

## THE USE OF FOURTH INDUSTRIAL REVOLUTION DRIVERS TO ENHANCE EMPLOYEE'S PERFORMANCE IN SOUTH AFRICAN MUNICIPALITIES

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*Abstract: The crucial drivers of change in most industries are the causes of change in the nature of jobs and they bring different effects to both the public and private sector. These drivers of change have created various models of change that have positive and negative consequences for skills needed by the government and labour markets. This study aims to assess the use of Fourth Industrial Revolution drivers to improve employee performance. The study used a qualitative research approach; data was collected from nine participants through semi-structured interviews. Participants were approached through a purposive sampling technique. The collected data was analysed using thematic approach. The results revealed that robotics, automation, and AI applications in the workplace may increase employee and employer safety. 4IR, when implemented as an assistant to the employees, not as a replacement, can significantly improve workers' living standards and raise income levels, especially for those who are technology experts. Clients have reaped the greatest benefits of 4IR thus far, not workers, as they now have unrestricted access to the digital world. Drivers of 4IR increase productivity across entire department of municipality, allowing workers to be more effective in their work by deploying robots, AI, IoT, and automation as assistants and tools. The study recommends that 4IR drivers must be implemented only if adopted as assistance to the employees, not as replacements, thereby reassuring the audience about the future of work.*

*Keywords: Employees, Performance, 4IR.*

### Introduction

As Ferrang and Toor (2017) point out, we are living in a world of perpetual motion, where goods, labour, and capital move at unprecedented speeds, driven by the innovation brought by technology. This technological innovation is not only changing all industries but also reshaping the way human beings manage their lives, making it a crucial area of study (Mketanae, 2017). Technology can be seen as an economic influence, which, with its power to disrupt, Dunaway (2019) indicates that these effects go together, and both are essential to leaders as no one knows how the 4IR drivers will develop. One thing that is totally clear is the need for critical reaction, which has to be comprehensive and integrated and must involve all stakeholders of society globally, from both public and private sectors, including academic and civil society (Sony & Jonny, 2019). The consequences for countries and businesses that did not consider embracing and adapting to the development brought by the 4IR are concerning since such countries will lose many investors because many businesses are heavily investing in technology (Karmazin, 2017). These are a few nations, such as Japan and Canada, or a multinational corporation, such as MacDonalds, which have positively responded to the 4IR and yielded positive results, which suggests that all other

nations and businesses need to follow suit to be at this level or standard (Blackburn & Davis, 2020).

From the perspective of the African continent, Roijjo and Sailander (2018) highlight the challenges that are faced by the African continent concerning 4IR, such as lack of infrastructure, for instance, access to broadband, including electricity, and poor education, which implies that the African continent always plays catch up when it comes to technological modification (innovation). To counteract this, the arrangement was for substantial mobilisation of funds to come up with new modern technology led by businesses and supported globally by other nations. These funds are to assist Africa in closing technological gaps as it is always following the rest of the world, and this will be advantageous in solving pre-existing inequality problems in Africa (Zouh, 2022).

Sony and Rauch (2016) indicate that the South African Minister of Trade and Industry, Stella Ndabeni Abrahams, stated that the best way is for South Africa to invest in mining, in which 4IR will offer many opportunities that will fast-track sustainable growth, through maximising the production of the mining industry made possible by 4IR. Furthermore, the 4IR is not only affecting the manufacturing arena; it also extends its effect to services sectors, not excluding legal professions, accounting, public institutions and commerce, therefore, South Africa needs to start working on its response (Prasad, 2018). South Africa is affected by 4IR – this is a reality that cannot be ignored, which creates many challenges for South Africa, such as inequality, poverty, and unemployment. The gap between the poor and the rich is already a challenge (Panda, 2021). Regarding the future of jobs, the World Economic Forum (WEF) (2016) predicted a loss of five million jobs in Africa alone by the year 2023 because of technological changes.

The 4IR is more complex than the Third Industrial Revolution and expands digital changes from the Third Industrial Revolution (Zhou, 2019). This entails heterogeneous evolving technologies, which change from a large-scale digital platform including smart sensors to 3D printing, advanced robotics, nanotechnology and synthetic biology (Rocky & Tark, 2018). Digital platforms are found anywhere and are essentially changing the clients' outlook (Ilyukhina, 2017). The youth are now growing up in a world that is full of computers, the internet, and digital communication, now living in workplaces, which brings new approaches, habits, and ideas. This is a sign of the rise in new technology that is disrupting workplaces, developing new industries, and requiring different approaches, as the existing ones are no longer relevant (Rashid & Perastirea, 2019).

Regardless of the importance of drivers of 4IR, there are limited studies conducted on the use of 4IR drivers on the performance of employees in public institutions. Nevertheless, the impact of these Fourth Industrial Revolution (4IR) drivers has been observed in both the private and public sectors. While numerous studies have focused on the effects of 4IR drivers on the private sector, there remains a gap in assessing their influence on employee performance within the public sector. Consequently, there is a pressing need for scholarly research into the utilisation of 4IR drivers and their implications on employee performance in public institutions. Most studies on drivers of 4IR in public sectors focus on the challenges of these drivers and ignore the potential effect of the drivers of employee's performance. In this particular context, this study was specifically designed to investigate the effect of utilization of 4IR drivers in improving employee performance. The study also provides the best practice the municipality can adopt to use 4IR drivers to enhance the performance of employees.

### *Basic drivers of change*

The crucial drivers of change in most industries are the causes of change in the nature of jobs and they bring different effects to both the public and private sector. These drivers of change have created various models of change that have different negative consequences for skills that are needed by the government and labour markets (Reaves, 2018). The new transformation of technology makes certain jobs obsolete, and tasks are divided in new ways, which results in job fragmentation in various industries. The government needs to come up with an emerging technology that will be of a high standard in order to remove developments that could reposition the businesses and government and lead to retrenchment of the employees (Scepanovic, 2019).

### *World Economic Forum (WEF)*

The World Economic Forum's "The Future of Jobs" (2016) communicated that the invasion of technology in all industries will change many jobs, especially from 2020 and moving forward. The changes in these jobs will require new skills, as stipulated by the survey that covers about 15 countries with large economies and South Africa is also one of these states (Daniel, 2020). The purpose of the analysis was to look at the effect of drivers of change in bringing information to the fore about the expected changes in geography and industry, including the expected effects on changing job functions, required skills and employment levels (Marwala, 2016).

### *Digitalisation*

The largest employer in South Africa is the government, estimated to have had 2,6 million employees in 2018 (Coleman, 2019). Government is the one major user of the products and services of Information Technology (IT), including the South African government (Reyy, 2019). Society has changed in many forms due to the use of digital communication, and most of society is not fully aware of this communication. Mhlanga (2018) reveals that about 130 governments in the world are providing or meeting the demands, expectations and desires of the society effectively by using online services. Through installed online services, most of the residents are benefiting, including those in rural areas who were struggling to find access. With these online services government is better able to access the rural population, including people with mental and physical disabilities. Digitalisation is the only way to improve the services of government, but the lives of people are changing significantly, including the work environment and the way people live (Scepanovic, 2018).

### *Internet of Things (IoT)*

Currently, there has been much advancement in technology regarding the concept called the Internet of Things (IoT). In the World, there are many devices, for instance, television sets, computers, mobile devices, and many more devices that can be connected to one another through the internet. All of this has been possible through the concept of the IoT. The internet makes it possible for one device to send information while other devices can receive the information such as data (Dunaway, 2019). Siemens (2016) observes the IoT as the network of objects that can be seen or touched, and the object can be able to sense, communicate, and interact with external or internal environments. The digital interaction that exists between systems and machines is also regarded as the driver of change in 4IR.

Lastly, Buckminster (2016) explains the IoT as a driver of change since it can change the way people work and live, and its future developments are unpredictable.

### *Big data*

Big data is the term that refers to the vast amount of complex data, which can be either structured or unstructured, which techniques and algorithms process and that is difficult to handle (Nicholas, 2020). Big data is also observed as the high velocity of different information assets, which requires innovative and effective cost in terms of information processes, which can be able to improve the processes of automation and decision-making (Maurizio, 2019). This big data helps departments or institutions to make better decisions and to analyse the information of the institution based on the available information. Technology is being improved every day, and it increases the availability of data, which is from various devices, since there are many devices to collect data from that are being made by the transformation of technology. To uncover the hidden information, it is necessary to analyse these data for future applications (Fernandez & Sriraman, 2020). The big data phenomenon indicates the current size by which information can be collected and made available. Many departments depend on the amount of information to make better or informed decisions, which can be possible through various technological models (Leandri, 2018). For instance, in the workplace, this could be the number of employees looking for jobs after retrenchment. In addition, an effective space is needed to keep the data after collection, which can be possible through technological transformation or inventions (Schwab, 2016). Most industries have moved from the traditional way of collecting and analysing data to better ways than before, which are introduced by technology (Big Data). Big Data are perceived as the driver of change because of the space provided for storage to hold data; now, organizations keep data safe and analyse it faster in safer ways because of technological transformation (Voltaire & Jack, 2019).

### *Artificial Intelligence (AI) and automation*

Artificial Intelligence (AI) is described as the intelligence of humans which is simulated in a machine that is programmed to think like humans and operate human actions. Chow-Miller (2015) adds that any machine that is programmed to work like the human mind is identified as the opposite of natural intelligence. Furthermore, AI is the strength of a robot or machine to perform tasks that are normally performed by humans, and these robots and machines are operating because of computer technology (Eisenberg, 2016). It is the use of machines that work or use human intelligence. Automation means that the jobs that were performed by humans are now being done by machines, and these machines can think, read, plan, and natural language can be manipulated by these machines. AI and automation are disrupting every employee in the workplace not only by automating the jobs but also by the change in the nature of jobs that require new skills (Nordin & Norman, 2017). Furthermore, the capacity of AI to work hand in hand with other emerging technologies, which are IoT, 3D printing, biotechnology, augmented reality, virtual reality and blockchain, and others, is changing the lives of people, organisations and institutions and societies because AI is affecting all industries and life that exists (Trang, 2021). AI is changing many industries, and others are being revolutionized, such as travel, education, health, finance, agriculture, finance, and many more (Hoang, 2020). Coleman (2019) reported that the banking sector is already using AI at a higher pace; in the last three years,

about 96% of banks have been using AI following the vision under the name, “Banking Technology Vision 2019 – Banking in the Post-Digital Era”. In the next three years, about 47% of the public institutions will be affected by the leading technology, especially AI. Artificial Intelligence has improved the finance industry considerably in both the private and public sectors, where credit decisions can be made online, and chatbots attend to the needs of customers and are able to detect fraud (Koetsier, 2020).

Artificial Intelligence has improved most services in the private and public sectors for bookings, chatbots, and check-in by facial recognition. It helps customers to receive the best, safest, and efficient services with or without the intervention of human beings. With the ability of AI currently, many machines are able to do many things regarding sensing capability, such as speech recognition (hear), computer vision (see), and natural language processing (understand), which aids a great deal in recognition and detection (Koetsier, 2021). Hackett (2019) adds that through AI, various activities are changing at high speed, for instance, transportation, with robots and self-driving cars, and many other vehicles that will change soon to autonomous and electronic, such as motorcycles, bicycles, airplanes and trains which indicate that drivers will no longer be needed both in the public and private sector. Technology is changing rapidly, and the majority of people are not fully prepared for the replacement of humans by machines. Many jobs will be replaced, and few people will be retained, despite limited opportunities for job creation (Hawk, 2020).

## **Literature review**

### *Municipalities in South Africa*

South African municipalities need to use AI, robotics, and automation that can improve communication and services and encourage or promote public participation in order to reconfigure public service delivery in the 4IR (Ogunnubi, 2018). As confirmed by Mirandilla (2021), combining 4IR and the governance of municipalities is the best way to ensure that smart governance is achieved that resembles smart cities (Twinomurinzi, 2020). However, local governments in South Africa have many difficulties that could prevent the implementation of 4IR, which will ensure smart service delivery (Ormrod & Maseko, 2018). These challenges include inadequate leadership-related administrative oversights and internal control (Siddle, 2022).

Drivers of 4IR is essential for promoting the social and economic well-being of the public, which is possible by taking advantage of technological advancement (Almazan & Ubacht, 2020). As explained by Rivett and Chemisto (2020:80), “such ICTs encompass various technologies, including fixed and wireless telephony, computing and information technology, broadcasting, audio and visual content, and internet and traditional methods of communication, including post deliveries”.

Some scholars support 4IR as it is an important strategy for running government and networking with other stakeholders (Bhatnagar, 2020). Anderson and Schroeder (2019) propose that 4IR is needed to improve municipality development and governance, which can be implemented in four ways. Firstly, a modification to an already-running program that provides public services; second, a tool that allows e-government (e-delivery) with the aim of cutting costs; third, releasing data on developmental spending as a way of maintaining accountability to the communities; and last, creating economic development, using AI, automation, and robotics.

In order to achieve effective service delivery using 4IR, South African municipal governments would need to utilise a variety of 4IR components (mentioned above) with the aim of improving financial services' accessibility, enhancing citizen coordination, facilitating data collection to improve the distribution of public goods, and to boost citizens' access to both public and private information (Hamman-Fisher, 2020). The usage of 4IR is very complex because of the technical skills shortage in many local municipalities in South Africa. Almazan (2019) states that during COVID-19, technological advancements worked effectively in the distribution of information, upholding accountability to the citizens and delivering proper public services.

Automation plays a pivotal role in augmenting the efficacy of personnel in municipal entities at the local level by optimizing administrative procedures and enhancing service provision (Mhango, 2020). Various studies conducted in diverse settings underscore the favorable influence of automation on the operational proficiency of employees and the quality of services rendered (Aguirre & Calderone, 2017). For instance, a scholarly inquiry conducted in the unsheathe Municipality accentuates how automation has expedited workflow, resulting in heightened work performance and service delivery (Schwab, 2016). Moreover, research undertaken in the Jeddah Municipality and Western Azerbaijan underscores the significance of automation in bolstering employee productivity and operational efficiency (Wolf, 2019). Nevertheless, impediments such as discrepancies among stakeholders and divergent perspectives on automation priorities may impede the efficient deployment of automation and the enhancement of employee performance within local governmental bodies (Höller, 2019). Hence, while automation harbors the potential to amplify employee output and service standards, mitigating organizational obstacles and aligning stakeholder interests is imperative for optimizing its advantages in local municipalities.

The Internet of Things (IoT) enhances employee performance by facilitating streamlining safety processes, worksite efficiency improvement, and data-driven decision-making (Al-Rodhan, 2020). Organizations can attain enhanced communication, computation, and decision-making through IoT and machine learning, resulting in heightened productivity and cost-efficiency (Brynjolfsson & Spence, 2019). The incorporation of IoT in human resource management aids in the optimization of recruitment, training procedures, and performance assessment, thereby fostering organizational culture enhancement, employee commitment, and performance supervision (Gershenfeld & Vasseur, 2022). Moreover, integrating IoT in the work environment boosts operational efficiency and promotes increased productivity, employee engagement, communication, and overall market effectiveness, catering to the escalating demand for productivity solutions in dynamic work settings (Brown, 2021). In essence, the integration of IoT enables organizations to make data-driven decisions, elevate employee performance, and foster operational excellence.

Robotics occupies a significant role in enhancing the performance of employees within various organizational environments, including municipalities (Donovan, 2017). Studies have indicated that using social robots as part of interventions can result in enhanced productivity and mental well-being among employees, particularly in workplace wellness initiatives (Meister & Mehta, 2018). The utilization of robotics and automation also has the potential to impact employee motivation, a factor crucial for the success of organizations, especially in light of rapid technological progress (Skilton & Hovsepian, 2018). Additionally, the integration of Human Resource bots based on artificial intelligence

has been shown to improve the employee experience by streamlining human resources tasks and enhancing communication within the workplace, ultimately leading to improved performance outcomes (Erboz, 2019). Furthermore, the introduction of industrial robots in manufacturing businesses has demonstrated a dual influence on employment and productivity, with robots bolstering enterprise efficiency and profitability while concurrently contributing to a decrease in employment levels, underscoring the importance of achieving a balance between operational efficiency and levels of unemployment in the context of technological advancements (Hooker & Kim, 2019).

Artificial intelligence (AI) is pivotal in elevating employee performance in local municipalities through several advantages, such as increased productivity, decision-making support, and service delivery enhancement (Nordin, 2018). The adoption of AI technologies, such as autonomous agents and predictive analytics, is rising among local governments to streamline service provision and revolutionize the socio-technical dynamics between employees and tools (Gumede & Rodny, 2020). Using AI-powered HR applications, municipalities can assess, forecast, diagnose, and pinpoint high-performing staff members, resulting in heightened job satisfaction and efficacy (David, 2019). The researchers indicate that the incorporation of AI in municipal administration not only bolsters the psychological empowerment of employees but also demands endeavours and investments to realize substantial enhancements in residents' quality of work and life.

The incorporation of big data analytics is of paramount importance in augmenting the productivity of employees across diverse sectors (Acher & Cheain, 2022). Studies suggest that the capacity for big data analysis positively impacts the operational efficiency of high-tech companies, with employees' inclination towards adopting AI applications also playing a pivotal role in operational achievements (Huemann & Silvius, 2017). Additionally, within the healthcare domain, the significance of big health data analytics (BDHA) is underscored as a critical element in enhancing job performance, particularly for older workers, by assigning appropriate tasks based on their health status and job roles (Sabini & Alderman, 2020). Moreover, applying big data in enterprise performance management results in enhanced assessment techniques, increased sales, and heightened efficiency in human resource management, ultimately elevating organizational effectiveness (Bergeron & Raymond, 2017). Furthermore, integrating electronic records management systems (ERMS) supported by proficient big data handling significantly boosts organizational performance in the oil and gas sector, demonstrating the potential of ERMS to enhance production efficiency and decision-making processes (Manyika, 2020).

#### *The use of 4IR to improve service delivery*

Doorgapersad (2022) affirms that technology is a crucial method to improve the way of providing service delivery and information to the public, and most governments use 4IR as a pivotal strategy. In South African local government, 4IR has improved many municipalities in terms of operational efficiency and it has brought transformation that was necessarily needed in the delivery of public services, especially in smart cities (Bannister & Sutcliffe, 2021). For the South African government, 4IR is needed as an enabler system to achieve social and economic development at the National, Provincial, and Local levels (Riyadh & Fahlevi, 2019). Gheorghe, Subić and Nancu (2020) consider 4IR as the primary paradigm that can change the governing system in the field of Public Administration. Many

academics link the 4IR expansion paradigm with e-government as a result of its usage becoming more widespread (Grimmelikhuijsen, 2021).

Drivers of 4IR is thought to rationalise government operations in line with the New Public Management (NPM) doctrine (Peters, 2021). Issah and Wayi (2020:10) consider "e-government as a next step in the rationalization of government activities along the lines of NPM." The potential utilization of 4IR is a shortcut to impose the rationalization of public administration to improve many aspects, such as transparency, speed of service delivery, and accountability for the action of public institutions, while also altering the type of services that public administration offers (Pashapa & Chare, 2021). As cited by Vyas and Doorgapersad (2020), this happens at all levels of government: National, Provincial, and local. Local government has the responsibility of providing services to the community within its jurisdiction as per community demands, as in the Constitution of the Republic of South Africa Act 108 of 1996 (Nhemachena, 2021).

During the COVID-19 pandemic, the usage of 4IR components, such as automation, robotics, and AI, has helped the government to improve transparency, efficiency, and accountability in service delivery (Rorisaan, 2022). Moving from traditional Public Administration towards using the 4IR, many public administrations regard 4IR as the best strategy to manage government entities. 4IR works as the integral mechanism in Public Administration in this 21st century that enhances service delivery (Sima, 2020). According to Poll (2018:70), "However, this paradigm shift demands investment in skills development for personnel to deliver smart services via e-platforms". This is important to guarantee that the South African government is in line with globally acceptable norms while ensuring that South Africa is also not left behind in technological advancement (Schäfer, 2020). However, the "Presidential Commission on the Fourth Industrial Revolution (PC4IR)" has been developed by President Cyril Ramaphosa of South Africa to provide proper guidance on how to adopt technological innovation in public institutions (Olivier, 2019). The commission has provided one key recommendation, which is 'Investing in Human Capital' (Rogers, 2018), even though it is difficult to retain some skilled expertise due to the usage of 4IR (Driessen, 2018).

### **Research Methodology**

A qualitative research approach was used in this study. The qualitative approach is a significant approach that delves into intricate phenomena by examining the expressions, attitudes, beliefs, and cultural backgrounds of individuals (Lahiri, 2023). The researchers used this approach as it is objective to comprehend the importance individuals attribute to their encounters and reveal their opinions. The data was collected using semi-structured interviews. Semi-structured interviews are a useful research method that blends pre-planned questions with unstructured inquiry to provide a thorough understanding of complex subjects and the disclosure of unexpected viewpoints (McCusker & Gunaydin, 2015). These semi-structured interviews are essential for revealing people's motivations, viewpoints, beliefs, and how different drivers of 4IR impact the performance of employees. This instrument also gave the researchers an interactive way to gather detailed information that may not have been anticipated beforehand.

Purpose sampling was employed in the selection of the nine participants from the designated municipality under Information and Communication Technology. The invitations for participation were personally delivered. Following the receipt of a sufficient



number of responses from the municipality, the participants were contacted via telephone to schedule a date and time for the semi-structured interviews. Despite three participants expressing their unwillingness to partake in the interview, the ultimate count of participants amounted to six.

Ethical considerations in research encompass the safeguarding of result confidentiality and study findings, as well as the preservation of respondents' identities (Mohajan, 2018). Initially, participants were provided with a detailed letter elucidating the research's purpose, anticipated duration, and research procedure. Subsequently, they were given the opportunity to express their willingness or reluctance to partake in the study in written form. These actions effectively addressed the principles of informed consent and freedom of choice. Participants were explicitly informed of their option to withdraw from the study if they experienced discomfort.

The interview schedule conducted with officials from the ICT municipality was systematically documented through audio recording and subsequently transcribed word for word. The data extracted from these transcripts was then analysed and utilized to derive conclusions and provide recommendations aimed at fulfilling the study's objectives and goals. Thematic analysis techniques were used to analyse the collected data since this approach assists the researcher in investigating the beliefs, perspectives, and experiences of individuals. Felton and Stickley (2018) state that the thematic approach provides distinct perspectives that alternative methodologies may not provide, especially in the realm of health services research.

### **Findings and discussion**

The drivers of the Fourth Industrial Revolution (4IR) encompass a multitude of factors that drive the integration of physical, digital, and biological domains, shaping the global economy. Factors from the supply side, such as research and development advancement, a skilled workforce, and environments conducive to innovation, play a pivotal role in nurturing innovative services and perspectives (Mudau, & Mukonza, 2021). The utilization of data science in the real estate sector, inclusive educational structures, decentralization of real estate markets, and effective data handling systems are identified as key drivers for successful incorporation in the era of the Fourth Industrial Revolution (4IR). Additionally, the application of artificial intelligence (AI) technologies in various institutions like telecommunications enhances competitiveness, lowers costs, and boosts performance, making a significant contribution to the global economy (Bhatnagar, 2020).

Municipalities have reaped the greatest benefits of drivers of 4IR thus far, as they now have unrestricted access to the digital world. New technological advancements have created many platforms to access services and products that improve the lives of citizens and less administrative duties in municipalities. The costs of communication, transportation, and logistics continue to reduce as drivers of 4IR emerge.

Drivers of 4IR increase productivity across entire departments of the municipality, allowing workers to be more effective in their work by deploying robots, AI, IoT, and automation as assistants and tools. Some research indicates that technology increases productivity, which results in high output but decreases hard work in municipal employees. Also, the adoption of drivers of 4IR increases job opportunities for those who enrolled in computer science, as explained by Spithoven (Spithoven, 2019). One of the interviewed managers mentioned: "Cloud computing to improve collaboration has been widely

embraced to enhance collaboration and data exchange among various departments. This has led to enhanced coordination and more effective delivery of public services. Adopting cloud services is an initial pragmatic approach for municipalities aiming to update the information technology framework. The cloud computing has improved our performance as employees since for collaboration we are assisted by cloud computer”.

When mentioning opportunities of drivers of 4IR, another participant stated: “Drivers of 4IR has brought many opportunities especially for the growth of employees. Drivers of 4IR assist us to track the progress of municipal plans, goals, objectives, and improve the service delivery”.

Robotics, automation, and AI applications in the workplace may result in increased safety for both employees and employers. 4IR also improves the operations and efficiency of the municipality. The extensive technical advancement of technology is the best way of improving all functions of government (Moeti & Maleka, 2021). One participant stated: “These drivers assist workers in avoiding the risks and hazards that manual labour frequently entails (high risk of institutional accidents) and protects the Municipality from potentially high legal costs and medical expenses in the case of accident which are more expensive than the cost of repairing a machine or robot.”

Analytics can evaluate feedback from residents to pinpoint areas necessitating improvement in municipal services. Municipalities can implement targeted enhancements and allocate resources more efficiently by comprehending performance metrics.

Aside from physical health, the availability of more flexible kinds of work as a result of technological advancement helps people's mental health as well; workers can allocate their time based on their needs, have time for a family, and develop a healthy social life which balances with work life (Mhlanga & Ndlovu, 2021). Additionally, in institutions that are adopting automation, AI, robots, and IoT, their workers are easily adapting to these changes, and many changes assist employees in being at a lower risk of being retrenched compared to those institutions that are slowly adopting drivers of 4IR. Berzisa and Vangelski (2019) state that robots have a significant impact on purely institutional operations, but they may also present significant advantages for AI in areas like communication and service delivery. Intelligent robots and digital assistants are already useful instruments in municipalities for performing difficult tasks and ensuring that employees are effective. To the question, how do AI and robotics assist in your duties? A participant communicated: “The recruitment and selection procedures for tenders and employment are transformed with the help of AI and robots. Automating routine tasks enables employees to concentrate on a more strategic municipal vision. Data analytics has facilitated more well-informed decision-making, improving resource allocation and service provision. Integrating data analytics can vastly amplify the capacity to make strategic decisions. Nonetheless, the municipality must tackle data quality and integration challenges to exploit this potential fully”.

However, one of the participants suggested that: We need ongoing training and assistance for these drivers of 4IR to ensure that they can proficiently utilize these tools because, wow, it’s not easy to adjust to technology.

Drivers of 4IR can potentially improve municipal services through advanced research and advancement in various departments and occupations. The question remains: Are government institutions prepared enough or ready for the change brought by AI, robotics, and automation as well if this change makes economic and societal sense? In more recent

times, technology, such as the internet, has transformed the way individuals or institutions communicate and preserve information (Loosemoore, et al., 2017). The supervisor mentioned: “We are not well prepared for these changes as a municipality since changed just invaded us. However, training programmes to enhance digital literacy among staff members are imperative to optimize the advantages of cloud computing. Augmented operational efficiency and employee productivity Staff members have reported heightened productivity and efficiency due to automating repetitive tasks and enhanced access to information via digital platforms”.

4IR drivers make it easier for all individuals to obtain an education and enhance their skills and knowledge through online learning. The drivers help to decrease the barrier to accessing education since lectures can be conducted online, which accommodates the working class since they can attend classes online while they are working or listen to recordings in their spare time. “As employees, we are able to further our education, which is part of the skills development in the municipality, and these online courses contribute a lot to our performance after we complete the qualification. As we come back and apply all the information we learn”

Ijeoma (2020) confirms that improving talents and skills reinforces individuals' self-confidence and competitiveness in the workplace, helps individuals adjust rapidly to a new environment, provides better strategies for employees to overcome all their challenges in the workplace, and ensures more effectiveness through being productive at the workplace. As a result, employees' workload becomes easy and improves through the adoption of the fourth industrial revolution (Ndamase et al, 2023). To the question. How drivers of 4IR decrease the load of employees. A participant mentioned that: “Augmented operational efficiency and employee productivity staff members have reported heightened productivity and efficiency due to automating repetitive tasks and enhanced access to information via digital platforms. Artificial Intelligence has analysed extensive datasets to offer practical municipal planning and operations insights. Personnel used data-driven approaches to decision-making more effectively, thereby decreasing the time devoted to analysis and enhancing the precision of resource allocation”.

This is supported by Malick and Masilela (2022), expressing that technological advancement assists many governments in improving their daily operations, and it ensures that the government contributes positively to society and fights against challenges of service delivery. Some drivers of the 4IR have already invaded government institutions, but especially the private sector, specifically financial sectors (banks, insurance companies, and consumer finance companies). According to the interviewed participant state: “We need to employ some of these drivers of 4IR that are used by private sector to improve our performance in term of service delivery remember our performance is judged based on service delivery to the community. In private sector has improved its services in terms of decreasing the long queues in the banking sector, and they are no longer experiencing a lot of complaints about poor services. Previously, we used to complain a lot in banking sector about attitudes and behaviour of employees towards us before the adoption of drivers of 4IR, but after the introduction of self-serving machines, we are no longer visiting bank sector”.

Drivers of 4IR has assisted municipalities in revenue collection citizens do not need to go to government institutions to pay for government services. They can use the Automated Teller Machine (ATM); some use cell phone banking to pay property rates, water, and

electricity bills. This is confirmed by the study conducted by Mushunje and De-beer (2021), stating that the advancement of technology allows clients to pay all bills without traveling. This provides less work for all municipal employees and improve the performance of municipal employees in revenue and debt collection, as some duties are performed through online platforms. This was confirmed by one of the participants: “AI-powered tools can automate data entry, scheduling, and basic customer service queries. This capability liberates employees to concentrate on tasks of higher value, ultimately enhancing their productivity and job contentment. Real-time monitoring of infrastructure, such as water systems, streetlights, and waste management, is achieved through IoT devices. This allows employees to promptly resolve issues before they escalate, thus reducing downtime and increasing service dependability. Large datasets are processed through advanced analytics to assess employee performance, recognize patterns, and streamline workflows”. “The 4IR drivers have presented us with an opportunity to easily communicate with our people/ clients through the use of the internet and social media. For example, the municipality’s Facebook page, Twitter handle, robot chats, emails, etc. enables us to easily reach our citizens and disseminate information, while the information can be kept safe for a long time in emails and other software. These platforms assist us from using old platforms such as Imbizo for citizen engagement, which is one of our key permanence areas”, said one participant:

This heightens safety and guarantees that tasks are executed with greater accuracy and reliability. Cloud platforms facilitate seamless collaboration across departments, granting access to shared data and applications. This enhances communication and coordination, resulting in expedited decision-making and more integrated operations. Scalable infrastructure is provided by cloud solutions, which can expand to the municipality's requirements. This adaptability permits the municipality to swiftly adjust to evolving demands without substantial upfront investments in IT infrastructure (Rocha & Hippert, 2018).

The drivers of 4IR use considerably lower human error in the operations of the government. Robotics can be deployed for duties like street sanitation, waste disposal, and upkeep of public areas. Automating such activities enhances operational efficiency, enabling employees to focus on supervision and other crucial tasks. Robots can undertake hazardous tasks, thereby lessening the likelihood of injury to municipal workers. It is mostly preferred by government institutions to lower institution expenses, boost daily operations and productivity, and speed service delivery to the city. Findings have also shown that robots, AI, and IoT may increase productivity. Findings also put emphasis on the great importance of education (Manyika, 2020).

However, the study also revealed that municipalities face financial resources and technical proficiency constraints necessary for integrating more sophisticated technologies. Issues with Infrastructure and Connectivity Inadequate internet connectivity and outdated infrastructure pose significant obstacles to the efficient deployment of 4IR technologies. The complexities involved in leveraging drivers of 4IR technologies to improve employee performance in a municipality are varied. Challenges include insufficient internal support, lack of integration of smart city plans into the Integrated Development Plan (IDP), inadequate IT skills and training, and a lack of awareness regarding the significance of ICT, all of which impede the successful implementation of 4IR initiatives. One of the participants indicated that: “The adoption of drivers of 4IR has the potential of replacing

employees, especially those who are doing repetitive tasks, and this can affect many employees that are not computer literate”.

Moreover, financial constraints, improper technology application, substandard document management, and the absence of a testing facility add to the barriers encountered in maximizing ICT utilization for enhanced service provision and employee productivity. Resistance to change presents a notable obstacle. Both employees and management might exhibit resistance to embracing novel technologies owing to concerns about potential unemployment, insufficient comprehension, or adherence to familiar procedures. To tackle these issues, strategies such as increasing efforts in providing ICT infrastructure, improving IT training, and enhancing employee skill development are recommended. By surmounting these challenges and putting into practice the proposed solutions, Municipalities can effectively exploit 4IR technologies to boost employee performance and service delivery (Matthews & Landsberg, 2022).

One of the interviewed participants added that: “With higher levels of education, the risks of 4IR decrease considerably”. The study by Mamokhere (2019) stated that training to enhance digital literacy among staff members is imperative to optimize the advantages of cloud computing. People who have access to education may be able to "protect" their careers and eventually benefit from technological advancement in terms of self-development and promotions. Since robots, AI, and IoT can perform a wide range of tasks, people must take advantage of their comparative advantages in cognitive abilities and their capacity for creative problem-solving in order to handle challenging circumstances. These abilities can be significantly improved through education.

### **Conclusion and recommendations**

In conclusion, the study covered that the drivers of 4IR present many opportunities to improve the performance of employees in the public sector. The drivers of 4IR The discovered favourable association between drivers of 4IR and improvement of employees' performance in the municipality. The municipality can manage to deliver effective service delivery to the society through use of drivers of 4IR. It assists both municipality employees to go back to school, and management is able to focus on strategic plans as drivers of 4IR are able to smooth the operation of the institution. The study found that drivers of 4IR make community engagement easy and improve the tasks of municipal employees. It indicated some challenges the municipality is facing when using or adopting drivers of 4IR, such as technical skills, poor infrastructure, and resistance to change. The municipality is afraid that the use of drivers of 4IR can create replace to technical literate employees.

Investments in enhancing digital infrastructure are crucial. Collaborative efforts with national and provincial authorities and private sector entities can aid in addressing these challenges. Collaborations and Partnerships engaging with universities, technology firms, and other municipalities have proven advantageous in exchanging knowledge and resources. Establishing a network of partnerships can grant the municipality access to cutting-edge technologies and exemplary practices. These collaborations can also facilitate staff training and development programs. Efforts to enhance skills should emphasize digital literacy and specific technical proficiencies. There exists a requirement for augmented funding and collaborations with technology firms to enable this transition.

It is imperative for municipalities to effectively incorporate modern technologies into their Integrated Development Plans (IDPs). Furthermore, the implementation of Industry 4.0

technologies in construction education and training, coupled with awareness-raising efforts, can effectively tackle the challenges faced by the construction industry. The importance of upskilling and reskilling initiatives cannot be overstated, as they are essential in equipping employees with the requisite digital skills needed in the 4IR institution's landscape. Additionally, the provision of adequate Information Technology (IT) infrastructure, training programs, and opportunities for skills development can help municipalities overcome barriers to ICT utilization and enhance employee performance. By taking action on these recommendations, municipalities can effectively harness 4IR technologies to improve employee performance. The use of 4IR drivers must be implemented only if adopted as assistance to the employees, not as replacements, thereby reassuring the employees about the future of work.

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