' or 'acquiring knowledge' through an accumulation of attitudes, talents, and opinions that become a merit or asset in the context of a given environment or scenario. Furthermore, attitudes shape capacity-building, denoting how an individual perceives, reacts, and interacts with others in organisational settings or towards a particular applicable and relevant phenomenon (Schwarzer, 2013:56).

Moreover, individual performance and capacity are tied to attributes, which are regarded as the features, characteristics, and abilities that one possesses to effectively execute tasks (Mumford, Todd, Higgs & McIntosh, 2017:27). These personal traits include level of experience, personality types, cognitive abilities, leadership styles, and flexibility levels. This study notes that capacity development has a positive influence and correlation with upgrading individual employees' various attributes.

The discussion components of human capacity relate to possessing the knowledge to do a job. These can be entry-level proficiencies needed to function in a specific job (Park, Kang & Kim, 2018:58). In this manner, the recruitment and placement of employees within an organisation are based on personal specifications being compatible with the job specifications. Taylor (2021:43) construes that a match between a candidate and the job is what organisations typically value in offering a contract of employment. However, organisations can also upskill employees with various onthe-job interventions focused on capacity-building.

For Bradford, Rutherford and Friend (2017:141), training is mainly centred on advancing what one knows, can do, or one's attitude towards those routines that can make that employee perform better and more productively. Elnaga and Imran (2013:140) infer that training is a management-initiated employee capacity-building intervention that is usually undertaken when there are indications that employees lack certain performance-enhancing skills or proficiencies which are instrumental to organisational success. In the context of the study, training is an initiative or intervention that seeks to address the capacity deficiencies that municipalities face in the wake of the need to adopt and fully implement smart governance in municipalities in the Republic of South Africa. Also, skills development differs from training, as discussed in the section below.

Moore (2012:1) conceptualises skills development as the intentional consequence of education and training determinations anticipated to facilitate growth. Such development of employees' aptitudes is related to their individual capacity to function well within the organisational or system bounds of each work environment—in this research, the local tier of government. Kraak (2008:12) explains the concept of skills development as inclusive of cognate exertions, which are done by, among others, public entities, governments, and individuals to increase production and, subsequently, effectiveness and capability to accomplish given tasks. Such productivity is evidenced by increased efficacy in rendering public services.

From the above, thus, there is no unanimity about what entails training and development in the context of employee capacitybuilding for improved productivity. According to Krishnan (2020:16), the orthodox elucidation of the skills scarcity challenge in the Republic of South Africa is somewhat skewed and insufficient because a myriad of factors negatively affect the definition and execution of policies aimed at developing skills locally. Prominent factors include, among others, political issues related to those responsible for formulating such interventions, maladministration, unethical conduct such as corrupt activities, the unwillingness of the political apparatus to bring needed transformation, and poor state institutions or machinery (Saltman, 2016:13).

Auxiliary factors include governance culture, financial constraints, the absence of administrative capacity to preside over the various interventions, issues of quality assurance, and the absence of human capital to push that agenda. This research viewed skills development through the multidimensional and dynamic lens of being an initiative that seeks to enhance the ability or capacity of individuals and groups to carry out specific tasks efficiently. Such proficiencies were viewed within the context of smart governance for effective local government. Skills development is arguably at the heart of improving human productivity, capacity (in its three dimensions as discussed previously), enterprise, competitiveness, value, and innovation. Concisely, the key determinants of skills development are technological, economic, social, legal, and political.

This section presented a comprehensive discussion of capacitybuilding in the context of rendering municipal services. From this discussion, capacity-building is regarded as improving existing skills and abilities. In addition, it is multidimensional and includes individuals, organisations, systems, and institutional flare. Capacity-building goes beyond human capital, which is where most productivity-enhancing interventions place focus. Such productivity is seen in more effective, economical, and efficient municipal commodities rendering.

# ANALYSING THE CASE STUDY: THE CITY OF EKURHULENI METROPOLITAN MUNICIPALITY

The City of Ekurhuleni (herein referred to as CoE) is one of South Africa's eight metropolitan municipalities and is an urban conurbation. According to Rogerson (2005:72), the CoE was founded in the region historically known as the East Rand. The CoE is renowned as the 'Gold Axis' due to the prevalence of natural deposits of gold and the subsequent mining of it (Marutllule,

2017:2). This CoE municipality is a merger of numerous historical towns, which includes Germiston and Kempton Park (Rogerson, 2005:72). According to Gungubele (2011:2), the uniqueness of this joint venture was the streamlining of the various administration systems while ensuring that there was no disruption to service delivery.

Historically, the economic profile of the CoE prides itself on having the biggest industrialised centre in the subregion (Rogerson, 2005:74). As of 2020, the CoE had 1.7 million low-income residents; thus, the municipality has the second largest population of low-income residents in the Gauteng Province (Motaung, 2021:70). This means that over 25% of its residents live on R561 or less per day (the poverty datum line) (Motaung, 2021:70). This study also notes the many challenges faced by this municipal entity, including the need for more access to quality water, housing, and electricity. Moreover, the South African Guidebook (2006/2007:51) indicates that the CoE accounts for a considerable portion of mechanisation (37%), chemicals (35%), metal (33%), and plastics (29%), thus indicating an industrial hub that drives the municipal, provincial, and national economies. An encouraging indicator is that the CoE contributes 25% of the Gauteng region's economy and adds a third to the national gross domestic product (GDP) (Motaung, 2021:70). However, as wealthy as the Gauteng Province is, the conflicting reality is that a staggering 610,000 people still live in poverty there, some of which are located in the CoE (Makhubu & Vyas-Doorgapersad, 2022:453).

Motaung (2021:70) notes that the word 'ekurhuleni' originates from the Tsonga dialect, which means 'place of peace', and is linked to being one of the epicentres of colonialism and apartheid before 1994. Makhubu and Vyas-Doorgapersad (2022:154) note that the term also refers to the commitment of the people of the municipality to shift from the history of violence that characterises the area. Statistically, 99.4% of the CoE's 3,774,638 residents are urban dwellers (Motaung, 2021:70).

For Marutllule (2017:4), one challenge that has continued to confront the CoE is that of informal settlements and the continued increase of structures that are not ideal to be regarded as proper human settlements in the 21<sup>st</sup> century. Paret (2018:343) notes that by the early 2010s, Tsakane Extention 10, a community within the CoE municipality, had increased to 6,500 shacks and 20,000 people, showing a precarious situation and a need for service delivery, including water and electricity. Furthermore, the municipality is confronted with various challenges; among others, it is a 98.9%

Black (African) community, with 40.6% unemployment, universal poverty standing at 65.9%, with a paltry 24.65% of residents having a flush toilet, only 17.6% of households with access to electricity, and only 3% of households owning a computer (Paret, 2018:343).

The above account shows a demanding community regarding municipal service rendering and the use of ICTs for improved living standards and service rendering by the municipality. The CoE is, therefore, on the cusp of having to source R6 billion to acquire 6,293 hectares of land and R71 billion to build 288,000 houses towards creating a liveable city and eradicating the squatter camps and informal settlements (Mawere, James & Titos, 2022:279). Thus, municipalities such as the CoE need to adopt measures to expedite addressing the plight of the poor, homeless, and destitute within their communities (Mawere et al., 2022:281).

From another perspective, a study by Patience and Nel (2022:563) unearthed numerous challenges that CoE faces, including a huge trust deficit between the residents and their political leaders, a lack of seriousness by the municipal officials concerning community involvement in the integrated development plan (IDP) and budget drafting formalities, and poor commitment to ensure public accountability. Kraai, Holtzhausen and Malan (2017:60) acknowledge that derisory accountability and bad governance are prevalent obstacles in Gauteng Province's local government.

Patience and Nel (2022:554) call for the CoE to gain the trust of their residents and service consumers to mitigate disruptive occurrences such as service delivery protests. The municipality must also increase its area's economic prospects to combat poverty (Makhubu & Vyas-Doorgapersad, 2022:154). This will show commitment from the governing multiparty coalition in the CoE to premise its service delivery on the rapid capacitation of the ICT services for improved community development.

#### **4IR IN THE CITY OF EKURHULENI**

Cloete (2012:129) asserts that paper-based bureaucratic municipal service delivery systems face numerous challenges, such as creating logjams that slow decision-making and service delivery. The CoE is gradually transitioning from this traditional service delivery model to a smart city-style focus; as a matter of factual argument, manual service delivery has become obsolete, therefore requiring the uptake of technologies to ensure a modern local government.

Masiya, Davids and Mangai (2019:31) note the frustrations that citizens or residents vent through service delivery protests and blame the reliance on a manual system that has been slow to effect transformation in South Africa's post-1994 society. This transitional period has seen a mixture of old and modern tools and strategies and inefficacy in municipal service delivery (Muridzi, 2019:41).

The CoE has implemented policy positions and set trajectories for achieving the capacity to become a smart city. However, this has to be followed by ample commitment and institutional logistics to achieve the same. Some scholars have argued that the CoE has not managed to fully transition to digitalised service delivery quickly enough, slowing its trajectory to fully embracing 4IR technologies (Ncamphalala & Vyas-Doorgapersad, 2019:211; Nzimakwe, 2021:11).

The current study acknowledges the government-wide efforts to ensure communities have digital infrastructure, such as mobile telephone network coverage, which are the building blocks for 4IRbased service delivery. Furthermore, Ncamphalala (2019:70) notes that the partnership between Bytes Technology Networks and the CoE for a R12 million ICT network infrastructure upgrade project is a notable development in the city's 4IR capacity-building. Such progress is notable, especially given that 21<sup>st</sup>-century service delivery hugely depends on the availability of reliable, fast, and omnipresent networks. Blom and Uwizeyimana (2022:211) argue that the load shedding of the electrical grid experienced in 2023 has led to worries from various stakeholders that the CoE's egovernance goals have been impeded. For instance, the unavailability of electricity weakens cell phone reception and disrupts how residents interact and pay for services, including linkages to bank and municipal accounts.

A solid link exists between ICT and municipal service rendering since the synchronisation of services with digital technologies improves service delivery, end-user satisfaction, and accountability (Nzimakwe, 2021:14). In the context of digital local governance being vital to the makeover of all local communities in South Africa, the 4IR interventions that the CoE utilises, and the extent to which these tools have been embraced in the municipality to effect service delivery, are discussed hereafter.

#### **E-Billing**

The CoE has a website, a mobile phone application (app) downloadable from app stores, and an e-billing and e-payment

system called Siyakhokha (meaning 'we pay'), where residents and ratepayers can check their bills (due dates) and pay their bills online using their mobile phones (Phiri, 2022:45). This is a good initiative since it reduces the burden of queuing and travelling to revenue halls. In the era of COVID-19, the CoE has managed to stay abreast with community developments and improve bill settlements through applications such as the Siyakhokha platform.

#### E-Health

In the context of the CoE, service points have been set up to deliver mobile healthcare services, and the CoE was accorded the Gauteng best TB cure rate medal in 2013 (Makhubu & Vyas-Doorgapersad, 2022:155). As argued above, the CoE's e-governance and smart city initiatives also promote the right to healthcare and access to healthcare information.

# **E-Procurement**

The CoE has a virtual platform where suppliers can register, and its procurement processes make it impossible for any supplier not registered to bid for municipal service delivery contracts (Legodi, 2017:18). The platform is simple and user-friendly and reduces the burden of working with hard copies, as suppliers and contractors can easily register and enrol online. This indicates that future and contemporary contracting and service delivery practices are digital, setting the tone for a 4IR agenda for the municipality.

#### **Customer Relationship Management**

The CoE uses its digital platforms and applications to manage its relations with its stakeholders, including customers. This includes a commitment to total customer relationship management (CRM), where the residents or customers are serviced by comprehensively addressing their queries and improving public consultation. Nzimakwe (2021:14) asserts that using e-governance to manage service rendering builds and maintains good relations between local government entities and residents. This is arguably the best way to close the gap between governments and their stakeholders. Citizens can easily monitor their government's activities and report anomalies such as burst water pipes, uncollected garbage, crime, and broken street lighting.

# **E-Government Portals**

The CoE uses its municipal portal to manage applications for housing, title deeds, and other services needed to render public

commodities. The Siyakhokha e-government portal can be accessed through the municipal website portal, www.ekurhuleni.gov.za, where stakeholders can get quotes and rates and stay in touch with the latest news through the EKU24/7 online (web-based) link.

# **E-Police and Public Safety**

The 4IR and the technologies that it brings, such as closed-circuit television (CCTV) cameras, infrared technologies, and instant monitoring of streets and traffic, have come as a relief to many cities (Mudongo, 2021:59). Embracing and fully implementing these electronic public safety measures can help both municipalities and the government rebuild trust and correct their tarnished images through an efficient community safety e-intervention. The CoE has CCTV security cameras in most public places to keep crime under watch.

# SERVICE DELIVERY CHALLENGES IN THE CITY OF EKURHULENI

The CoE faces various service delivery challenges that are almost homogenous to other local tier counterparts in the Republic. First is the challenge of overwhelmed public services, especially healthcare provision. Since 1994, several changes have occurred in the South African healthcare system. Around 80% of the population in South Africa depends on public healthcare, and the remaining 20%, typically the wealthy, use private healthcare (Maphumulo & Bhengu, 2019:1). Mtshali and Jili (2022:389) note that the developing world, like South Africa, has adopted and utilised the 4IR to improve how public commodities can be delivered despite the challenges.

Introducing ICTs requires modern infrastructure and resources to effectively implement various 4IR initiatives (Nalubega & Uwizeyimana, 2019:3). Poor ICT infrastructure and inadequate resources remain a considerable impediment to implementing 4IR technology, especially in the developing world (Sumberg, Fox, Flynn, Mader & Oosterom, 2021:641). Dependable and capable electrical power production is critical to embrace and implement 4IR paradigms effectively (Nalubega & Uwizeyimana, 2019:5). This can also be segmented at the municipal level where the CoE faces challenges related to providing reliable internet access for its entire juridical area. Such has affected the delivery of 4IR-related services to various communities, specifically those living in informal settlements and coming from low-income families. The acute shortage of ICT-related proficiencies and the state's limited capacity to attain the required impetus for adopting technologies are related to increased government efficiency. Ntulo and Otike (2013:11) note that to integrate complete e-government systems, a robust technological foundation is needed. Thus, the government must establish an effective communications network to offer e-government services. This presents a significant challenge, especially in rural areas with spotty or nonexistent internet connections. A lack of capable workers and inadequate human resource training is a significant concern in rural areas due to the scarcity of coaches and mentors (Alkureishi, Choo, Rahman, Ho, Benning-Shorb, Lenti, Velazquez Sánchez, Zhu, Shah & Lee, 2021:23). The CoE needs to attend to the issue of skills scarcity to ensure that there are no critical shortages, especially in its ICT Unit, which is the nerve centre for adopting and using 4IR solutions.

# 4IR INITIATIVES TO IMPROVE SERVICE DELIVERY IN THE CITY OF EKURHULENI

The CoE is committed to providing 4IR-based service delivery, as seen in its various initiatives, such as providing over 148 Wi-Fi hotspots in the municipality to ensure residents can access free internet for e-service delivery to thrive. Furthermore, the city has partnered with service providers to roll out optical fibre cables for broadband internet. This indicates the seriousness of the city's leadership when it comes to smart solutions and hence makes it optimally prepared for 4IR smart service delivery. Some of the pillars on which the service delivery improvement trajectory of the municipality relies are discussed next.

#### Information and Communication Technology

The term 'information and communication technology' (ICT) denotes all technologies that enable the digital sharing of data or transfer of information through various platforms that are significantly more efficient than the previous (old) methods. These include, among others, satellite systems, mobile phone platforms, and video conferencing (Sakthivel & Radha, 2021:25). In commitment to the digital revolution, the CoE has laid the foundation and installed various ICT infrastructures for the success of 4IR-based service delivery. This includes rolling out Wi-Fi hotspots and installing fibre optic cables in various localities. Additionally, the engagement of Bytes Technology Networks in the R12 million ICT networks infrastructure upgrade contract is a testament to the CoE's digital agenda focus (refer to the CoE website for details: https://www.ekurhuleni.gov.za/).

#### **Fourth Industrial Revolution**

Chigbu, Ngwevu and Jojo (2023:100) construe that the 4IR signifies a new game altogether, where various innovations and novel inventions such as AI, robotics, and blockchain technology dismantle physical and other borders to facilitate better living standards in society; this includes biotech and data analytics (Kasza, 2019:119). The 4IR includes cheaper computer equipment and increasing availability of fifth-generation (5G) broadband and fibre optic networks (Roblek, Mesko, Bach, Thorpe & Sprajc, 2020:85). The smart city focus of municipalities such as the CoE is premised on adapting to the 4IR to benefit from it. The CoE is committed to being an active role player in the 4IR, and the various technology-based changes it is implementing are proof of this commitment.

#### **Capacity-Building**

The CoE takes cognisance of the need to build ample capacity for both human and institutional dimensions to flourish and be impactful in the 4IR. Brown, LaFond and Macintyre (2001:10) view capacity-building as a systematic process that improves individuals' understanding and the performance of tasks. This includes evolving the skills, aptitudes, capabilities, and proficiencies needed for a person, organisation, or entity to pursue organisational objectives effectively (Brown et al., 2001:10).

Capacity-building refers to the enhancement of the ability of the CoE to deliver smart city initiatives within the 4IR to improve the living standards of its ratepayers and inhabitants. The CoE, therefore, has various training and development aims that are realised through different interventions to capacitate individual and organisational dimensions. These include upskilling for e-skills and other soft-skill abilities, procuring and developing 4IRcompliant systems, and creating a culture of continuous improvement and merit-based appointments.

According to Paposa and Kumar (2019:255), the central advantage of skills development for proficient and loyal employees is that it limits organisational liability, decreases operational costs due to less wastage of resources (efficacy), improves job satisfaction, and leads to improved commitment and productivity. Hence, the CoE's capacity-building initiatives also focus on interventions such as skills development. However, the CoE is not effectively achieving this goal, as seen in the fragmented adoption, implementation, and sustainment of adequate capacity.

#### Competency

Competency is one pillar on which capacity-building interventions for 4IR are founded. For Dubois and Rothwell (2000:7), competency is the ability to know something. It represents the values and other social attributes employees should possess to produce a product or service that meets a customer's or user's expectations. In this research, municipal officials' ability to render municipal services effectively is linked to their capacity to be competent. For Sperry (2010:4), competencies show a wide array of individual and professional proficiencies relative to an external standard of expectation.

The CoE must employ a holistic approach to creating and sustaining 4IR competencies for improved service delivery and smart governance, including creating an institutional (infrastructural) human capital system and networked spectrums of capacity-building to ensure that the city and its management and inhabitants are ready for the 4IR. This also speaks to the need for the CoE to ensure that it budgets for capacity-building and makes it a priority on its smart city agenda, slated to end in 2055. A considerable window of opportunity exists for the CoE since the 4IR smart tools and systems, such as AI, blockchain, and data analytics, promise to revolutionise how the municipality delivers services.

#### **Talent Management**

Nkala, Mudimu and Mbengwa (2021:193) note that talent management regards the systematic packages and formalised procedures that seek to acquire capable human talent to help attain predetermined goals.

The attraction, retention, and utilisation of employees with the proper set of skills is part of the CoE's talent management strategy, and it informs the kinds of interventions that speak to how the expected competencies can be built and retained. The CoE is taking advantage of how the 4IR can be a tool for better talent management by using technologies such as blockchain technology, which are instrumental in recruiting meritorious and productive human capital. Technology-based tools and strategies also make upskilling employees for the 4IR more efficient.

However, as much as the CoE has 4IR initiatives to improve its delivery of services, it also has challenges related to 4IR adoption, implementation, and readiness, as discussed next.

#### CHALLENGES RELATED TO THE 4IR IN THE CITY OF EKURHULENI

South Africa's local government faces many obstacles regarding capacity building for the 4IR. Eynon and Dutton (2007:227) note that some of the pressing challenges to fully embracing and utilising e-governance in public entities across the world include too much regulatory red tape and bottlenecks, concerns over data security, the digital divide, lack of knowledge or education, resistance to change, and absence of dedication from those who must drive this digital revolution. At times, poor decisions on the part of municipalities impede digital transformation. Thakur and Singh (2012:46) note that Municipality's costly 4IR investment consumes a considerable portion of the municipal budget, calling into question whether the project has been done through proper due diligence to ensure its sustainability.

The following are some of the challenges that the CoE faces regarding its capacity to deliver 4IR solutions:

#### **Computer Illiteracy and Skills Shortage**

Computer literacy refers to the capability to use computers at an optimum level for creating, communicating, and collaborating in a literate society (Tafazoli, Parra & Abril, 2017); hence, it is one's proficiency to use a computer to perform specific tasks. In the context of this study, this refers to being able to use a computer or any other similar device. Ncamphalala (2019:9) argues that the CoE suffers from a shortage of computer skills, which affects the formulation and implementation of initiatives.

The CoE faces challenges due to the unavailability of 4IRcompatible skills. The skill sets in the market are somewhat obsolete, and the soft skills needed for the contemporary digital era are scarce. This skills scarcity and illiteracy affect how management designs and drives the 4IR agenda within the municipal context. It also affects how the ICT Department and the entire municipality develop convenient tools such as websites, applications, and residents' interfaces that use less data when affecting e-governance and e-payments.

#### Unavailability of Free WI-FI

Municipalities typically use Wi-Fi hotspots to ensure their residents can access the internet using wireless technology. The CoE only has 148 free citizen-targeted Wi-Fi hotspots, which is considered too little, especially given that the entire municipality has an expansive area of 1,975 km<sup>2</sup>. Muridzi (2019:52) notes that the availability and reliability of fast internet for residents affects their use of virtual service delivery solutions.

The Wi-Fi coverage in the CoE is an obstacle, especially for those dwelling in informal settlements far away from social and recreational amenities such as gyms, swimming pools, clinics, parks, and public libraries where public Wi-Fi access points are typically available. Such creates a digital divide that leaves the poorest of the poor segregated from enjoying e-governance while those in middle and high-income communities are spoilt for choice. Therefore, 4IR initiatives must be inclusive.

#### Service Providers' Autonomy

For Menon and Fink (2019:35), the 4IR is a networked multistakeholder revolution that requires various role players to pool resources and strategies for its success. This research argues that municipalities must create networked delivery mechanisms with all financiers, pressure groups, and community-based organisations to deliver affordable and fast broadband internet. Municipalities, therefore, rely on these service providers for Wi-Fi facilities and access.

The CoE faces the challenge of the dependence of its applications on the goodwill of other role players, such as banks and developers of third-party applications. For example, using online payment platforms such as Siyakhokha requires that local banks approve each citizen's devices to access their online banking platforms. Sometimes, some devices do not have enough security upgrades to qualify for such actions, thus excluding some residents from using this service. This also concerns the poverty and inequality debate, where the affluent usually enjoy easy access to platforms because of their high-end gadgets, while those experiencing poverty struggle to get compatible mobile (phone) gadgets and devices. According to Verma, Khanna, Agrawal, Darwish and Hassanien (2019:9), smart city governance is best designed for communities that can afford access to enabled gadgets that can easily improve their interface regarding privacy and security issues.

#### **Device Compatibility**

Device compatibility denotes the ability of a technological gadget to perform specific tasks or run a particular application (Mishra & Tyagi, 2022:108). This primarily refers to devices like smartphones that run more recent versions of applications, such as those for making online municipal payments. In line with the above challenge, the CoE also faces the challenge of a greater section of its residents having devices unsuitable for digital solutions. Mbatha and Lesame (2013:48) call for constantly upgrading user gadgets to facilitate the use of digital solutions and platforms. Some residents have entry-level cell phones that are incompatible with the newer digital applications.

Moreover, mobile phones become outdated as time goes by and become incompatible with new applications (Da Cruz, Rodrigues, Sangaiah, Al-Muhtadi & Korotaev, 2018:56). With the arrival of the 5G network, a feature of the 4IR, more and more devices are being rendered obsolete (Holland, 2020:25). Therefore, this presents a challenge for the CoE and its smart city initiatives since the pace of technological advancements is not commensurate with the living standards of its residents and their ability to afford current, up-to-date gadgets.

#### Website Interface and User-Friendliness

Yu and Kong (2016) construe that a website interface refers to the usability of a website concerning ease of access to all relevant information by all categories of users. Subban, Nzimakwe and Pillay (2007:237) establish that information overload is one of web users' most critical problems. At times, there is a poor interface design of websites, which are not regularly updated by the responsible authorities, thereby hosting false or outdated information that can mislead stakeholders. Paulo (2016:44) reveals that some factors affecting using websites include the language used, poor design of messages and notices, and the hurdles related to accessing crucial information. Thus, the interface affects residents' practical use of smart solutions.

The CoE website is moderately user-friendly, but more can be done, especially with the need for a download link so residents can easily download reports, plans, and other critical documents to keep track of their municipality. As it stands, one can struggle to find, read, and download content like the current IDP and budget. Therefore, they need to ensure that their website loads fast, has easy links, and has all the critical details that residents require from their local government.

#### Internet Access

Internet access refers to the ability of consumers to have free and unlimited access to internet services in terms of speed, affordability, and security (Mojapelo, 2020:271). Independent of the challenge to mobile Wi-Fi, the issue of internet access further affects the ability of municipalities and other entities to govern their jurisdictions smartly. This stems from both local government and resident perspectives. From the government's perspective, the use of smart solutions like unmanned aerial vehicles (UAVs) (drones), CCTV, and other such technologies and devices in remote areas and informal settlements is hugely dependent on fast and reliable internet (Mohamed, Al-Jaroodi, Jawhar, Idries & Mohammed, 2020:119). From the citizens' perspectives, the availability of fibre internet in communities is a requisite condition for the success of smart city initiatives. Even mobile internet is built on a robust fibre internet infrastructure (Mohamed et al., 2020:120).

The fibre internet coverage in the CoE is not comprehensive, and some informal settlements do not have reliable and fast internet. This is further exacerbated by the fact that most of the broadband internet in locations across the CoE is provided by the private sector, which can be beyond the reach of some residents.

#### **Obsolete Equipment and Applications**

Obsolete equipment refers to technological or other outdated and archaic infrastructure (Kimani, Oduol & Langat, 2021). Nzimakwe (2021:13) notes that the scarcity of skills on 4IR tools in South African local government has affected the development of timecompliant applications compatible with prevailing security and other requirements in the ICT fraternity.

Within the CoE, there is a challenge of lack of e-skills needed to develop the applications and resident interfaces that are time compliant. Blom and Uwizeyimana (2020:215) note that the scarcity of these soft skills has somewhat stagnated the adoption and application of smart solutions that improve the delivery of public goods and services towards the total transformation of living standards for historically disadvantaged communities and individuals; these are the majority of the CoE's residents.

# **Online Security Risk**

According to Button and Cross (2017), online risk concerns exposure to hackers, fraudsters, and other criminals when using internet-based technology applications. Another challenge that the CoE faces is the scepticism that some residents have using online platforms, especially those requiring linking bank accounts with municipal applications. Some residents in developing countries are sceptical about how secure municipal applications are, especially given the rampant rise in online fraud and security breaches (Swiatkowska, 2020:19).

Overall, a certain degree of risk is involved with e-payment platforms, especially in countries with weak data security laws (Swiatkowska, 2020:4), such as South Africa. The flaws that some residents might notice on municipal websites are enough to raise suspicions of the risk of hacking and, hence, residents' reluctance to use such facilities for the online payment of municipal services.

#### **Change Management**

Lauer (2021) defines change management as the inevitable reconfiguration process organisations undergo to improve their effectiveness and remain productive. This study refers to reconfiguring the CoE's systems for 4IR capacity and smart city service delivery practices. Bwalya and Mutula (2015:9), who investigated the impact of change on organisations in the context of the 4IR, argue that entities must manage transitions smoothly to avoid creating resistance to the change process. A smooth transition enables employees to adapt, adjust, and re-engineer themselves to emerging cultures and practices and avoid shock associated with change (Bwalya & Mutula, 2015:9).

While the CoE presently has little resistance to change regarding egovernance and smart solutions, utilising inadequate skills, competencies, and capacity for the task at hand is more challenging. The management of the transition from manual to virtual governance requires human capacity-building interventions to precede the adoption of such change, hence the need for capacity-building initiatives in the CoE. Such can ensure that the right mix of human skills and cognate resources is deployed for maximum service delivery. Ncamphalala (2019:124) challenges the CoE to use merit-based appointments for key ICT positions as a human capacity-building intervention for ICT adoption, implementation, and sustainability.

# RECOMMENDATIONS

The study proposes an analytical framework called 'A Multi-Stakeholder Networked System for 4IR Capacity-Building' (see Figure 2).



Figure 2: A Multi-Stakeholder Networked System for 4IR Capacity-Building

Source: Authors' illustration (2024)

As shown above, there is a need for the municipality's network capacity for 4IR to include the South African Local Government Association (SALGA) as the association of South African municipalities. The SALGA can assist in synchronising 4IR capacity issues and benchmarking these with expectations for local government entities. Citizens must be involved as residents, ratepayers, and recipients of municipal services.

There is a need to build the capacity of service consumers or users to enable them to become part and parcel of the 4IR. Such a stance

ensures that 4IR initiatives are not exclusionary but inclusive. There is also the need to include private sector service providers, who, according to Fox and Signe (2021:51), are the investors of capital and expertise needed for the 4IR. Thus, these investors can provide financial arrangements for 4IR capacity and expertise to roll out various 4IR tools and systems in the municipality.

The role of the academic stakeholders will be to cater for knowledge production and management through research on the future of 4IR and to source and co-create products and solutions. The Local Government Sector Education and Training Authority (LGSETA) will be at the forefront of training and development for 4IR in local government, hence its inclusion as the overseer of municipalities in the entire Republic. Community-based organisations, civil society organisations and other pressure groups usually advocate for the citizens as these groups are closer to the communities.

Mojapelo and Ngoepe (2022:21) note that civil society and other community-based groups lobby for better service delivery in communities. Lastly, a stakeholder that is also needed is the State Information Technology Agency (SITA), especially given the need for the government to synchronise its technology services.

Based on the findings and arguments presented in the analytical framework, the study recommends including skills-transfer clauses in subcontracting agreements. The Western and Asian countries have 4IR hegemony due to their leading roles in technological advancements. This has led to these countries having the necessary human capital, expertise, and knowledge to embrace the 4IR. The CoE must ensure a compulsory clause in all outsourcing practices to ensure these contracts have skills transfer provisions; this is good for successful planning. Such can help the municipality from an ICT infrastructure perspective-cloud computing, technology, mobile applications, incubation hubs, and innovation centres-to ensure the hands-on transfer of skills and expertise each time there is an ongoing contract. The principalagent theory argues that contracting out essential public services raises concerns about how a private sector service provider can promote the public's interest, thus the need to ensure that any such engagement also benefits the municipality itself.

This research study argues that the 4IR is not for the installation of infrastructure and technology by outsiders but for the capacitation of local talent (residents) by these companies for future self-reliance.

# CONCLUSION

This study explored capacity-building initiatives for effectively executing 4IR strategies in the local tier of the South African Government. Such initiatives are intended to improve public services and commodities rendering in South African municipal entities using ample, creative, human, institutional and policy capacity that aligns with the 4IR, thus providing service in the era of smart governance. In the same vein, over three decades after the dawn of an era of inclusive and participative democracy in South Africa, these initiatives can potentially transform the postapartheid communities.

The study profiled the study area and contextualised the various challenges and particularities in the CoE regarding the status quo. The discussions regarded the various obstacles to sustainable service delivery that the CoE currently faces, its various 4IR practices, the challenges threatening the smooth adoption of 4IR initiatives, the capacity-building challenges, and the pillars on which it builds its 4IR capacity-building initiatives. The study shows a municipality with many service delivery backlogs for providing liveable human settlements, fast and reliable fibre internet and Wi-Fi, and community safety. Such challenges can easily be resolved within adequate 4IR capacity; however, this is yet to be achieved. Furthermore, the CoE, which is committed to the 4IR agenda, faces challenges due to skills scarcity, poor infrastructure, poverty, and the absence of a strong developer team to drive its 4IR transformation. From the discussions in this article, the researcher argues that the COE has numerous opportunities to improve municipal service rendering if it can fully build and sustain a strong 4IR capacity for employees and itself.

The study findings highlight the potential for improving smart governance by comprehensively implementing 4IR systems and technologies in the CoE. This is particularly important given that the municipality aims to be a fully functional smart city by 2055. This researcher argues that the 4IR technologies the CoE needs to achieve its smart governance goals depend on building sufficient human, institutional, system, and networked capacity. The study also indicates that the CoE has considerable potential to contribute to the country and region's GDP, but only if its staff are sufficiently capacitated and systems, such as e-billing, e-health, e-police, elibrary, and e-governance, are well maintained. In the same vein, it is critical that the municipality employs CRM strategies to ensure capacity-building programmes are successful. These its programmes can also significantly improve staff competencies to create a strong, smart city for the present and future.

# Note

This article is based on an unpublished PhD thesis titled Ncamphalala, M. 2024- Capacity-building initiatives for improved 4IR services in the City of Ekurhuleni Metropolitan Municipality, at UJ under the supervision of Prof. S. Vyas-Doorgapersad. Unpublished PhD Thesis. Johannesburg: University of Johannesburg

# BIBLIOGRAPHY

- Alkureishi, M.A., Choo, Z.Y., Rahman, A., Ho, K., Benning-Shorb, J., Lenti, G., Velazquez Sánchez, I., Zhu, M., Shah, S.D. and Lee, W.W. 2021. Digitally disconnected: qualitative study of patient perspectives on the digital divide and potential solutions. JMIR human factors. 8(4): p.e33364. https://doi.org/10.2196/33364
- Analoui, F. and Danquah, J.K. 2017. Critical capacity development. Cham: Springer. https://doi.org/10.1007/978-3-319-47416-8
- Barrow, R. and Woods, R. (Eds.). 2008. An introduction to philosophy of education. London: Routledge. https://doi.org/10.4324/9780203969953
- Blom, P.P. and Uwizeyimana, D.E. 2020. Assessing the effectiveness of e-Government and e-Governance in South Africa: during national lockdown 2020. Research in World Economy. 11(5): 208-219. https://doi.org/10.5430/rwe.v11n5p208
- Bolisani, E. and Bratianu, C. (Eds.). 2018. Emergent knowledge strategies: Strategic thinking in knowledge management. Cham: Springer. https://doi.org/10.1007/978-3-319-60657-6\_8
- Borras, S. and Edquist, C. 2019. Holistic innovation policy: Theoretical foundations, policy problems, and instrument choices. Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198809807.001.0001
- 7. Bradford, S.K., Rutherford, B.N. and Friend, S.B. 2017. The impact of training, mentoring and coaching on personal learning in the sales environment. International Journal of Evidence Based Coaching and Mentoring. 15(1): 133-151.
- 8. Brown, L., LaFond, A. and Macintyre, K.E. 2001. Measuring capacity-building. Chapel Hill, NC: Carolina Population Center.
- Button, M. and Cross, C. 2017. Technology and Fraud: The 'Fraudogenic' consequences of the Internet revolution. In The Routledge handbook of technology, crime and justice. London: Routledge. Pp. 78-95. https://doi.org/10.4324/9781315743981-5

- Bwalya, K.J. and Mutula, S. 2015. A conceptual framework for e-government development in resource-constrained in countries: The case of Zambia. Information Development, pp. 1-16. https://doi.org/10.1177/0266666915593786
- Bwire, A.M., Nyagisere, M.S., Masingila, J.O. and Ayot, H.O. (Eds.). 2015. Proceedings of the 4th International Conference on Education. Nairobi, Kenya: Kenyatta University.
- Chigbu, B.I., Ngwevu, V. and Jojo, A. 2023. The effectiveness of innovative pedagogy in the industry 4.0: Educational ecosystem perspective. Social Sciences & Humanities Open, 7(1): 100419. https://doi.org/10.1016/j.ssaho.2023.100419
- Chimhowu, A.O., Hulme, D. and Munro, L.T. 2019. The 'New' national development planning and global development goals: Processes and partnerships. World Development. 120(1): 76-89. https://doi.org/10.1016/j.worlddev.2019.03.013
- Cloete, F. 2012. E-government lessons from South Africa 2001-2011: institutions, state of progress and measurement: Section II: Country perspectives on e-government emergence. The African Journal of information and communication. 12(1): 128-142. DOI: https://doi.org/10.23962/10539/19712.
- Da Cruz, M.A., Rodrigues, J.J., Sangaiah, A.K., Al-Muhtadi, J. and Korotaev, V. 2018. Performance evaluation of IoT middleware. Journal of Network and Computer Applications. 109(1): 53-65. https://doi.org/10.1016/j.jnca.2018.02.013
- De Smet, A., Lurie, M. and St George, A. 2018. Leading agile transformation: The new capabilities leaders need to build 21<sup>st</sup> century organizations. Brisbane: McKinsey & Co.
- 17. Dubois, D.D. and Rothwell, W. 2000. The Competency Toolkit: Volume II. Amherst: HRD Press.
- Elnaga, A. and Imran, A. 2013. The effect of training on employee performance. European journal of Business and Management. 5(4): 137-147.
- 19. Eynon, R. and Dutton, W.H. 2007. Barriers to networked governments: Evidence from Europe. Prometheus. 25(3): 225-242. https://doi.org/10.1080/08109020701531361
- 20. Fox, L. and Signe, L. 2021. The fourth industrial revolution (4IR) and the future of work: could this bring good jobs to Africa. Evidence Synthesis Paper Series 51
- 21. Gungubele, M. 2011. Welcome Address by the Executive Mayor of Ekurhuleni: Mondli Gungubele: Welcome to the place of peace and Africa 's first aerotropolis-the City of Ekurhuleni. IMFO. 16(2): 8-9.
- Holland, B. 2020. Emerging Technology and Today's Libraries. (In Emerging Trends and Impacts of the Internet of Things in Libraries (pp. 1-33). IGI Global. https://doi.org/10.4018/978-1-7998-4742-7.ch001

- International Labour Organization (ILO). 2017. Conceptual Framework of the International Standard Classification of Occupations. Geneva: ILO.
- 24. Kasza, J. 2019. Fourth Industrial Revolution (4IR): Digital Disruption of Cyber-Physical Systems. World Scientific News.134(2): 118-147.
- 25. Kimani, K., Oduol, V. and Langat, K. 2019. Cyber security challenges for IoT-based smart grid networks. International journal of critical infrastructure protection. 25(1): 36-49. https://doi.org/10.1016/j.ijcip.2019.01.001
- Kraai, S., Holtzhausen, N. and Malan, L. 2017. Oversight mechanisms in local government-a case of Ekurhuleni Metropolitan Municipality in South Africa. African Journal of Public Affairs. 9(6): 59-72.
- 27. Kraak, A. 2008. Human Resources Development Review 2008. Education, Employment and Skills in South Africa. Pretoria: Karen Press. https://doi.org/10.1080/1363908052000332311
- 28. Krishnan, K. 2020. Learner mobility and learning and teaching: a case study at a secondary school in Pretoria. Pretoria: University of South Africa. (Dissertation-Masters).
- 29. Lauer, T. 2021. Change management: fundamentals and success factors. Berlin Heidelberg: Springer. https://doi.org/10.1007/978-3-662-62187-5
- Legodi, L.F. 2017. Governance Challenges in Combating Supply Chain Management Corruption in Ekurhuleni Metropolitan Municipality. (Doctoral dissertation, University of the Witwatersrand, Faculty of Commerce, Law and Management, Wits School of Governance).
- Makhubu, A. and Vyas-Doorgapersad, S. 2022. policy frameworks and implementation gaps in poverty alleviation strategies in the City of Ekurhuleni, South Africa. African Journal of Development Studies.12(3): 149-166.
- Manyara, J.N., Amunga, H.A. and. Ondigi, S.R. 2015. Effective educational technology integration through capacity-building: Inexorable modernization of the Kenyan Education system. In Bwire, A.M., Nyagisere, M.S., Masingila, J.O. and Ayot, H.O. (Eds.). 2015. Proceedings of the 4<sup>th</sup> International Conference on Education. Nairobi, Kenya: Kenyatta University. Pp 205-211.
- Marutllule, N.K. 2017. Causes of informal settlements in Ekurhuleni Metropolitan Municipality: An exploration. Africa's Public Service Delivery and Performance Review. 5(1): 1-11. https://doi.org/10.4102/apsdpr.v5i1.131
- Marutllule, N.K. 2017. Causes of informal settlements in Ekurhuleni Metropolitan Municipality: An exploration. Africa's Public Service Delivery and Performance Review. 5(1): 1-11. https://doi.org/10.4102/apsdpr.v5i1.131

- 35. Masiya, T., Davids, Y.D. and Mangai, M.S. 2019. Assessing service delivery: Public perception of municipal service delivery in South Africa. Theoretical and Empirical Researches in Urban Management. 14(2): 20-40.
- Mawere, J., James, M. and Titos, K. 2022. Coalition Governance and Service Delivery in South Africa: A Case Study of Tshwane, Johannesburg and Ekurhuleni Metropolitan Municipalities. Journal of Public Administration. 57(2): 272-283.
- Mbatha, B. and Lesame, Z. 2013. Diffusion and adoption of information and communication technologies in the public sector: the case of selected government departments in KwaZulu-Natal. Communicare. 32(2): 40-62. https://doi.org/10.36615/jcsa.v32i2.1638
- Menon, J. and Fink, A. 2019. The fourth industrial revolution and its implications for regional economic integration in ASEAN. Journal of Asian Economic Integration.1(1): 32-47. https://doi.org/10.1177/2631684618821566
- Mishra, S. and Tyagi, A.K. 2022. The role of machine learning techniques in internet of things-based cloud applications. Artificial intelligence-based internet of things systems, pp.105-135. https://doi.org/10.1007/978-3-030-87059-1\_4
- 40. Mohamed, N., Al-Jaroodi, J., Jawhar, I., Idries, A. and Mohammed, F. 2020. Unmanned aerial vehicles applications in future smart cities. Technological forecasting and social change.153: p.119293. https://doi.org/10.1016/j.techfore.2018.05.004
- 41. Mojapelo, M. and Ngoepe, M. 2022. Advocacy as a strategy to raise the archival profile through the civil society in South Africa. Archives and Records. 43(1): 18-35. https://doi.org/10.1080/23257962.2020.1813095
- 42. Mojapelo, S.M. 2020. The internet access and use in public libraries in Limpopo
- 43. Moore, K. 2012. Taoiseach's Public Service Excellence Awards. Pretoria: Department of Education and Skills Development.
- 44. Motaung, M.N. 2021. Section 195 of the South African Constitution to promote ethical conduct. Auckland Park: University of Johannesburg. (Dissertation-MA).
- 45. Mtshali, T.L. and Jili, N.N. 2022. The effectiveness of the 4ir technologies in elevating small-scale farming at Kwadlangezwa, Kwazulu-Natal in South Africa. International Journal of eBusiness and eGovernment Studies. 14(1): 388-408.
- 46. Mudongo, O. 2021. Work in Progress in Computer Vision and AI Surveillance in Africa. African Portal.
- 47. Mumford, M.D., Todd, E.M., Higgs, C. and McIntosh, T. 2017. Cognitive skills and leadership performance: The nine critical

skills. The Leadership Quarterly. 28(1): 24-39. https://doi.org/10.1016/j.leaqua.2016.10.012

- 48. Muridzi, G. 2019. Framework for e-governance to improve service delivery for local authorities in South Africa. Potchefstroom: North-West University (Thesis-PhD).
- 49. Muridzi, G. 2019. Framework for e-governance to improve service delivery for local authorities in South Africa. Potchefstroom: North-West University (Thesis-PhD).
- Nalubega, T. and Uwizeyimana, D.E. 2019. Public sector monitoring and evaluation in the Fourth Industrial Revolution: Implications for Africa. Africa's Public Service Delivery and Performance Review. 7(1): 1-12. https://doi.org/10.4102/apsdpr.v7i1.318
- 51. Ncamphalala, M. 2019. The role of ICT to promote smart governance in local governments. Unpublished MA Dissertation. Johannesburg: University of Johannesburg.
- Ncamphalala, M. and Vyas-Doorgapersad, S. 2019. The use of Information and Communication Technology (ICT) for Smart governance in the City of Ekurhuleni. Administratio Publica. 27(3): 205-221. https://doi.org/10.20525/ijrbs.v11i2.1593
- Nkala, B., Mudimu, C. and Mbengwa, A.M. 2021. Human resources for health talent management contribution: A case for health systems strengthening in the public health sector. World Journal of Advanced Research and Reviews. 9(2): 192-201. https://doi.org/10.30574/wjarr.2021.9.2.0062
- 54. Ntulo, G. and Otike, J. 2013. E–Government: Its Role, Importance and Challenges. School of Information Sciences. MoiUniversity, pp.1-16.
- 55. Nzimakwe, T.I. 2021. Leading Digital Transformation and Innovation in Local Government Institutions in South Africa. Administratio Publica. 29(2): 1-23.
- 56. Paposa, K.K. and Kumar, Y.M. 2019. Impact of training and development practices on job satisfaction: A study on faculty members of technical education institutes. Management and Labour Studies. 44(3): 248-262. https://doi.org/10.1177/0258042x19851649
- 57. Paret, M. 2018. The politics of local resistance in urban South Africa: Evidence from three informal settlements. International Sociology. 33(3): 337-356. https://doi.org/10.1177/0268580918764837
- Park, S., Kang, H.S.T. and Kim, E.J. 2018. The role of supervisor support on employees' training and job performance: an empirical study. European Journal of Training and Development. 42(1/2): 57-74. https://doi.org/10.1108/ejtd-06-2017-0054

- Patience, J.J. and Nel, D. 2022. Governance, democracy and accountability from a network governance perspective within the city of Ekurhuleni. Africa's Public Service Delivery and Performance Review. 10(1): 554-560. https://doi.org/10.4102/apsdpr.v10i1.554
- 60. Paulo, M. 2016. The role of e-Governance in Europe's image of the Chinese Communist Party. The International Communication Gazette. 78(1-2): 39-63. https://doi.org/10.1177/1748048515618105
- 61. Phiri, A. 2022. Smart Grid and Net Metering for Grid-Interactive Distributed Generation for the City of Ekurhuleni. (Doctoral dissertation, Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg).
- Roblek, V., Mesko, M., Bach, M.P., Thorpe, O. and Sprajc, P. 2020. The interaction between internet, sustainable development, and emergence of society 5.0. Data. 5(3): 80-107. https://doi.org/10.3390/data5030080
- 63. Rogerson, C.M. 2005. Local development planning in Ekurhuleni: emerging policy and strategy in South Africa's newest metropolitan area. Africa insight. 35(4): 72-79. https://doi.org/10.4314/ai.v35i4.22457
- 64. Sakthivel, D. and Radha, B. 2021. ICT Tools for Modern Education. International Journal of Multidisplinary Research and Explorer. 9(1): 22-27
- 65. Saltman, K.J. 2016. The politics of education. Oxon: Routledge. https://doi.org/10.4324/9781315632742
- 66. Schwarzer, R. 2013. Self-related cognitions in anxiety and motivation: An introduction. In Self-related cognitions in anxiety and motivation. New York, NY: Psychology Press. https://doi.org/10.4324/9780203781609
- 67. Siders, A.R., 2019. Adaptive capacity to climate change: A synthesis of concepts, methods, and findings in a fragmented field. Wiley Interdisciplinary Reviews: Climate Change, 10(3), p.e573.
- Skilton, M. and Hovsepian, F. 2018. The 4<sup>th</sup> industrial revolution: Responding to the Impact of Artificial Intelligence on Business. Cham: Springer Nature. https://doi.org/10.1007/978-3-319-62479-2\_1
- Skilton, M. and Hovsepian, F. 2018. The 4<sup>th</sup> industrial revolution: Responding to the Impact of Artificial Intelligence on Business. Cham: Springer Nature. https://doi.org/10.1007/978-3-319-62479-2\_1
- 70. South African Guidebook 2006/2007. 2006. Socio-economic facts of the Gauteng: Ekurhuleni Metropolitan Municipality. Pretoria: Department of Tourism.

- 71. Sperry, L. 2010. Core competencies in counselling and psychotherapy: Becoming a highly competent and effective therapist. London: Routledge.
- 72. Subban, M., Nzimakwe, I. and Pillay, P. 2007. E-governance as an alternative service delivery strategy. Journal of Public Administration. 42(5): 235-246.
- Sumberg, J., Fox, L., Flynn, J., Mader, P. and Oosterom, M. 2021. Africa's 'youth employment' crisis is actually a 'missing jobs' crisis. Development Policy Review. 39(4): 621-643. https://doi.org/10.1111/dpr.12528
- 74. Swanson, R.A. 2022. Foundations of human resource development. Oakland, CA: Berrett-Koehle. https://doi.org/10.1108/hrmid.2010.04418gae.001
- 75. Swiatkowska, J. 2020. Tackling cybercrime to unleash developing countries' digital potential. Pathways for Prosperity Commission Background Paper Series. (33): 1-49.
- 76. Tafazoli, D., Parra, M.E.G. and Abril, C.A.H. 2017. Computer literacy: Sine qua non for digital age of language learning & teaching. Theory and Practice in Language Studies. 7(9): 716-722. https://doi.org/10.17507/tpls.0709.02
- 77. Taylor, S. 2021. Resourcing and Talent Management: The Theory and Practice of Recruiting and Developing a Workforce. London: Kogan Page.
- 78. Thakur, A. and Singh, A.J. 2020. E-Voting System using Blockchain Technology for Trusted Voting in Democracy. Mukt Shabd Journal. 9(5): 4758-4766.
- 79. Verma, A., Khanna, A., Agrawal, A., Darwish, A. and Hassanien, A.E. 2019. Security and privacy in smart city applications and services: Opportunities and challenges. Cybersecurity and Secure Information Systems: Challenges and Solutions in Smart Environments, pp.1-15. https://doi.org/10.1007/978-3-030-16837-7\_1
- Verma, A., Khanna, A., Agrawal, A., Darwish, A. and Hassanien, A.E. 2019. Security and privacy in smart city applications and services: Opportunities and challenges. Cybersecurity and Secure Information Systems: Challenges and Solutions in Smart Environments, pp.1-15. https://doi.org/10.1007/978-3-030-16837-7\_1
- 81. Xing, B. and Marwala, T. 2017. Implications of the fourth industrial age on higher education. arXiv preprint arXiv:1703.09643. https://doi.org/10.25073/0866-773x/87
- Yu, N. and Kong, J. 2016. User experience with web browsing on small screens: Experimental investigations of mobile-page interface design and homepage design for news websites. Information Sciences. 330: 427-443. https://doi.org/10.1016/j.ins.2015.06.004