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An examination of the Fourth Industrial Revolution in the context of the South African local government

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Background: Local governments in South Africa have been called to account for service delivery inefficiencies and this resulted in them adopting e-government initiatives to enhance service delivery. The Fourth Industrial Revolution (4IR) offers many benefits for increased service efficiency and effectiveness.

Aim: This research study aimed to examine the concept of 4IR technologies within the local government context.

Setting: This study was conducted in Johannesburg, South Africa, with research participants from the City of Johannesburg (CoJ) Metropolitan Municipality and the South African Local Government Association (SALGA).

Methods: This study adopted a qualitative research design, using semi-structured interviews as primary data and reviewed relevant reports and literature as secondary data. Fourteen leaders were purposively selected and interviewed from the local government in Gauteng. Thematic analysis was used to analyse the data.

Results: The study established that the local government has embarked on digital transformation in an effort to enhance service delivery for the citizens. As a result, leveraging 4IR technologies to enhance service delivery for citizens has become a priority for local government.

Conclusion: Local government service delivery has been plagued by a myriad of crippling challenges as evident in the widespread protests. The 4IR can be perceived as a response to service delivery challenges while enhancing local government relevance and impact.

Contribution: This study contributes to an understanding of the concept of 4IR within the context of local government and service delivery.

Keywords: South Africa; municipality; citizen service; technology; local government.

Introduction

Globalisation has caused enormous changes in the political, economic, social, and technical systems of most nations' local government sectors, motivating governments throughout the world to reform their citizen outreach and support strategies to accommodate these changes at a municipal level (Lufunyo 2013). According to the *South African Municipal Systems Act (No. 44 of 2003)*, a municipality is the institution that consists of political office-bearers responsible for the administration of the municipality and the people that live in that particular local or geographic area. The South African Constitution (1996) mandates municipalities to provide services in a justifiable manner and to provide facilities to municipal administrations. Municipalities play a critical role in providing essential services and nurturing growth in the communities they serve. Municipalities ensure that there is an equitable provision of services to all citizens (South African Local Government Association [SALGA] 2015; Statistics South Africa 2016). The South African government has, however, been heavily criticised for poor service delivery which resulted in significant protests besetting the local government sector (Masiya, Davids & Mangai 2019).

Mugambiwa and Tirivangasi (2017) note that the poor provision of service delivery by municipalities is linked to a lack of employees' having the skills and competency levels required to carry out their workplace responsibilities for implementing community–municipal participation strategies. Poor service delivery provision at the municipal level has often resulted in communities' staging violent service delivery demonstrations (Breakfast, Bradshaw & Nomarwayi 2019; Kgobe 2020).

The application of technologies available in the Fourth Industrial Revolution (4IR) can be perceived as a solution to the public service delivery challenges experienced by South Africa as well as heightening global competitiveness (Thani 2020). Mhaka (2020) posits that the inventiveness of 4IR has enabled municipalities to have elements of a smart city which aims to improve the quality of life of their citizens, enhance businesses, and create a conducive environment for economic growth. As such, it is imperative for local government to lead in the 4IR transition to support basic service delivery.

However, even with the highly predicted opportunities related to digital transformations through the use of 4IR technologies, local government sectors throughout the world have been challenged with complicated issues associated with adopting these 4IR-related service delivery changes for their citizens. South Africa's municipal sector has not been immune to these difficulties as South Africa is still in a 'catch-up phase' in adopting proactive strategies and policies to move into mainstream activities (Layton-Matthews & Landsberg 2022:60). This research study examined the effectiveness of 4IR within the local government in which citizens continuously interface with government employees for service provision.

Literature review

The effect of Fourth Industrial Revolution

Digital transformation has influenced business operations, citizen engagements, and has created value for their stakeholders.

The 4IR has been defined as 4IR has been defined as a fusion of digital technologies blurring the lines between the digital, physical, and biological spheres. Schumacher, Erol and Sihn (2019) define the concept of 4IR as a combination of advanced technologies that integrate machine intelligence with people in manufacturing processes, generating high-agility value chains. According to Lavopa and Delera (2021), the innovative way in which connectivity, software, and hardware are integrated and reconfigured distinguishes 4IR from previous technological revolutions.

The 4IR is preceded by three major industrial revolutions and is at the peak of the previous three industrial revolutions, growing at an exponential growth rate, diffusing 'much faster and more widely than in previous ones' (Schwab 2017). The 18th century experienced the first industrial revolution marked by the construction of railroads and the mechanisation of production processes; the 19th century witnessed the second industrial revolution with the widespread use of electricity and mass production; and the third revolution, in the 1960s, saw the automation of production processes through technological advancements (UNIDO 2020).

The current 4IR revolution has been driven by technological breakthroughs and is 'uniquely marked by a blurring of the boundaries between the biological, the physical and the digital realms' (UNIDO 2020:1). Schwab (2017:13) states that, the 4IR is fundamentally different from the previous revolutions as it is characterised by a range of new technologies that are fusing the physical, digital, and biological worlds, impacting all disciplines, economies, and industries. According to Schwab (2016:37), the 4IR is seeing great strides in developing technologies from 'gene sequencing to nanotechnology, and from renewables to quantum computing.'

The 4IR aims to achieve automation enhancements, effectiveness, and operational efficiency (Ślusarczyk 2018).

The 4IR, like its predecessors, presents enormous economic potential and has a significant impact as a result of its rapid advancement (Schafer 2018). The 4IR advancements are gathering pace as technological innovations become more widely accessible. The World Economic Forum (2018) has stated that 4IR presents a fundamental change to governments, industry, and society. The 4IR presents a myriad of new opportunities for accelerating innovation and increasing production, expanding manufacturing industries, and simplifying processes (OECD 2017; WEF 2017). McKinsey (2020) views 4IR as representing a new era of innovation in technology consisting of a multitude of advanced technologies. For South Africa, 4IR offers huge potential to realign the country's economy and transform society (Sutcliffe & Bannister 2020). The 4IR offers both the South African government and businesses the potential to create millions of high-quality jobs and improve operational efficiency and the delivery of outcomes to citizens and customers (McKinsey 2020). Therefore, the 4IR may have profound effects on many spheres by fuelling growth by unlocking new market opportunities and enhancing human–machine relationships.

However, all industrial revolutions come with their benefits and drawbacks, challenges and opportunities, and uncertainties. Notwithstanding, the 4IR presents several benefits owing to the emergence of novel technologies, such as providing improved competitiveness, quality and efficient processes, increasing productivity, enhancing decision-making, and safety for employees through reducing jobs in dangerous environments. As far as the drawbacks are concerned, 4IR presents many challenges on account of an increasing dependency on technology, having to adapt to the exponential speed of change, the digital gap, a lack of qualified staff, and increasing cyber risks. A McKinsey Global report reveals that almost 800 million jobs will be non-existent by 2030, and between 75 million and 375 million people will be required to switch occupational categories and acquire new skills (Bughin et al., 2017). The impact of 4IR on employment is one of the biggest challenges emerging for employees and employers to manage. Companies are furthermore beginning to appreciate the need to nurture a

culture of lifelong learning, equipping their workforces with the skills necessary to succeed in the future.

In South Africa, one of the complexities currently associated with the business world is the adoption of 4IR. Xu, David and Kim (2018) argue that as 4IR is linked to enormous shifts in technology and innovation, this technological transformation can make its implementation challenging as a result. Several studies have questioned South Africa's readiness for 4IR. Bell et al. (2018) discovered that the country's 4IR implementation is impeded by market concentration (which hampers liberalisation), fragmented economic support, and leadership and co-ordination challenges in government.

In addition, South Africa has a skills crisis that mirrors global conditions, informed by mismatched availability of capacity and market demand and challenges with the educational system (Dessus, Goddard & Hanush 2017). Skills shortages and the demand for competent employees have created persistent challenges in various sectors, in particular the local government. A digital transformation such as 4IR requires considerable financial, human, and technical resources, aligned to the attainment of organisational goals including having leaders that are capable of managing digital transformation and influencing the transition (Dahlström, Desmet & Singer 2017; Draper et al. 2019). Nevertheless, the lack of technical understanding and competence to supervise digital transformation remains a challenge. These difficulties are attributed to the lack of leadership style that is appropriate for the digital transformation and effective planning that will have a detrimental impact on the organisation in the future (Gupta 2018; Sow & Aborbie 2018). It is crucial that organisations embarking on digital transformation employ digitally savvy leaders for stability and success during and post the transition.

Local government in South Africa

Section 151(1) of the South African Constitution (1996) makes a provision for municipalities to be constituted to serve citizens' needs (Constitution, RSA 1996:Section 151/1). Section 152 states that the local government is the engine of citizen service delivery (Constitution, RSA 1996:Section 152/1). This local sphere of government, is the one nearest to citizens, providing municipal services for which the local government is responsible, and other services that the national or provincial government may delegate to them to deliver (Statistics South Africa 2016).

The White Paper on Local Government (1998) stated that a developmental local government's function is to safeguard residents' and communities' quality of life, while also advancing economic and social development (Koma 2012, 2014). Municipalities have a duty to foster social capital among citizens regarding the government's ability to deal with concerns relating to their lives and other community matters, if they wish to prevent protests related to the lack of service provision (South African Cities Network 2016).

Locally, service delivery refers to the way in which local governments provide essential resources to communities, such as land and housing, infrastructure, energy, water, and sanitation (Ndebele & Lavhelani 2017). Reddy (2016) believes that local governments are crucial in service delivery because they serve as a conduit between the national government and its constituents. In addition, local governments foster engagement and involvement by local residents and decentralise administrative authority, planning, and decision-making. Van der Waldt (2014) posits that the decentralisation of service delivery encourages community involvement and participation, poverty alleviation, and social cohesiveness.

Local governments in South Africa are tasked with developing democratic and integrated communities, free of racism, poverty, and other societal ills (Siddle & Koelble 2016). Local government is essential in alleviating the inequalities of the apartheid legacy and in accelerating service delivery for local communities (Msomi, Reddy & Zondi 2018). Reddy and De Vries (2015:12) are of the view that local government is the government sphere operating at the community level to give expression to the essence of participatory democracy. Research studies have examined the performance and efficiency of the local government sector. These have revealed many problems within municipalities as a consequence of inadequate service delivery and practices that intrinsically jeopardise quality service delivery (Mugambiwa & Tirivangasi 2017). The sector has been plagued by various challenges, which include a lack of municipal capacity, service backlogs, difficult relationships between municipal councillors and officials, unrealistic expectations from senior government, and institutional weaknesses such as corrupt and nepotistic practices (Koma 2016; Siddle & Koelble 2016). Siddle and Koelble (2016) contend that local governments' existing operations run counter to their obligation to make sure that communities have access to services, as a result of maladministration, corruption, and unethical and amoral leadership practices, which result in the haemorrhaging of public funds and impediments to service delivery (Potrafke 2017; Ranchod 2020).

Digital transformation in the local government sector

Service delivery practices in many economies are constantly evolving, leading to the digital transformation of the local government, helping this sector to shift from a reactive to proactive citizen-oriented provision of services (Ogada et al. 2016). E-governance facilitates the deployment of governmental services online, in so doing, simplifying municipal administrative procedures, lowering the cost for citizen access to such services, enhancing municipal accountability and responsiveness, and shortening response times to citizens' queries and needs (Faid et al. 2020). The term e-governance refers to the utilisation of information and communication technologies (ICT), including the internet, to offering governmental information and services

to people (Mosleh et al. 2016). E-governance seeks to integrate ICT into all governmental operations to improve the capacity to meet the demands of both citizens and the general public, support its governance, and to improve service delivery (McKinsey 2015).

Related concepts also include e-democracy, which employs electronic communication methods and technologies to improve decision-making processes via public and citizen engagement, and e-commerce, which, in the context of e-governance, is the exchange of money through the internet for the payment of services and utilities, such as car registrations, utility-bill payments, taxes, leisure programmes, or government-purchased office supplies (Kamaruddin & Noor 2013; Potrafke 2017). e-Municipality reflects e-governance service within the local government and defines the production of relevant information for citizens. e-Municipalities play a significant role in delivering effective and efficient services to citizens (Nel-Sanders & Malomane 2022). To accomplish this continual integration of e-governance, governments such as South Africa must proactively plan for the strategic integration of public-service-delivery plans and procedures by digital methods, adopting a citizen-oriented strategy for improving citizen access to governmental services. A citizen-oriented strategy focuses on the consequences of service delivery to ensure that demands and needs of the citizens are met.

According to the Stobierski (2019), successful deployment of digital methods within the local government sector requires a data-driven culture that encourages creativity, cooperation, and risk-taking when adopting digital technologies and trends. Such data-driven organisations advocate the incorporation of artificial intelligence (AI) and data analytics into business strategies and processes to improve decision-making, products, performance management and monitoring, and to gain a competitive edge (Misa et al. 2020).

Few studies have been undertaken to investigate the uptake and acceptability of 4IR technologies in local government (Nalubega & Uwizeyimana 2019; Sihlongonyane, Ndabeni & Ntuli 2020; Sutcliffe & Bannister 2020; Uwizeyimana 2019). Studies have not yet identified elements that may have a significant effect on local government officials' approval of 4IR technology. The aim of the present research, therefore, was to fill a knowledge gap. There is a need for academic attention to the study of the local government sector and its leaders' understanding of 4IR. It is vital to investigate municipal leaders' roles and responsibilities, leadership development, and the advancement of municipal leaders' capacity to handle the difficulties of adapting to 4IR technological transformation when addressing the needs of the citizens. This study sought to examine the concept of the 4IR in the context of local government.

Research methodology

The data and findings reported here are part of a larger research project that used an exploratory sequential mixed-methods research design. This article reports only on the qualitative component of the study and, in particular, the data and findings related to local government sector leaders' responses to their understanding of 4IR technologies in order to achieve citizen-driven service delivery.

This study is firmly positioned within the interpretive research paradigm. Interpretivism is a philosophical approach based on idealism, a view of the world that it exists but consists of multiple, socially constructed realities (Berryman 2019). It is asserted that 'interpretivism emphasises that humans are different from physical phenomena because they create meanings' (Saunders, Lewis & Thornhill 2015).

A qualitative study design was adopted in the study because of its appropriateness for extracting detailed, rich descriptions of the topic under investigation (Bryman 2016). The qualitative research is exploratory and is used to investigate underlying beliefs, motives, and causes that help identify and explain the nature of social phenomena. Semi-structured interviews were used to collect data from purposefully selected participants from the City of Johannesburg (CoJ) Metropolitan Municipality and the South African Local Government Association (SALGA) who work with SALGA on training and were willing to participate in the study. The first cohort with whom interviews were undertaken were the SALGA leaders responsible for initiatives that include strategies to support municipalities; the second cohort interviewed comprised managers from the CoJ Municipality, responsible for delivering citizen services by applying training provided by SALGA. These participants were included in the study because they have an appreciation and understanding, both at a leadership and practical level, of the problems and complexity brought about by 4IR technology's adoption within the public sector. From their expert knowledge of these problems, they were able to suggest possible factors that affect the uptake and use of 4IR technologies in providing improved citizen services. Overall, six CoJ municipal leaders and eight SALGA managers were interviewed. Before conducting the interviews, an interview guide was developed, enabling the researcher to guide the semi-structured interviews. With participants' consent, interviews were audio-recorded and the recordings were securely stored electronically and then transcribed verbatim.

With participants' consent, interviews were audio-recorded. The recordings were securely stored electronically and then transcribed verbatim. Transcripts were proofread alongside the recording to ensure accuracy. The researcher also took notes during the interviews and recorded thoughts and insights immediately following each interview. These notes were also typed up to be included in the analysis.

All data collected were imported into ATLAS.ti (Version 8) for analysis. The thematic analysis procedures outlined by Braun and Clarke (2006) were followed, starting with immersion in

the data and then assigning codes, or short descriptions, to items of interest in the text. A combined deductive and inductive approach was taken to develop the codes, harnessing the flexibility of the thematic analysis method (Braun & Clarke 2006). To ensure reliability and validity, triangulation was used in this study. The findings from interviews in this study were checked against the findings by other scholars found as part of the literature review. This approach is consistent with Sekaran and Bougie (2009).

Ethical considerations

The main ethical considerations of this study were the protection of the anonymity of participants with regard to archiving data in a secure and private manner, and writing up the findings in a way that did not disclose identifying details (Creswell 2013). Participants were informed about the study and advised of their right to withdraw without consequences at any time. Following this, they provided their written consent by signing informed consent forms. Prior to data collection, the Research Ethics Committee of the researcher's university approved the conducting of a larger study. Ethical clearance to conduct this study was obtained from the Milpark Business School Research Ethics Committee (No. DBA2021/08/003).

Data presentation, interpretation and analysis

According to the findings from the research study's interviews, the 4IR concept may be described by identifying three major themes: features of 4IR, technology and new innovations, and benefits of the 4IR for enhanced service delivery. Participants considered these three themes as the primary points that will undergo substantial changes (modifications) that will usher in the 4IR in the context of the connection between SALGA and the CoJ.

Features of the Fourth Industrial Revolution – Digital transformation

Participants were asked to identify what they believe are the features of 4IR within their context. In addressing this question, it was crucial to explore and consider 4IR features and applications and digital transformation within the context of local government. Some participants agreed that the 4IR is described as a period which involves the use of new and advanced means, and features and components of technology that enhance information management and administration to enable the efficient accessibility of services and resources by citizens. Participants believed that 4IR encompasses aspects of digital transformation in the information use, data connection, and ease of accessibility. Participants echoed that 4IR would impact systems used in accessing and disseminating information such as mobile devices; smartphones and laptops; as such accessibility and -sharing abilities would undergone significant upgrades and improvements. Participants believed that 4IR encompasses interpersonal relationships, communication, engagement and data accessibility, as well as data connectivity. All of these, in terms of the use of shared information, are greatly scaled up in 4IR as data connectivity and accessibility increase. One participant viewed 4IR as the:

> '[*N*]ext wave of internet connectedness; faster, simpler, and much more personalised ways of doing [*through the*] … use of technology to get interaction with citizens … and the … gathering of tools or information to solve problem[*s*].' (Participant 7)

According to Griffiths and Ooi (2018), Hirschi (2018) and Skilton and Hovsepian (2018), these findings are consistent with previous studies, which show that digitisation and access to information are also used to explain 4IR. All participants agreed that 4IR entails unrestricted access to information, digitisation, and the merging of biological and physical worlds.

Furthermore, participants believed that 4IR technology will include devices used for accessing and disseminating information, such as mobile devices, smartphones, laptops, and other similar devices equipped with data collection or storage, accessibility, and sharing capabilities – all of which should be scalable and improved upon. Citizens would interact with municipalities more efficiently as a result of this technological adoption. Participants believed that improvements in the way information is shared and utilised will result in a better and closer relationship between local government officials, and citizens and their governments, thus achieving close interconnectivity.

Participants are of the view that implementing digital transformation increases service delivery by promoting public-service procedures and productivity, improving employee and customer experiences, and assisting in the management of business risks. Digital transformation initiatives in the local government sector are focused on collecting data and analysing business processes to improve service delivery, as digital transformation plans are tailored to the requirements of each local government-sector organisation (Ranchod 2020; Sibanda, Zindi & Maramura 2020; Wessel et al. 2021).

Fourth Industrial Revolution technology and new innovations

On reflecting on their views on 4IR technology and new innovations, participants regarded 4IR as an era that will bring about significant changes in the ways they conduct their work. They considered 4IR as a technological revolution that will have a significant impact on their work and their interaction with one another and their clients. Some participants agreed that 4IR will transform the way in which local government officials engage and interact with citizens.

The research participants viewed service delivery as directly linked to and impacted by technology and new innovations. The participants argued that effective information management and improved service delivery are both dependent on technology. The participants stated that technology in 4IR is characterised by mobile devices,

computer devices, high-speed internet connections, cyber–physical and virtual systems, 3D and 4D printing, virtual reality, and AI. A number of participants believed that some of these features or components were found in previous revolutions but could be considered crude when compared with the changes that the 4IR will bring.

Some of the participants expressed different views and perspectives of their understanding of the theme of 4IR. Interviews reflect on the participants' views on technology in the 4IR in the following excerpts:

> 'Fourth Industrial Revolution is a technological revolution which impacts on how humankind lives, works and relates to one another. Utilisation of technology such as mobile devises, computer devices.' (Participant 2)

> 'A new chapter in human development, driven by the increasing availability and interaction of a set of extraordinary technologies, which building on the three previous technological revolutions.' (Participant 3)

> 'The Fourth Industrial Revolution comprises cyber-physical systems, Internet of Things, networks, 3D and 4D printing, virtual reality.' (Participant 4)

> 'Machine learning, information, Internet of Things, smart tools, automation and technology are being accessed and used in everyday lives.' (Participant 6)

> 'A period comprising of a number of technology dependent on faster and reliable internet, more connection, more data analytics, focused on harnessing data, more connected structures, automating process and self-managing system, the use of machine learning, improved mobility self-service.' (Participant 7)

The participants shared that new forms of technology are expected to take shape, be applied to, and become embedded in almost every sphere of daily human life. Some participants believed that technology is embedded in service delivery, which makes it more effective and accessible to citizens and makes the circulation of resources more efficient. Participants also stressed the importance of information management – new forms of technology that make information highly accessible and well-managed. This can be done through the use of technological components and smart devices, social media, automated machines, and artificial intelligence.

Participants also stated that three features that characterise the 4IR – information, service delivery, and technology – are interconnected. In support of this view:

> 'The use of new and advanced technology to get interaction [*information*] with citizens so they can smartly access service from the provider, and the provider being able to analyse and understand the need of the citizens so as to improve the delivery of services.' (Participant 8)

Participants stated that they were also better equipped with resources, capabilities, and knowledge to utilise and manage technologies for accessing services efficiently.

Participants opined that, aside from being characterised by technological advancements, the 4IR will also usher in significant changes such as innovation, that is, changes in the way things are done. Participants argued that the dimension of physical space and the way it is used and managed will take a different turn. These changes have been perceived as disruptive in nature, as they will be considerably different from those in the three previous industrial revolutions.

Service delivery in the Fourth Industrial Revolution

Participants mentioned that service delivery entails several areas and aspects of everyday life, such as banking, telecommunication, electrical supply, and other local services that citizens use on a daily basis. Participants echoed that there is a strong drive towards citizen engagement, participation, and transparency in its local government structures. Some participants reported that this is therefore an important conduit in driving 4IR advancement within the context of service delivery.

Research participants shared the following different views regarding the theme of service delivery in the 4IR:

> 'My understanding of Fourth Industrial Revolution is that services should be delivered in high speed and efficiently. Access services [*from*] the comfort of their homes through fast working internet.' (Participant 1)

> 'Many citizens are no longer expected to go to the municipal offices and enquire or pay for the services that they utilise.' (Participant 2)

> 'This has to do with making the lives of citizens even at the lowest level easier, bringing and delivering services to them.' (Participant 6)

> 'Faster, simpler and much more personalised ways of doing which should apply across all industry and used in delivering goods and services to customers or citizens, efficient infrastructures delivering electricity, water and meeting with expectations of the citizens.' (Participant 7)

> 'Services should be delivered in high speed and efficiently. Customers must be able to access services at the comfort of their homes through fast working internet. Most of activity should be automated.' (Participant 10)

Participants stated that in the 4IR, services are expected to be improved upon and delivered quickly and effectively to citizens. The manner by which individuals access these services is expected to take on a different dimension. Some participants believed that citizens would access and receive services easily, in the comfort of their homes, without having to go through rigorous processes and difficult channels. These services will be delivered to them using new and special innovations that are different from those used in previous technological or industrial revolutions. One of the participants used the example of energy services such as electrical supply: that the means by which citizens will access these services will take a new direction, as they no longer need to visit municipal offices to enquire about or pay their accounts. They can easily enquire about, access, and pay for these services from the comfort of their homes or

other remote locations. According to Mawela, Ochara and Twinomurinzi (2017), municipalities are important in accelerating e-governance programmes for the engagement with all stakeholders, including businesses, local communities, non-governmental organisations, and traditional leadership structures.

Most participants mentioned that the 4IR will be characterised not only by efficient service accessibility, but by better allocation and circulation of resources in the system. The participants stated that these resources are also services and will be easily accessible by a high percentage of citizens both in urban and rural areas. Some participants reported that the rate at which services are being rendered and accessed, the means of accessibility, and the population who can access them are what will differentiate the 4IR from other eras or previous technological revolutions. E-governance concerns the ways in which 'decision and policy-making processes may be supported by information and communication technologies (ICT)' (Mawela 2015).

Other participants stated that self-servicing is another venture that is expected to take shape in the age of 4IR. Citizens are required to be better equipped with the resources, skills, and knowledge for how to deal with certain issues related to managing the services that they have access to. Participants mentioned, for example, that in electricity service supply, citizens do not need to visit municipal offices or be informed by officers of their consumption, how to make payment, or renew their service. Instead, citizens are expected to be informed and knowledgeable about how services are rendered to and consumed by them, and how they can apply for new services or change their current package. Participants opined that the use of smart meters will not only help regular citizens monitor their energy consumption, but it will also help them to access electricity from home with ease.

These findings are in line with the principles of e-governance, which is essentially a set of multifaceted public-sector technological platforms used to create and support governmental structures. These structures also enable services to be delivered in efficient, effective, and accessible ways (Bwalya 2017). The advent of 4IR has accelerated the development of e-governance platforms and, in addition to advances in big-data computing, the internet itself has advanced to better support processes that feed into value-based service delivery and decision-making systems.

Discussion of findings

The local government sectors around the world have faced difficult challenges related to service delivery for their citizens in their efforts to adapt in response to the 4IR. The South African local government has not been exempted from these issues. As a result, leveraging 4IR technologies to enhance service delivery for citizens has become a priority for local government, despite known problems such as poor management, inefficient expenditure, public-sector corruption, and declining citizen-service performance.

Participants felt that preparing for the 4IR will improve digitisation and digital transformation in the management and storage of information and data relevant to delivering civil services for present and future use, making life easier, and improving our connection to our past, present, and even future. Improvements in access to information will improve engagement with people so that they may make informed decisions about obtaining services from a provider. From the provider's point of view, the richness of data collected will allow them to analyse and understand the needs of citizens in order to improve service delivery. Furthermore, many actions will be automated; services should therefore be supplied quickly and efficiently. Mawela et al. (2018) state that, municipalities are crucial in expediting e-Government programmes relevant to all stakeholders, including businesses, local communities, non-governmental organisations, and traditional leaders. Within this context, e-Governance policies must be perceived as significant mechanisms for provision of services. E-governance is essentially a collection of multiple public-sector technological platforms that are used to establish and maintain governmental institutions. These frameworks also allow for efficient, effective, and accessible service delivery (Bwalya 2017). Likewise, the Local Government Sector Education and Training Authority (2020) believes that better integration of e-governance platforms at the local government level would result in a more proactive modernisation of governance, innovation, and engagement of citizens. Enhanced stakeholder engagement and interaction are required for promoting effective 4IR integration (LGSETA 2020).

The findings show that gains in information distribution and service delivery are both closely related to the use of technological innovations, which characterise the 4IR. Technology is required for both effective information management and enhanced service delivery. When it is incorporated in service delivery, services become more effective and accessible to citizens, and the efficiency of resource circulation is improved. New kinds of technology in information management make information more accessible and manageable, via the use of technical components, devices, and AI. The 4IR is defined as a period in which new and sophisticated tools, features, and components of technology are deployed for enhanced information management and data intelligence for efficient use by citizens to access services and resources. Aside from technological breakthroughs, the 4IR will bring about important changes such as innovation, which refers to changes in the way activities are carried out.

Another theme discovered in the research study was the impact of 4IR on service delivery. Participants recognised the importance of adapting to the 4IR while preparing local government personnel. The 4IR's disruptive technology developments, including Internet of Things (IoT), AI, and machine learning, promise to boost workforce efficiency across governmental sectors through digitalisation. The participants' responses regarding service delivery in the 4IR suggested that they felt that the 4IR should result in

improved citizen service delivery. They also stated that the manner in which individuals gain access to governmental services is anticipated to change. Citizens will no longer need to attend municipal offices to make inquiries or pay for services they use, or even access certain services, because they may do it from the convenience of their homes or other locations, via a reliable internet connection. According to the findings, with 4IR, citizens may anticipate government services to be upgraded and supplied quickly and effectively. The findings are consistent with the findings of Ogada et al. (2016), who discovered that service delivery procedures in the economy are continually changing, resulting in local government sector's digital transformation and responsive service delivery.

Contribution

The current study concentrated on adding to the body of knowledge regarding the understanding of 4IR within a local government context. As South Africa's local governments have only recently begun to integrate 4IR technology, this study may help local government leaders consider the elements that contribute to an effective understanding of 4IR technology adoption for municipalities.

The research findings should help municipal leaders better understand how local government employees understand the concept of 4IR technology and its benefits to enhancing service delivery.

Conclusion

Despite the fact that the government has created several service delivery improvement programmes over the years, these have had minimal impact for service delivery provision. The 4IR can be perceived as the response to service delivery challenges while enhancing local government relevance and impact. It is an emerging disruptive shift in which the accelerated adoption of new technologies is inevitably redesigning and transforming service delivery.

In the public service context, human resources are a critical element in enhancing public service delivery. As such, it is crucial for local government officials to have a comprehensive understanding of their role and service delivery in the context of the 4IR. Local government officials need to have the ability to effectively and clearly understand the anticipated changes linked to the 4IR and how they can be embraced within local government and the far-reaching impact on service delivery.

It is recommended that local government needs to assess the state of preparedness of municipalities and officials for digitisation and the execution of 4IR initiatives and implementation, and the levels of digital maturity that municipalities possess, so as to have an improved grasp of the assistance that officials and municipalities require as part of their obligation to improve service delivery.

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Authors' contributions

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Data sharing is not applicable to this article, as no new data were created or analysed in this study.

Disclaimer

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