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Digitization in the 4IR Era: The New Strategic Driver of State-Owned Enterprises' Operational Efficiency

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ABSTRACT

Getting state-owned enterprises to perform at optimum level and achieve the best for the country is the dream of every government. Unfortunately, even if digitization is one of the indisputable strategies for achieving such a vision, little has been done in most of the previous epistemological studies to discern how digitization would leverage the state-owned enterprises' operational efficiency. Instead, a lot of studies have been more fascinated with the analysis of the management and performance of state-owned enterprises, as well as factors like mismanagement, financial mismanagement, and political interference that affect the effective performance of most state-owned enterprises in South Africa. In contrast, this study takes a different approach. Given the operational management problems and cost control issues that most state-owned enterprises experience in South Africa, it is such a question that this study sought to explore and solve if digitization can improve operational efficiency to lower costs and bolster the profitability and financial sustainability of state-owned enterprises. To achieve that, the study used a systematic review structured according to four steps encompassing the formulation of a systematic review question, literature search, data extraction and thematic analysis. As the world digitizes, findings indicated most state-owned enterprises to also embrace the use of the required 4IR digital technologies and infrastructure. But in that process of digitization, some of the state-owned enterprises were also found to experience impediments arising from unclear digital strategy, poor digital operations management, budgetary constraints and resistance to organisational change. Given such dynamics, it suggested that it is important that state-owned enterprises consider addressing such problems by introducing the appropriate digital strategy accompanied with the use of the appropriate change management and transformational leadership style.

INTRODUCTION

Digitization leverages the state-owned enterprises' operational efficiency, competitiveness and cost minimization. In turn, this increases profitability to spawn returns on shareholders' value. Such insights echo empirical facts from countries like China and the United States that have digitized the operations of their state-owned enterprises. In such countries, experience indicates digitization to drive the business success and sustainability of most state-owned enterprises (Zhang, Yang, & Chen, 2023). Digitization improves the level of operational automation. This reduces the risks of human error to spur improved operational efficiency. This reduces wastes and costs to bolster the state-owned enterprises' overall operational efficiency. Most of the modern state-owned enterprises struggle with managing and mitigating operational efficiency issues, poor management, and poor activities' coordination and control. However, through digitization, it becomes easier for state-owned enterprises to identify and ameliorate such challenges during their earlier stages. This bolsters the success of most state-owned enterprises (Gong, Yang, & Shi, 2020).

Digitization is a strategic change and transformational initiative requiring the integration of various forms of digital technologies in all aspects of the operation of the state-owned enterprises. It requires a shift in the way the business thinks and manages its operations to the embracement of the approaches that bolster effective use of the available digital technologies in the way that leverages the state-owned enterprises' operational efficiency. Even if most state-owned enterprises have not yet embraced the required technologies, theories imply that in the modern 4IR era, such digital technologies encompass artificial intelligence, deep learning, and machine learning technologies (Kraus et al., 2021). It also includes digital technologies like Internet-of-Things, cloud computing, big data, cyber-physical system, blockchain technology, virtual reality, augmented reality, edge computing, 3D and 4D printing, mobile devices and technology as well as advanced monitoring and tracking.

Artificial intelligence, deep learning and machine learning technologies enhance the simulation of human brain to limit actual human intervention and engagement in the accomplishment of various organisational activities. It is through deep learning technologies, that state-owned enterprises are able to digitize and automate important operational functions. This limits physical human engagement to reduce risks of errors, while also reducing the overall labour costs (Venkatesh, Thong, & Xu, 2021). As this reduces operational costs to enlarge the operational profit margins of state-owned enterprises, usage of Internet-of-Things improves activities' coordination and control. Internet-of-Things connotes a set of interconnected mobile and immobile devices that bolster efficiency of organisational communication, activities' coordination and control. It also improves the management of seamless activities' flow.

While accomplishing such tasks, Internet-of-Things also aids the easy gathering, analysis, storage, and retrieval of information essential for bolstering the state-owned enterprises' seamless operations (Dwivedi et al., 2020). Quite often, lack of accurate information on the required customer orders can affect the smooth movement of goods from the suppliers to the required points-of-sale. Limited information on the required customer orders can also affect or delay decision on the quantities of goods that must be manufactured to respond to the unfolding changes in demand. Internet-of-Things plays instrumental roles for enhancing the effectiveness of demand forecasting and production scheduling. Under JIT system, this improves the capabilities of the state-owned enterprises involved in manufacturing to ensure that it is only quantities adequate for meeting demand which is produced.

Effective use of Internet-of-Things is enhanced by the effective use of cloud computing (Alalwan et al., 2022). Cloud computing improves the accessibility of state-owned enterprises to more powerful computing technologies and resources. This improves the speed of activities' accomplishment and decision-making to improve state-owned enterprises' operational efficiency. Cloud computing improves accessibility of computing technologies anywhere and at any time. This bolsters the degree of organisational coordination, teamwork, and combined effort that enhance the overall organisational operational efficiency in the way that influences attainment of the wider organisational goals and objectives. In that process, cyber-physical systems as well as augmented reality and virtual reality improve product design. It enables the state-owned enterprises assess situations and discern the improvement initiatives that can be adopted prior to implementing the decision (Viana, 2021).

Yet as the state-owned enterprises interact with and gather a lot of data, it is big data technology that enhances the processing of the larger volume of the gathered data. It enables data processing in the way that enables managers make meaningful decisions on the critical activities that must be accomplished to bolster attainment of the desired organisational goals and objectives. These suggest the investment in the required digital technologies is essential for enhancing digitization. However, Romero et al.'s (2019) "Five Management Pillars for Digital Transformation" insinuates digitization is not just the initiative of putting in place the required digital technologies. Instead, the effectiveness of the process of organisational digitization is also measured by five pillars encompassing technology, strategy, people, processes and culture. Strategy formulation is the first activity that must be accomplished during the digitization process. Strategy outlines the objectives of digitization, the required resources, technology, and the timeline that all the required aspects of the organisational operations must have been digitized. Strategy defines the kinds of digital technologies that must be acquired for the business to complete its digitization processes (Kuldosheva, 2021).

Technology connotes a set of digital technologies that the business must put in place for its strategic goals and objectives to be achieved. Process refers to changes required on how the organisational activities are accomplished for the business to achieve its desired strategic goals and objectives. As operational processes change, even the organisational culture must also change (Perkin & Abraham, 2021). Culture refers to a set of etiquettes, procedures, norms, and policies that must be changed and transformed to support the digitization of the organisation. People connote a set of skills, talents, experience, and competencies that the business has at its disposal to enhance the successful implementation of the required digital strategies.

Romero et al.'s (2019) "Five Management Pillars for Digital Transformation" explain the observance of all these five pillars to influence the successful implementation of the required digital transformation strategy. The five pillars highlight the critical areas that often determine the success or failure of the business digitization processes. However, Ganguli's (2024) "5D Framework for Digitization" implies in addition to the five pillars, digitization processes are also influenced by five Ds encompassing digital devices, digital platforms, digital media, digital data, and digital technology. Digital devices refer to a combination of digital equipment like computers, tablets, smartphones, and other mobile devices that are used for accomplishing various digital activities.

Digital platforms are a combination of networks and technological frameworks that are used for engaging, collaborating, and networking with the internal employees as well as the external actors like customers, citizens, government departments, donors/funders, and civil society organisations. Such digital platforms are highlighted in Ganguli's (2024) "5D Framework for Digitization" to encompass e-mails, site reviews using TripAdvisor and search engines like Google, Search Engine Optimization, ChatGPT, and various social media platforms like X, Meta, Instagram, TikTok, LinkedIn, and Telegram. Digital media depicts multitudes of various business information and data encoded in videos, images, social media contents, animations, and web pages. Digital data connotes the large volumes of data generated from the various virtual and digital interactions and engagement. Since some of these data may not be useful, big data analytics aids identification of relevant and irrelevant information that must be discarded.

Digital technology refers to a set of technologies like robotics, artificial intelligence, Internet-of-Things, cloud computing, virtual reality, big data, and augmented reality that must be put in place for business digitization to be a success (Mittal, 2020). Even if that is so, various digitization theories still offer different insights on things that influence or constrain business digitization. Such insights are depicted in theories like Institutional Theory, Resource-Based Theory, Dynamic Capabilities Theory, Technology-Organisation-Environment Framework, Diffusion of Innovation Theory, Organisational Inertia Theory, Integration and Interoperability Theory, and Data Security and Privacy Theory. Institutional Theory argues that it is the organisational goals, policies, norms, and operational approaches and philosophy that influence or constrain the ability of state-owned enterprises to adopt the appropriate business digitization strategy. To ensure the success of business digitization, managers in state-owned enterprises must ensure that the existing rules, norms, and operational practices are either aligned or modified and changed to support the successful implementation of the required digital strategies.

As businesses accomplish digitization, Barney's (1991) "Resource-based Theory" suggests that it is only how the state-owned enterprises utilize the available digital technologies that can turn into the strategic value-creating resource that spurs their competitiveness. In most cases, state-owned enterprises experience challenges of attaining competitive edge that disrupts private sector operators. But Barney's (1991) "Resource-based Theory" seems to insinuate that if state-owned enterprises adopt and use digital technologies in the right way, it can improve competitiveness for the state-owned enterprises to disrupt even the most efficient private sector operators. However, Teece's (1998) "Dynamic Capabilities Theory" notes that even if digitization bolsters a firm's competitiveness, it is still not a once-off business endeavour. Instead, digitization is noted as a continuous improvement business initiative that requires periodic changes and modifications to respond to the changing ecosystem trends.

Such a view accentuates the thinking in Technology-Organisation-Environment Framework that notes variables influencing successful digitization to encompass technology (like the kinds of the adopted technology, cost of installation and maintenance), organisational (variables like culture, skills, policies, and rules), and environment depicting ecosystem trends' changes instigated by the changes in government policies, competitors' behaviours, and pressure from citizens and civil society organisations (Perkin & Abraham, 2021). Unfortunately, even if these theories highlight some of the constraints that state-owned enterprises must avoid during the implementation of the required business digitization strategies, it is instead failure to change some of such factors that has emerged as the major impediment affecting the success of digitization in most South African state-owned enterprises. For that reason, the section below elucidates on the methodology used for measuring the level of digitization in state-owned enterprises as well as the major impediments and improvement initiatives that must be adopted going forward.

METHODOLOGY

The study used systematic review in the quest of discerning the level of digitization in state-owned enterprises as well as the major impediments and improvement initiatives that must be adopted going forward. Systematic review is one of the qualitative critical content analysis methods that focus on analysing, extracting, and interpreting information from the existing studies (Brignardello-Petersen, Santesso, & Guyatt, 2025). Through such analysis, systematic review often focuses on evaluating, identifying, and responding to some of the questions not answered by most of the existing studies. From the analysis in this study, usage of systematic review was motivated by a lack of answer to the question on how digitization would improve state-owned enterprises' operational efficiency. A lot of studies have examined the management and performance of state-owned enterprises as well as factors like mismanagement, financial mismanagement, and political interference that affect the effective performance of most state-owned enterprises in South Africa. Likewise, a lot of studies have been conducted on business digitization in South Africa. But limited studies have examined how digitization would improve the operational efficiency of state-owned enterprises.

Given the operational management problems and cost control issues that most state-owned enterprises experience in South Africa, digitization is an area that most of the contemporary South African studies should have examined. Unfortunately, that is often not the case. Such a gap left an unresolved question as to how digitization would bolster improved operational excellence of the state-owned enterprises. It is such a question that this study sought to explore and solve. To solve such a question, the process of systematic review was structured according to four steps encompassing the formulation of a systematic review question, literature search, data extraction and thematic analysis (Garg, 2025). The systematic review question for the study was: Given the current

operational challenges, how would digitization leverage the state-owned enterprises' operational efficiency? And what are the major impediments that must be identified and addressed if digitization in state-owned enterprises is to become a success?

After the formulation of this systematic review question, literature search was not just guided by the use of such questions, but also by the use of keywords encompassing "Digitization and Operational Efficiency in State-Owned Enterprises", "Advantages of Digitization for State-Owned Enterprises", "Limitations of Digitization in State-Owned Enterprises in South Africa", "Strategies for Implementing Digitization in State-Owned Enterprises in South Africa". Usage of these keywords enabled the limiting of the study and the research process only to the analysis and extraction of the information which was relevant to the research topic. In that process, the major search engines used during the literature analysis process encompassed Google, PubMed, EBSCO and Scopus. To determine the articles to be extracted, the inclusion/exclusion criteria ensured that the article was published in English in the period between 2020 and 2025 to reflect only the latest digitization problems in state-owned enterprises. In addition, the article also had to have full-text, since articles with only abstracts were excluded from the study. Any relevant articles meeting these criteria were extracted and subjected to analysis using thematic analysis. In the first instance, each of the extracted articles was read and analysed with the motive of extracting the major themes offering insights on how digitization leverages the state-owned enterprises' operational efficiency. Thereafter, major subthemes and chunks of texts explaining each of the themes were extracted to offer coherent explanations on the major impediments that must be identified and addressed if digitization in state-owned enterprises is to become a success. From such analysis, below are the details of the findings.

FINDINGS

As the world digitizes, findings indicated most of the state-owned enterprises to also increasingly embrace the use of the required 4IR digital technologies and infrastructure. But in that process of digitization, some of the state-owned enterprises were also found to experience impediments arising from:

- Unclear Digital Strategy
- Poor Digital Operations Management
- Budgetary Constraints
- Resistance to Organisational Change

Details of each of these impediments are evaluated as follows.

Unclear Digital Strategy

An unclear digital strategy is one of the challenges affecting the successful digitization of the state-owned enterprises' operational processes. In most cases, the importance of digitization of state-owned enterprises' activities is raised as essential for improving operational efficiency, but steps are never taken to develop and use a clear digital strategy (Shibambu, 2024). In effect, the process for digitization in most state-owned enterprises is often not guided by any digitization plan or strategy. Instead, the process is often undertaken in a random way. There is often a misconception that even without the use of the appropriate digital strategy, the digitization processes in the state-owned enterprises would be a success. Unfortunately, that is often not the case. Even with the acquisition and installation of the required digital technologies, the successful implementation of digitization initiatives has often still been a challenge (South African Broadcasting Corporation [SABC], 2021).

Without a clear digitisation strategy, it is not possible for all managers and supervisors at all levels to discern the objectives that must be achieved from digitization. It also affects the understanding of the critical operational areas that must be digitized to influence the successful implementation of the required digitization initiatives. The problem of unclear digital strategy often arises from the over-engagement of the top managers in state-owned enterprises in the formulation of core corporate strategy. Most of the top managers often focus on planning and the formulation of long-term strategic plans (Parliamentary Monitoring Group, 2021). Even if digitization often constitutes some aspects of such long-term strategic plans, the digitization aspect is often never elucidated in detail. Since the importance of digitization is already reflected in the long-term strategic plan, the assumption is often that even if digitization is not elucidated in detail, it would still be a success. Unfortunately, that has often not been the case.

Failure to elucidate how digitization can be accomplished using a clearly developed plan often affects the capabilities of the managers charged with digitization from discerning the priorities of the activities that must be executed to improve the state-owned enterprises' level of digitization (Shibambu & Marutha, 2021). The implication is that even if some of the state-owned enterprises in South Africa have digitized, there are often still challenges of the quality of the acquired technologies. This is because there is often a lack of time for assessing and discerning the critical digital technologies that must be put in place to influence the successful execution of the required organisational digitization initiatives.

Lack of a clear digital strategy affects the prioritization of the activities that must be accomplished to influence the success of the digitization programmes. The effect is that sometimes, things that should have been accomplished last are accomplished in the beginning to affect the overall smoothness of the digitization processes.

Lack of a clear digital strategy not only caused the failure of ESKOM's IT upgrades, it also affected the successful implementation of smart metering systems (Vermeulen, 2024). In South African Broadcasting Corporation – SABC, problems of unclear digital strategy manifested in the outcomes that not only delayed its digital migration, but also its capabilities to digitize

and meet or even surpass the required global standards. This reflects how uncertainty of digital business strategy can affect discerning the critical activities that must be executed in advance to enhance the successful organisational digitization. If the problems are not arising from unclear digital business strategy, challenges could emanate from poor digital management.

Poor Digital Operations Management

Most state-owned enterprises suffer from the problems of poor digital operations management. Quite often, the assumption is that once the required digital technologies are acquired and installed, the process of digitization is over. That approach has often affected the successful implementation and management of the newly introduced digital technologies (Shabalala & Heiberg, 2021). Even if some of the employees are not conversant with the process for using the newly introduced digital technologies, different technologies are often introduced with only minimal training and competence development. Because different digital technologies are used by the population, the management assumption is that employees would easily shift to using the newly introduced digital technologies. Management assumes that with just little training, the employees would shift from using the non-digital operational systems to the required new digital operational approaches (Department of Public Enterprises, 2019).

However, that is often not the case as some form of dualism often arises. Dualism may arise to reflect a situation where some employees who are knowledgeable and capable usually transition into using the required digital technologies, while the other groups of the employees struggle only to abandon the use of the newly introduced digital technologies. Even if the purpose of digitization was to improve the state-owned enterprises' operational efficiency, the mere fact that some of the employees are using digital technologies while the others are not using the same technologies affects operational efficiency (BusinessTech, 2021). Incompatibilities of the work methods and technologies used slow down the processes of activities' accomplishment to undermine the improvement of state-owned enterprises' operational efficiency. During the implementation of the required digital strategies and technologies, these imply that usage of some aspects of change management is essential for ensuring the success of the digitization processes. But that is not the case. Some state-owned enterprises use the appropriate accompanying change management strategies, but quite often follow-ups are not accomplished to ensure the success of the digitization initiatives.

When the South African Post Office (SAPO) sought to improve its operational efficiency, it did a great job of introducing its digital track-and-trace system. However, the introduction of such a technology was not accompanied with training so that the employees would transition to effectively use such technologies (Komna & Mpungose, 2024). The effect was that due to inadequate personnel training, the system could frequently malfunction and break down. This delayed deliveries. It interfered with the efficiency of Post Office operations as well as the satisfaction and contentment of the public with the services offered by the South African Post Office. Just like the South African Post Office, Denel, the state-owned enterprise that manufactures arms also struggled with its digitization processes.

Due to poor management, forecasting and lack of clear digital strategy, Denel introduced a lot of digital technologies in its manufacturing operations without assessing whether it would have adequate skills, talents and competencies for using such digital technologies (Malope, Van der Poll, & Ncube, 2021). This was not the case, as increasing exodus of its skilled labour affected the effective utilization of the newly introduced digital manufacturing technologies. Similar problems were also evident in South African Airways (SAA). When SAA introduced its new enterprise resource planning system, it failed to take off because the employees were not trained and prepared to change and start using the system. Besides challenges arising from poor digital operations management, challenges can also arise from budgetary constraints.

Budgetary Constraints

Most state-owned enterprises have problems of budgetary constraints. Just like governments, most state-owned enterprises are often struggling. This implies that even if funds are allocated, it is often used for other purposes (Shibambu & Ngoepe, 2020). This affects the commitment of the required adequate financial resources in the implementation of the required digital strategies. Because of mismanagement, some of the state-owned enterprises are often unable to generate their own revenues to improve their financial sustainability. This causes problems of limited funds. Even if the government releases the financial bailout package, it is often not enough for doing all that the struggling state-owned enterprises intend to address. In effect, the spending on bailout funds is usually prioritized. In such priorities, not all the essential activities for enhancing digitization are considered. Some technologies may be acquired while leaving out the rest of the technologies to affect the digitization of state-owned enterprises' operations (Shibambu, 2024). If all the technologies are acquired, some of the computers or mobile devices could be missing. Or only limited funds could be committed to training and maintenance of the installed digital technologies, computers and machines. This affects the effective utilization of digital technologies put in place in the way that improves the operational efficiency and competitiveness of the modern state-owned enterprises. Yet as most state-owned enterprises fail to generate the required revenues and demand government bailout, problems also often arise from corruption and embezzlement that eat into most of the funds (Parliamentary Monitoring Group, 2021).

Whether the funds are generated from revenues or from government financial bailout packages, corruption often causes the loss of a larger percentage. This affects the amount of funds that can be allocated to ensure the successful implementation of the required digital strategies. It affects the acquisition and establishment of the required digital technologies. It also affects the adequacy of

the funds allocated for the maintenance of the digital operational system put in place. When SABC strove to digitize its operations, poor financial management and embezzlement emerged to erode the allocated funds (South African Broadcasting Corporation [SABC], 2021). This slowed the process of SABC's digital migration process. PRASA (Passenger Rail Agency of South Africa) also had to abandon the digitization of its ticketing systems when irregular expenditures and financial mismanagement became common and caused the loss of the allocated funds.

To completely digitize its operational systems, Transnet had allocated R1.5 Billion to digitize its entire procurement processes only to discover that the R1.5 Billion was inflated (Vermeulen, 2024). These explain how despite the government providing the required financial bailout package, mismanagement in some state-owned enterprises often still arises to cause loss of funds and budgetary constraints that affect the implementation of the required digitization strategies. Budgetary constraints affect the investment in the required digital infrastructure. Eskom attempted to digitize its operational, metering and billing system, but failure to replace the outdated infrastructure in some areas still emerged as one of the impeding challenges (Shabalala & Heiberg, 2021). Due to inadequate financial resources for engaging the required talents, Transnet's logistics digital management system could also not fully integrate with its digital port platforms. Before it was subsequently corrected, it affected customs clearing and cargo tracking. Even in situations where some state-owned enterprises manage to introduce a fully functional digital system, some limitations have often still arisen from resistance to organisational change.

Resistance to Organisational Change

Resistance to organisational change is one of the challenges that often affect the successful implementation of the required digitization strategies. State-owned enterprises are service delivery instruments of government that are used for creating and delivering various services to the population (Shibambu & Marutha, 2021). In that regard, digital change and transformation influencing digitization often occur at two levels. The first level deals with the introduction of the required digital technologies and training and getting the internal employees to use them in the accomplishment of various operational activities. When the internal employees use such digital technologies, the second level of digitization in the state-owned enterprises deals with getting the general public to use the newly introduced digital technologies. It is through the state-owned enterprises that the government creates and delivers the desired services to the general population (Shabalala & Heiberg, 2021). In that regard, the general public often includes the suppliers, subscribers to various government services, donors/funders, civil society organisations and the media. When the general public embraces the use of various digital technologies to access the required services, it often becomes easier for improving the pace of digitization in the state-owned enterprises. This is because the internal use of various digital technologies in state-owned enterprises is met with the effective use of various digital technologies by the general public. That implies as various digital technologies are introduced to digitize the operations of state-owned enterprises, they must also be accompanied with the training and education of the general public to change (Department of Public Enterprises, 2019).

The general public must be educated and trained on the digital changes made for providing the required various services to the population. In addition, partner organisations like the suppliers, donors/funders and civil society organisations must also be encouraged to digitize and integrate with the digital operational approaches in state-owned enterprises. Unfortunately, that is often not the case. Most quests for digitization of the operations of state-owned enterprises are often met with a higher level of digital illiteracy from the population. Sometimes, the general population like the consumers of electricity and telecommunication services struggle with using the newly introduced digital technologies. This is because efforts are often placed on the internal systems in the state-owned enterprises to digitize and use all the required modern Fourth Industrial Revolution digital technologies (Shibambu & Ngoepe, 2020). But the failure to educate the public to change and embrace the use of various digital technologies is often a problem. Even if it does not cause failure, it can still frustrate and slow down the process of digitizing all the activities in the state-owned enterprises.

Yet as the population fails to embrace the required digital technologies, the other disadvantaging factor has often arisen from fear of compromising cybersecurity systems. The general public fears unleashing various confidential personal data like the national identification numbers, banking details, phone numbers and addresses to strangers working for various state-owned enterprises. Given other past incidents, this causes most of the general public to be cautious about using the available digital technologies and infrastructure (Malope, Van der Poll, & Ncube, 2021). And once they are cautious, it delays the successful implementation of the required digitization strategies, since most of the people would prefer visiting the designated state-owned enterprises to do one-on-one manual transactions. The problems of cybersecurity are not only feared by the general public, but also the actors inside the state-owned enterprises themselves. State-owned enterprises are agents of the state with several internal government players interfering and influencing the activities of state-owned enterprises.

Since governments often operate in secrecy for certain classified activities and operations, the use of digital systems in state-owned enterprises that can be compromised to reveal all the confidential government information can affect the utilization of the available digital technologies. In that regard, some activities are accomplished using the available digital technologies, but when it comes to the accomplishment of certain classified information, the use of the required digital technologies is abandoned in favour of manual processes (Komna & Mpungose, 2024). Quite often, these manual activities are accomplished at the top level. If the top managers can leave the available digital technologies and use the manual processes and systems, it also creates a bad example

which is emulated by the lower level of employees. This slows the change and transformation of organisational culture to support the successful utilization of the available digital technologies and infrastructure. Incidents of poor cybersecurity management in state-owned enterprises are reflected in the 2021 incident when Transnet experienced the most devastating ransomware attack that disrupted port operations to cause congestion and huge economic losses. Likewise, Eskom also suffered cybersecurity breaches that affected employees' payroll data. With these fears of the implications of data security breaches, some of the employees may resist changing to use the available digital technologies. Others may just resist change and adopt the use of the available digital technologies because they are used to the current operational systems or because they fear encouraging the use of the technology that would cause job losses (BusinessTech, 2021).

The motive of establishing state-owned enterprises is to provide the required employment opportunities to the population of the country. In effect, the argument that digitization may reduce labour costs to improve the profitability of state-owned enterprises is often not received well. When the South African Post Office introduced online postal services, trade unions criticized and sabotaged it as an initiative that would cause job losses. For Eskom, the preference of the employees in local branches to use the relatively similar manual processes emerged as a hindrance to the successful rollout of smart grid technologies. Combined with the lack of the appropriate KPIs (Key Performance Indicators) for measuring the success of digitization initiatives, all these have often affected the successful adoption and use of the required digital technologies and infrastructure in most state-owned enterprises. Whether or not in the state-owned enterprises, these findings raise a lot of managerial implications for the contemporary managers.

CONCLUSION

Even if most of the state-owned enterprises are increasingly embracing the use of the available digital technologies and infrastructure, it is important that they introduce the appropriate digital strategy. Use of the appropriate digital strategy clarifies the direction that digitisation will take in terms of the objectives that must be achieved, the required digital technologies and infrastructure, skills and the expected budgets. It also clarifies the initiatives that must be put in place to mitigate cybersecurity risks that often affect the confidence and trust that the public has in the digital technologies of the modern state-owned enterprises. The clarity of the digital strategy put in place clarifies the required activities to eliminate risks of surprises that often emerge to affect the successful use of the available digital technologies and infrastructure. As various new digital technologies are being introduced to change the nature of state-owned enterprises' operations, it is also essential for state-owned enterprises to use the appropriate change management strategies. Combined with the use of transformational leadership, this can improve the creation of the vision that can be communicated and used to rally all the internal and external actors to adopt the use of 4IR digital technologies as essential for leveraging the operational efficiency of the state-owned enterprises.

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