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Public Sector Leadership in the Fourth Industrial Revolution: A Theoretical Framework-Based Approach to Enhance Service Delivery

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Abstract: **Objectives:** This paper provides a theoretical framework and conceptual literature review of organisational leadership in the 4th Industrial Revolution (4IR), especially in Public sector institutions in South Africa. **Prior work:** Agility, adoptability and adaptability in leadership have never been this important globally, coupled with many changes in this digital era. This is the main reason people, especially leadership, have to invest and embrace technology; otherwise they will perish as they would not be part of the world today. This means that organisational processes and systems have to be driven by astute leadership and a skilled workforce, to foster innovations in the business-operating model. **Approach:** The paper is conceptual in nature and is based on literature review of relevant articles in the field. This paper delves into the nuances of public sector leadership, shedding light on how leaders can effectively navigate the intricate intersections of technological advancements, societal expectations, and governance imperatives in the context of the 4IR. **Implications:** It is critical that the current workforce in the working environment, especially the public sector, is re-skilled and trained in relevant coursers or careers appropriate in the 4IR. The theoretical frameworks which are applicable to this paper include the following: Task Technology Fit; Technology Acceptance Model and Information System Success Model. **Value:** As the work moves to 5IR and South African public servants also have to upskill themselves so that they can be able to apply 5IR skills and competencies in order to enhance

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service delivery in South Africa.

1. Introduction

The Fourth Industrial Revolution (4IR) is bringing with it opportunities and challenges never seen before for public sector leadership in the fast-paced 21st century. The job of leaders in the public sector is becoming more crucial and difficult as individuals and organizations negotiate the areas of automation, big data, artificial intelligence, and linked technologies (World Economic Forum, 2018). The modern world necessitates a reassessment of conventional leadership styles, with academics and professionals alike recommending novel ways that mesh with the 4IR's revolutionary powers (Davos, 2016). According to Raelin (2016), leadership in the 4IR is defined as "practice of leading, not theory."

Without a doubt, automation, interconnection, smart houses, machines, and other instruments are becoming commonplace in today's environment. With most of our lives now spent virtually, big data offers the most complete record of human activity throughout human history. Never before has the internet gathered so much information from such a wide range of people worldwide. The internet of things is necessary for the 4IR because it calls for decentralized but integrated processes and systems that are transparent, self-optimizing, self-configuring, and self-diagnosing (World Economic Forum, 2018).

Among the most important qualities for leadership in the 4IR are determination, relentlessness, and urgency. To be relevant in the 4IR era, leadership requires fluency with digital and technological skills. Most significantly, this kind of leadership needs to develop the skills necessary to function well in the data ecosystem, where they can lead innovation, collaborate to acquire cutting-edge technology, and maximize the value of the goods and services they provide. This ought to be the cornerstone of providing services, especially in the public sector where leadership appears to encounter numerous obstacles. Organizations with leaders in the 4IR tend to have more well defined decision-making processes and are also disruption drivers. According to Forbes (2017), an agile leader is one who can lead cross-generational teams, is creative, and isn't afraid to take risks. The world is changing quickly, and to keep up with this, an organization needs a leader that is technologically astute, forward-thinking, and nimble.

2. Related Work

The fast incorporation of digital technology has been the primary driver of a gradual yet dramatic transition in the operational landscape of the public sector over the past 20 years (Davos, 2016). The need to modify conventional leadership theories to address the particular difficulties presented by the 4IR is becoming more and more apparent to academics and researchers (World Economic Forum, 2018). Notably, the 4IR has fundamentally changed how governments function and serve their citizens, ushering in a new era marked by the integration of the physical, digital, and biological domains. Examining the literature on public sector leadership in the context of 4IR is essential to understanding the ramifications of these developments (Davos, 2016). This work integrates insights from academic works to synthesize and expand upon pertinent research conducted from 2013 forward.

The recent literature has extensively examined the transformative impact of the 4IR on leadership in the public sector (Davos, 2016; World Economic Forum, 2018). In order to successfully manage the complexity coming from the integration of artificial intelligence and other sophisticated technologies, scholars emphasize the necessity for adaptable leadership methods (World Economic Forum, 2018; Yukl, 2013). It is also important to highlight that, in contrast to the private sector, public sector leadership is slower to adapt to environmental or technological advancements, which makes them obstacles to the changes their organizations need to make. Moreover, scholars are encouraged to investigate novel approaches since the 4IR presents opportunities and challenges that call for a reassessment of conventional leadership models (Bass & Riggio, 2006; Charan, Drotter & Noel, 2011).

Agile approaches have transcended their conventional sectors as businesses understand the growing requirement for flexibility in response to technology disruptions. Agile principles are extended to the whole product lifecycle through the use of DevOps approaches, which emphasize the interaction of development and operations teams (Humble & Farley, 2010). Moreover, the notion of agile innovation transcends procedural approaches and involves a cultural transformation that prioritizes trial and error, quick feedback loops, and ongoing education (Rigby, Sutherland & Takeuchi, 2016). This strategy gives organizations the ability to improve product development cycles, adapt quickly to changes in the market, and cultivate a resilient and innovative culture.

Agile technology breakthroughs are necessary for leadership in the 4IR to embrace and stay relevant in the environment. Technological advancements that are agile

have arisen as a dynamic reaction to the 4IR's increasing rate of change. These developments, which have their roots in agile project management approaches, place a high value on customer-centricity, adaptability, and cooperation (Schwaber & Sutherland, 2017). The agile manifesto, which was released in 2001, has been a driving force in the field of software development. It emphasizes the importance of adapting to change rather than sticking to a strict plan and encourages tight, ongoing engagement with stakeholders (Schwaber & Sutherland, 2017). Since it is the foundation of service delivery, this is what the public sector is expected to accept and modify.

The function and effects of change and transformation in the organizations they lead must be understood by those in leadership positions in this field. They must lead projects that bring about change in organizations and act as change agents themselves in order to develop the collaborations that this agile manifesto advocates. It is noteworthy that the principles of agility have extended beyond the realm of software development and are now prevalent in other businesses and sectors. This has allowed organizations to effectively manage uncertainty and adopt iterative development processes. The four leadership philosophies of the 4IR period that South African public sector leaders can embrace are covered in the following section.

3. Problem Statement

The Department of Communications (2010) created the National e-Skills Action Plan in South Africa. This strategy led to the creation of the National e-Strategy in 2017, which highlighted the ICT skills gap within the framework of the nation's 4IR. In 2020, the National e-Strategy was completed and authorized. This approach brought attention to the barriers to the ICT sector's competitiveness as well as the public sector's dearth of investment in R&D. It went on to suggest that one of the main areas of attention for the proposed Fourth Industrial Revolution Commission should be leadership abilities. South Africa's present digital skills gap is impeding the nation's capacity to boost productivity and competitiveness.

In addition, the Fourth Industrial Revolution (4IR) has made it necessary for nations to create new policies, strategies, and innovation plans in order to support an inclusive approach where the government takes the lead, especially in the fields of technology and innovation. Currently, multiple 4IR components are dispersed throughout the government of South Africa. Although both the commercial sector and civil society are active in the same field, there isn't yet a unified strategy or

blueprint that unites all significant actors in one area of interest. The crux of the matter is that although governments have been impacted by the global financial crisis, their primary challenge is in stabilizing their daily finances. Public expenditure has become the major trend as a result of the financial crisis, with experts predicting soaring costs and expenditure.

The world's present conflicts have had a disastrous effect on everything, particularly the developing nations. For instance, the ongoing conflict between Russia and Ukraine has had a disastrous effect on the world at large, making food and fuel costlier. Analogous to the holy war between Israel and Palestine, as supplies of essential commodities run low, practically everything becomes extremely expensive. In the case of South Africa, practically every month gasoline is growing and hitting the poor of the poorest the most. Massive strikes also follow in the public and private sectors, with the public sector suffering more from unjust wage negotiations and a lack of enthusiasm for implementing the hybrid model.

Because of this, public sectors everywhere will still prioritize reducing expenses, lowering citizen expectations, and raising productivity. The National Treasury's constant cuts to department budgets and the implementation of new rules and regulations to rein in spending are even more difficult for public sector chiefs to manage. An excellent illustration is the current financial freeze on hiring that was imposed by the National Treasury in January 2024; it prohibits hiring or appointments in any government agency until further notice. This implies that the environment in which leaders operate will continue to be demanding and crucial. There is little doubt that the public sector will take advantage of its chances even though the fourth industrial revolution may still be in its early stages.

As digital and fourth industrial revolution technologies become more widespread, the number of people engaged in administrative tasks such as data entry will drop substantially, while the number of skilled digital and artificial intelligence experts will rise, albeit in smaller numbers. The loss of administrative jobs to automation should not be as brutal as many headlines suggest, but a rather more gradual process in which clerical staff are able to develop their roles as their administrative burdens are eased. By 2029, artificial intelligence (AI) will routinely be making decisions that affect people's lives. Technology will also change the size, shape and employment mix of public sector bodies (Deloitte, 2019). This is the time when public sector leaders, have to be clear about what technology can do for their organisation. The days when those at the top could cheerfully admit to being a luddite are coming to an end. When this is done accordingly, leaders will also appreciate

technology's wider impacts and contribute meaningful within organisations.

In light of the above-mentioned situation, managing the roll-out of artificial intelligence will oblige many public sector leaders to undertake significant levels of restructuring, with all the difficulties and hard choices that entails.

4. Literature Review: Four Types of Leaders in the 4IR

According to World Economic Forum (2019) there are four categories of leaders in the 4IR namely: social supers, data-driven decisives, disruption drivers and talent champions which are discussed below:

- **Social supers:** The organizational objective must influence society. An organization loses relevance if it has no social influence. Here, leadership is distinguished by its capacity to perform well by performing well and even going above and beyond what is required. These CEOs make significant investments in social responsibility initiatives that benefit numerous organizations and even their local communities. One such initiative is the Gift of the Givers Association in South Africa, whose work even extends outside the nation.

- **Data-driven decision-making:** Make investments and take advantage of 4IR prospects. Using technology is essential to building agile organizations; it is not an alternative. Businesses that use technology effectively are far more productive. In light of current technical breakthroughs, this need to be a crucial strategic lever or aim. Particularly after the Covid-19 outbreak, many organizations had to pay enormous amounts of money for buildings that were mostly unoccupied, acquire data, and secure information and data (cyber information). Whether it is still necessary for individuals to report to work when technology allows them to perform as efficiently and effectively from home is a difficult issue to make.

- **Disruption drivers:** These executives are aware that their companies differentiate themselves from rivals by investing in disruptive ideas. All they need to do is stay one step ahead of the competition and maintain their innovative edge. They should stay away from working locations and other areas that they are not allowed to play in or visit. They enjoy trying new things and require adaptable surroundings to stimulate their ideas. The reason behind disruption drivers' enthusiasm for innovation is their readiness and confidence in the face of 4IR unknowns; they are merely weary of doing things the same old way. As a result, it is imperative that the 4IR leadership recognize, support, and participate in this shift

toward becoming disruption drivers.

- **Talent Champions**: Staff members are being prepared for the digital transition by this leadership. In this case, management makes investments in retraining staff members for the workforce of the future. The management of talent inside an organization becomes crucial. Numerous factors come into play, and the leadership must safeguard and preserve the existing talent. Various organizations pursue the greatest talent at all costs. Talent winners are also dedicated to making a difference in society. Most organizations use social responsibility initiatives to accomplish this. The majority of government departments implemented the internship program thanks to the public service, and many interns are typically hired on after the program. At the moment, the majority of organizations have successfully embraced digital transformation; numerous ones worldwide are holding meetings and conferences using various platforms such as zoom and many others. The world has become so small that interaction of various communities has become so easy, convenient and efficient.

The following section will discuss the theories that are relevant to the study.

5. Theoretical Framework

5.1. Task-Technology Fit Theory and Its Implications on 4IR Leadership

Goodhue and Thompson (1995) originally coined the construct of Task Technology Fit (TTF) and they defined it as "the degree to which a technology assists an individual in performing his or her portfolio of tasks". The creation of this construct led to the subsequent creation of TTF theory, which suggests that technologies positively impact outcomes when they are utilised and match a task. From this theory, the conceptualisation of TTF has gradually evolved to refer to the match between a task and technology. Although the theory may seem simple, its premise has been used to explain many dynamics of workplace technologies. The two primary outcome categories of TTF are performance and user reactions. Performance is the output from a technology applied to perform a task, whereas user reactions are users' perceptions of a technology applied to perform a task both determine the influence of technologies and TTF (Howarda & Roseb, 2019).

According to the TTF, the adoption of technology is determined by how well technology appears to fit the needs of specific tasks. The task-technology fit (TTF) concept contends that performance and acceptance are influenced by how well a task

and the technology being used to complete it "fit" together (Goodhue & Thompson, 1995). In many instances studies indicate that performance improves when technology is ideally adapted to the users' abilities and tasks. The task-technology fit (TTF) is a popular theoretical framework for analysing the effects of information technology on performance, gauging usage effects, and determining the compatibility of task and technology features. The task technology fit, which in turn affects users' performance and utilisation, can be influenced by both task features and technological qualities. TTF has been extensively investigated and used in a variety of information systems since it was first proposed (Alyoussef, 2023).

The antecedents of TTF maintained that the theory is about interactions between the individual, task, and technology. Rephrased, TTF theory states that improved performance in terms of faster or more efficient accomplishment of tasks is a result of the fit between individual abilities, technology functionalities and task requirements. The fit between a task and technology refers to how efficiently and effectively a particular task can be performed with a particular technology. The fit between a task and technology refers to how efficiently and effectively a particular task can be performed with a particular technology (Mathieson & Keil, 1998).

Task characteristics measure how well a technology helps a human do their portfolio of tasks; tasks are widely defined as the activities people take to transform inputs into outputs, while technologies are seen as the means by which people complete their tasks. The necessity for a link between technological attributes and task characteristics forms the basis of the TTF model. The paradigm of TTF illuminates the functional features of technology use. For example, in academic institutions students will adopt technology if they recognise that it will help them execute their everyday tasks effectively. Based on the association between performance expectancy and technological characteristics, the TTF model predicts when users will utilise technology effectively it positively influence the adoption thereof (Alyoussef & Omer, 2023).

TTF is a theory that defines 'the matching of the capabilities of the technology to the demands of the task'. As an extrinsic motivational factor, the task–technology fit is associated positively not only with perceived ease of use but also with the perceived usefulness. TTF implies a match between the capabilities offered by technology and the requirements of a job in order to determine the connection between task, technological features and user performance.

5.1.1. Factors Influencing Task-Technology Fit in Public Leadership

Leadership in the public sector requires a strategic approach to technology adoption and integration. Public leaders must navigate the challenges of ensuring that technological solutions align with the unique tasks and goals of governmental agencies. One of the key areas to consider in the public service is the organisational skills strategy aligned to the digital needs to ensure that the skills employees have are aligned to the technology required for delivering services to various stakeholders. There are various factors which influence Task-Technology Fit in the Public sector. These include the following; Organizational Culture: The alignment between technology and tasks is influenced by the prevailing organisational culture (Nidumolu, Subramani & Aldrich, 2001). Public sector leaders must foster a culture that embraces technological innovation. Policy Implications: The fit between technology and tasks is often shaped by government policies and regulations. Leaders need to be aware of the policy landscape and advocate for policies that support effective task-technology alignment.

5.2. Technology Acceptance Model and Leadership

In recent years, understanding the dynamics that can influence people's acceptance of new technologies has become increasingly important due to the widespread adoption of new devices and tools. Investing in the latest technologies in most organisations has been one key responsibility for leadership to ensure that they are at par with their peers in other organisations and competitive with the world at large. As a result of this initiative mainly by leadership, many organisations have spent a lot of money on acquiring latest technologies but remain with the responsibility of ensuring its acceptance and its use effectively. The use of new technologies leads to cost and time savings compared to higher quality of products and services (Molino, Cortese & Ghislier, 2017). The rapid advancement of digital technologies is fundamentally changing the nature of work and organisations brought by the 4IR. Reaction to the use of new technology will affect interest in using it and lead to mastery of the information technology. When someone uses new technology, they perceive it as valuable and believe it will help them perform their jobs better (Putria, Widagdob & Setiawanb, 2023).

The Technology Acceptance Model (ATM) postulates that the intention to use technology is a function of perceived ease of use and perceived usefulness. TAM is the simplest, easiest, and most powerful measure of technology usage. Critical to

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note is that in many organisations, users continue to struggle with new technology because technologies are constantly changing and there is increased pressure on employees to develop their skills so that their organisations can stay competitive. TAM is a popular model for explaining the behavior of technology users and has been empirically demonstrated to have high validity in many research contexts (Venkatesh & Davis, 2000).

TAM theorises that an individual's behavioral intention to use a system is determined by two beliefs: perceived usefulness, defined as the extent to which a person believes that using the system will enhance his or her job performance, and perceived ease of use, defined as the extent to which a person believes that using the system will be free of effort. According to TAM, perceived usefulness is also influenced by perceived ease of use because, other things being equal, the easier the system is to use the more useful it can be (Venkatesh & Davis, 2000). To support the above-mentioned, researchers have demonstrated that the intention to use a technology has been the strongest predictor of actual usage of technology. Intention to use a technology is more directly influenced by the individual's perception of its usefulness, even if people did not have a positive attitude toward using the technology (Siegel, Acharya & Sivo, 2017). Perceived ease of use is described as "the extent to which the individual believes that employing a certain system would increase his or her job performance." The degree to which a person believes that using a particular technology would not be difficult to grasp is known as "perceived ease of use" (Alyoussef, 2023).

Since perceived usefulness is such a fundamental driver of usage intentions, it is important to understand the determinants of this construct and how their influence changes over time with increasing experience using the system (Venkatesh & Davis, 2000). Another important aspect to acknowledge is that TAM maintains that advances in technology change human civilisation and increase production capabilities both in quality and quantity. The emergence of new technologies in the 4IR has fundamentally changed the way people work and live. This era has facilitated communication between humans and humans with machines without being limited by space and time. The existence of the internet as an example, has made a great contribution to societies, companies, industries and governments. The development of technology in this digital era has also given birth to the latest and best technology-based innovations in various sectors throughout the world (Putria, Widagdob & Setiawanb, 2023).

5.3. Information System Success Model

Using technology presented by the 4IR to analyse big data and trends in society will assist policymakers to ascertain trends and to adjust to polices for improving a lot of societies. When it comes to the 4IR, leadership needs to have a vision of what is required for the future, but most importantly invest in technology for the working environment to thrive. In the business sector, 4IR is demonstrated through the invention of smart factories which are highly-flexible, producing massively and largely customised. In the public sector, the pace of the 4IR is lagging behind due to bureaucratic procedures and rigid policies. Innovation and technology have never been better in the history of humankind. The use and appreciation of modern technology are simply at its peak.

Delone and McLean (2016) coined the Information System Success Model (ISSM) and explain it as a way to gauge the success of Information systems (IS) in organisations and determine the net benefit. IS outsourcing has become a worldwide phenomenon with no signs of slowing down because it improves cost competitiveness and allows organisations to liberate resources to focus on the core competences. They argued that it is a multidimensional and symbiotic paradigm which underlies IS success. The model provides a valuable context for determining IS performance's multidimensionality (Abdulkareem & Ramli, 2021). This model is designed to provide a broader and more in-depth understanding of the IS system's efficacy by defining, explaining and systematising the relationships between the different quality dimensions (Alyoussef, 2023).

In addition, user's satisfaction is viewed as one of the significant achievement measurements of IS achievement. As per Delone and McLean (2016), client satisfaction and utilisation of the system are closely associated. Delone and McLean recommended an accurate characterization of six significant classes of IS achievement, where customers' satisfaction was the most broadly utilized unusual amount. Despite the fact that DeLone and McLean (2016) recommended that system utilisation is the most fitting variable for estimating the accomplishment of IS, intention to use is additionally a significant piece of system success, since mentally a user would not utilise the system in the event that he/she does not have the desire to use the system. Usually, the quality of information is measured in terms of accuracy, timeliness, completeness, relevance, and consistency (Harlie, Hairul, Rajiani & Abbas, 2019).

Numerous academics such as Alyoussef (2023), proposed some changes to this

paradigm, which resulted in the new version of ISSM in 2003. According to the new model, the key success elements for implementing ISSM to achieve net benefits are service, system, information quality, system utilisation, and user happiness. The researchers suggested that service, system, information, and quality are the determining factors of ISSM's continued use if a successful evaluation of the system is sought. Abdulkareem and Ramli (2021) also argued that the model has been revised over the years to accommodate changes and the dynamic nature of Information and Communication Technologies (ICT).

The model maintains that the IS project or programme's performance and efficacy are predicted by the combined or independent impact of the quality dimensions (information, system and service qualities) on the actual use or intention to use, user satisfaction and net benefits. The model was originally developed for IS in the private sector. However, it has been expanded over the years to include other areas of IS such as mobile usage and social media use, e-health, e-procurement, e-learning, e-filing and e-government systems (Alyoussef, 2023).

6. Leadership in Information Communication and Technology Era

The 4IR leadership operates on complex issues and requires a different mindset particularly in the implementation of new inventions on information communication and technology. This kind of leadership does not resonate with standard procedures and motivational ethos; but rather on disruption. Disruption is not merely change or evolution but rather, the use of technology or new business models to reinvent or reshape existing businesses. Speed and scale are two key elements of disruption and should be considered at all times in the life of the organization (Statistics South Africa, 2020). Business leaders in the 4IR are increasingly, requested to formulate comprehensive workforce strategies ready to meet the challenges of this new era of accelerating change and innovation.

Currently, all over the world, the most important meetings are being convened via multiple IT applications with zero cost. The same thing applies to training in the corporate world and academic institutions; training is conducted using e-learning and remote teaching. Businesses and schools have gone online and almost everything is increasingly live streamed. Not a day goes by where we are not receiving groundbreaking news on pioneering technology like internet of things (IoT), robotics, AI, cloud computing, 3-D printing, smart data or augmented reality. All of these technologies are not only revolutionising one industry, but rather all industries

are being revolutionised equally in a radical and exponential way (World Economic Forum, 2016).

Although technologies have the capacity to automate and potentially augment a variety of tasks across board, it differs from one sector to another; for example, the private sector usually uses more and advanced technology versus the public sector. The greatest risks of digitization are associated with automating sensitive tasks and the unknown knock-on-effects. Additionally, many sectors face disruption and shifts in demand through non-technological factors, such as the effect of ageing and other critical illnesses. This situation would require some efficiencies, which include updated technologies to meet the demographic changes afoot, freeing time spent in administration and record keeping for some abnormalities. The world at large is currently controlled by technology, using some of the best ICT tools at speed that is beyond human ability.

7. Opportunities and Challenges of the 4IR

The 4IR has presented both challenges and unprecedented opportunities the world over. This has enabled leadership in all spheres of life, to think differently and make decisions that can transform various organisations for the future. The business as usual era has elapsed and has emancipated the 4IR to another level. According to (Jarbandham, 2017), 4IR brings with it both challenges and opportunities. It is therefore, incumbent for leadership to harness the benefits of the 4IR and to prepare for challenges of disruption that is anticipated (World Economic Forum, 2016).

8. Opportunities of the 4IR For Leaders in the Public Sector

The Fourth Industrial Revolution (4IR) presents a myriad of opportunities across various sectors, revolutionising the way societies operate and businesses function. One prominent aspect is the integration of advanced technologies such as artificial intelligence (AI) and machine learning (ML). These technologies enable the automation of repetitive tasks, leading to increased efficiency and productivity. As highlighted by Schwab (2017), the 4IR blurs the lines between the physical, digital and biological realms, offering unprecedented opportunities for innovation.

In the realm of healthcare, the 4IR facilitates personalised medicine through the analysis of vast datasets, genomics, and advanced diagnostics. Precision medicine

tailors medical treatments to individual characteristics, optimising outcomes and reducing adverse effects (Topol, 2019). Additionally, the Internet of Things (IoT) plays a pivotal role in creating smart healthcare systems, connecting devices for real-time monitoring and proactive health management (Schwab, 2017).

Moreover, the 4IR has transformative implications for education. The integration of virtual reality and augmented reality technologies in classrooms enhances the learning experience by providing immersive and interactive educational content (World Economic Forum, 2018). These technological advancements in education contribute to the development of essential skills for the future workforce, preparing individuals for the dynamic demands of the digital age. In the business landscape, the 4IR opens new avenues for sustainable practices and economic growth. The adoption of blockchain technology, for instance, enhances transparency and traceability in supply chains, reducing fraud and promoting ethical business practices (Tapscott & Tapscott, 2016). Furthermore, the utilization of big data analytics allows companies to gain valuable insights into consumer behavior, enabling targeted marketing strategies and product innovations (Schwab, 2017).

Disruptions and technological innovations in the 4IR have presented far more opportunities across the globe than problems. So many things have changed for the better as compared to the past; but only needs a positive mind to seize the opportunity. On top of the list is communication. The proliferation around the internet of things all over the world has significantly changed the way people live in communities, how they communicate in general and how they work in the corporate world. A good example is that at the present moment, especially in developed communities, people now have choices of going to shops or ordering online. In most cases shopping online seems to be very convenient, safe, cheaper; thus, saving money and time.

As intelligent of things proliferate, organisations expect a shift from stand-alone intelligent things to a swarm of collaborative intelligent things. In this way, multiple devices will work together, either independently of people or with human input. For example, if a drone examined a large field and found that it was ready for harvesting, it could dispatch an "autonomous harvester" unlike in the past where there will be people and vehicles doing the same job over an extended period of time (World Economic Forum, 2016).

In conclusion, the opportunities presented by the Fourth Industrial Revolution are vast and transformative across diverse sectors, shaping the future of societies,

economies, and individuals. Embracing these opportunities requires a proactive approach to adapt to the evolving technological landscape and harness the potential for positive change.

9. Challenges of the 4IR in Leadership in the Public Sector

Challenges to innovative organisations are not difficult to understand, but many leaders in various organisations find that it is extremely difficult to knock these challenges down and proceed to successful innovation. Some of the challenges are polices and processes, a lack of communication, mindsets, attitudes, and old habits. Leaders continue to focus more on using advanced technologies to protect their positions than on making bold investments to drive disruptions. Although the world is largely moving with speed due to disruptions and technological inventions, there is one major economic sector where disruptive innovation remains as rare as a rainy season in a dessert; that is the public sector. Rigid rules and regulations, polices and Acts are the order of the day (Deloitte, 2019).

In environments where disruption is common and accepted, life simply becomes easy and better. In the public sector, however, the opposite applies and that negatively affect service delivery. A good example is the one of renewing licenses with the Department of Transport in South Africa. Many people have not renewed their licences for many years as lines in the system are not working almost every time. This creates a serious problem especially, when driving beyond the borders of South Africa, as the officials simply require valid drivers' licenses and not entertain the stories given by multiple of SA citizens. This is a classical case where tasks at hand and technologies introduced into the system simply do not comprehend, hence the importance of the task-technology fit theory.

The dearth of public sector is seriously a major problem; the State Information Technology Agency (SITA) is another hurdle in issuing of information and technology licences in most government departments. Almost everything comes to a standstill waiting for procedures and approval around SITA. It is argued that advanced technology has necessitated expansion of information and technology portals but permission or approval from SITA, continues to be a problem. Organisations that have worked and failed to change from a rigid structure to one that fosters innovations know that the future requires them to promote creativity to stay viable. The walls they encounter are physical, habitual, procedural and psychological. This is where good leaders break the cycle of negative perpetual

habitual and physiological effects, but rather create positive working environments.

10. Leadership Skills Required in the 4IR

• Managing the millennium workforce should be at the core of the discussions by 4IR leaders and top management. What skills-set will be needed in the future, which specialities will be beneficial and taking the organisation forward in the 4IR dispensation? The new era of robotics, AI, internet of things, digitalisation may further affect gender inequalities and leadership must be ready to address those issues.

• Leaders must have an appetite for disruption and be able to use data driven insights for decision making. Strategy, leadership and management skills are required to manage various disruptions. Leaders should be desiring positive social and environmental impact for societies where they are established, and this should be embedded in the core strategies of the organisation. In addition, leaders should also be welcoming to government regulations regarding the technology's ethics. This technological ethical behaviour should be embedded within the organisational culture (Deloitte Insights, 2019).

• A 4IR leader must ensure employees are properly skilled in technology but equally be responsible on the use and access of information. Address the mismatch of the current workforce skills and that of the future. 4IR is all about speed, so should be re-skilling of employees in various organisations. Agility and continuous learning will be at the heart for growth and retention of the workforce in the turbulence times.

• The organisational brand needs to be sharp, sleek, exciting and robust. People must always be at the heart of a transformation (Carnett, 2015).

• A 4IR leader must be accessible and challenge the status quo in a way that he/she becomes a beacon for the culture of the organisation. Organisational culture stimulates retention of workforce and works the opposite way depending on how it is embraced. Modelling to the employees on what a leader believes matters and set priorities, which are convincing to employees to follow suit.

• Leaders in the 4IR should find new ways of maneuvering difficult territory and start to embrace quality work-life balance. Technology has changed and disrupted the whole world, so much that new ways of working have to be ventured. These include remote working and flexible schedules so that employees can deliver on the

required outputs. It has been proven that flexible work hours enable more engagement and less absenteeism and requests for time-off by employees (Power, 2020).

• Leaders in the 4IR must keep their senses on the ground and foresee the mood of how employees perceive issues and address them speedily. This calls for a leader whose soft skills are mature and synchronised to address matters swiftly. Emotional intelligence of such a leader would assist in recognising their own emotions and those of others and discern the required action for achieving the set goals (Power, 2020).

• The world is seeing revolutionary advances in science and technology – artificial intelligence, gene editing, robotics, and so on; which together have been dubbed the 4IR future skills. Success in this new era – whether that means, macroeconomic growth, human welfare or solving the most intractable problems facing the world, will therefore require managing teams of highly specialised technical experts.

• Leaders must embrace highly specialised technical experts, encourage, and manage transition of various skills within the organisations. This will assist employees to transit from their current skills or roles to the jobs of the future. It is crucial that employees must also embrace technology as a catalyst to innovation and assisting them to improve their skills. New training and career-development interventions have to be considered in order to enable people to reposition themselves for new technological demands.

• Skills gaps in the local labour market are amongst the most cited barriers to appropriate technology adoption for several industries. As industries make investments in new technologies, the impact on each industry is determined by the task composition of each sector and the desirability of automating or augmenting specific tasks. Existing research has highlighted that some industries remain labour-intensive in the production such as agriculture, manufacturing and construction. If new technology can be introduced and managed well, the augmentation of a range of tasks today can create the opportunity for new, higher productivity growth within those sectors.

• In the current projections of companies surveyed overtime, they suggest that administrative tasks in the Financial Services and Investors sector are set to be significantly replaced by machine labour. For example, administering and physical tasks are often low value and low productivity tasks and have limited space in the

4IR. While today machines and algorithms perform 36% of the collective hours spent on this task, by 2022 this share will rise to 61%, with knock-on effects on the demand for Data Entry Clerks, Secretarial staff and Accounting staff (Nusantara, 2017).

The skills required in the 4IR are quite diverse and depend on the type of the organisation. The following are some of the skills required in most organisations:

• Application developers to design interfaces, services and process flows;

• Big data specialists; the internet of things has facilitated massive information the World over and specialists are needed to analyse it accordingly;

• Machine learning specialists;

• Internet of Things (IoT);

• Artificial Intelligence (AI);

• Cloud and quantum computing;

• Digital Transformation Specialists;

• Organizational Development Specialists;

• Software and Applications Developers and Analysts;

• Basic data literacy for almost all employees in any organisation;

• Training and Development Specialists;

• Robotics Specialists and Engineers;

• Leadership and management professionals;

• People and Culture Specialists;

• Client Information and Customer Service Workers;

• Service and Solutions Designers;

• Digital marketing, communication and strategy Specialists.

11. Conclusion

From the literature discussed above, the article would recommend that the public sector should invest in developing future leadership skills to lead and implement the

organisational strategies in line with the 4IR; to conduct a skills assessment in the 4IR working environment to determine the capability of employees to implement the organisational strategies; and to develop leadership programmes consisting of various blocks: for instance, leading innovation, change and transformation, leadership and management, etc.

Collaborative leadership is deemed very important and emphasised in the 4IR. It is describedas the desire to promote team spirit and increase levels of trust. It also stresses the ability to choose and do the right thing. Silo mentality has no place in 4IR leadership as technology has forced people to network and work collaboratively. Developing strategy collaboratively is part of "servant leadership". This requires empathy, humility, open-mindedness and listening. It also requires and develops, trust, collaboration and buy-in across the organisation. Leaders must learn to rely on the new sources of data, anticipate emerging trends, forecast unforeseen consequences, build strong networks based on trust and communicate constantly. So much is changing with speed and the impact equally becomes significant. Moreover, leadership must provide strategic direction in how organisations will transform to become lean, agile, modern and innovative amidst of daily technological advancement.

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