RESEARCH ARTICLE:

Building Resilient FMCG Supply Chains in South Africa Amid Prevailing Load-Shedding Challenges

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Abstract

Load-shedding (the controlled interruption of electricity supply) has become a prevalent challenge in South Africa, and it has had a significant impact on the operations of fast-moving consumer goods (FMCG) supply chains. The goal of this study was to find ways of developing FMCG supply chains that are resilient enough to endure the negative consequences of prevailing power outages. The frequent and erratic nature of load-shedding poses serious issues for South Africa's FMCG sector. An exploratory research approach was used to uncover six overarching themes in the midst of prevailing load-shedding challenges in South Africa. Semi-structured interviews were used to explore primary data from 25 supply-chain industry professionals, complemented by secondary data from industry reports and literature. In the face of persistent issues with energy supply, this study adds to the body of knowledge by offering FMCG companies in South Africa useful insights and practical recommendations for sustaining operations and achieving long-term sustainability. Furthermore, the findings can provide FMCG businesses in South Africa with useful tactics and information. This useful advice is priceless for operational effectiveness and business continuity planning. Although supply-chain resilience and uncertainty management are extensively covered in the current literature, there is a deficiency of research concentrating specifically on the FMCG industry in South Africa and its particular load-shedding difficulties.

Keywords: *challenges; load-shedding; resilience; South Africa; supply chains*

Introduction

In recent years, South Africa has been grappling with load-shedding, which refers to the controlled interruption of electricity supply implemented by the national power utility, intended to prevent a total collapse of the country's power grid (Aliyu *et al*., 2018; Botha, 2022). Load-shedding is a result of electricity demand exceeding supply capacity, and it has been a persistent issue in South Africa. Load-shedding has far-reaching implications that extend beyond inconvenience for households (Masinga and Madzivhandila, 2023). While load-shedding has affected all sectors of trade and industry, one of the areas hit hardest is the fast-moving consumer goods (FMCG) industry, which plays a critical role in meeting the daily needs of the South African population and relies heavily on a stable and consistent supply chain to meet consumer demands. As suggested by Berahab (2022), the FMCG industry plays a critical role in South Africa's economy, encompassing a wide range of products such as food, beverages, personal-care items and household goods, making it a key economic sector. These goods are characterised by high consumer demand, short shelf lives and frequent replenishment requirements. The impact of load-shedding on FMCG supply chains, which are responsible for the efficient distribution of essential products, is particularly significant. Load-shedding disrupts the smooth flow of goods, leading to delays, inefficiencies, increased costs, and potential losses for businesses operating in the FMCG sector (Moobi *et al*., 2023).

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Any disruptions to the FMCG supply chains can have immediate and tangible consequences for both businesses and consumers. As load-shedding continues to prevail in South Africa, it has become imperative for FMCG companies to adapt and build resilient supply chains that can withstand and mitigate the effects of power interruptions. The future sustainability of these companies relies on their ability to navigate this challenging landscape, ensuring uninterrupted production, efficient distribution and reliable customer service (Ali *et al*., 2023). Ohiomah and Sukdeo (2022) explored the challenges faced by the FMCG industry in South Africa amid prevailing load-shedding and highlighted the significance of building resilient supply chains to overcome these obstacles.

According to a South African Reserve Bank (SARB, 2023) report, load-shedding cost the country's economy around R45 billion between 2007 and 2019 (reducing GDP growth by 5%), and approximately R225 billion between the first quarter (Q1) 2020 and Q1 2023 (reducing GDP growth by 15%). Manufacturing production was down by 1.1% in November 2022, compared to the same month the previous year (Statistics SA, 2024). Agriculture shrank by 12.2%, marking its first annual decline since 2019. Since 1995, the annual decline in agricultural production has been the largest (−19.9%) (Gumbi and Parakozov, 2024; Shivambu, 2022). According to Smith (2023), load-shedding raised operational costs, causing 64% of township small to medium-sized enterprises (SMEs) to cease operations and 66% of the FMCG enterprises to lay off employees. According to Lawlor (2023), Stage 5 and 6 load-shedding had a major detrimental effect on the FMCG retail sector. For instance, in 2022 Shoprite had to spend R100 million on diesel because of Stage 6 load-shedding, which resulted in a 10% reduction in profits and a 5% loss of yearly trading hours. Against this backdrop, it is crucial to explore strategies and technologies for building resilient FMCG supply chains in South Africa.

Literature Review

South Africa's power-supply challenges can be traced to a combination of factors, including insufficient electricity-generation capacity; operational challenges faced by the state-owned power utility, Eskom; maintenance backlogs; inadequate investment in renewable energy; delayed infrastructure projects; and an increasing demand for electricity as a result of population growth and industrialisation (Ohiomah and Sukdeo, 2022). One of the primary reasons for load-shedding is the limited electricity generation capacity, which is unable to keep up with the country's growing energy needs. This has resulted in an ongoing strain on the power grid, leading to breakdowns and an increased reliance on temporary measures such as load-shedding. Eskom, the main electricity provider in South Africa, has faced significant operational challenges. Mismanagement, corruption, financial difficulties and inadequate maintenance have plagued the power utility, affecting its ability to ensure a stable power supply (Ali and Imtiaz, 2019). These issues have contributed to the breakdown of power plants, unplanned outages and the need for load-shedding as a way to balance supply and demand. There is a need for studies to determine ways to maximise cooperation among different stakeholders (such as distributors, suppliers and governmental organisations) in order to create supply chains that are more resilient to power outages. This article aims to contribute to the understanding of how resilient supply chains could be built amid prevailing load-shedding in South Africa.

Organisations may improve their supply-chain resilience by defining uncertainties, foreseeing and evaluating risks, creating mitigation and adaptation plans, encouraging cooperation and utilising technology (Akhtar *et al*., 2023; Lebepe and Mathaba, 2024). Load-shedding presents erratic disturbances to the FMCG industry in South Africa, which can have an impact on transportation, inventory levels, manufacturing schedules and overall supply-chain performance. Businesses might create backup plans and alternative tactics to ensure operational continuity by foreseeing load-shedding situations and their possible effects (Lawlor, 2023). In addition, encouraging cooperation among supply chain participants can result in improved information exchange and group problem-solving, both of which are essential during difficult times (Naidoo, 2023). Utilising technology such as real-time monitoring systems and advanced analytics can also enable faster reaction times to load-shedding-related problems and offer useful insights. Building resilient FMCG supply chains in South Africa amid prevailing load-shedding challenges requires a proactive and multi-faceted approach. Embracing renewable energy sources, adopting energy storage technologies, fostering collaborative partnerships, and leveraging technological innovations are key strategies to mitigate the impact of load-shedding and ensure the long-term sustainability of the FMCG industry (Maresch *et al*., 2023). Marais and Spangenberg (2023) emphasise the importance of incentivising supply-chain stakeholders to conduct risk assessments, develop robust contingency plans and implement business-continuity strategies. By implementing these strategies, FMCG companies can navigate the challenges posed by load-shedding, enhance

supply-chain resilience and continue to meet the evolving demands of consumers in South Africa (Lebepe and Mathaba, 2024).

The adoption of renewable energy sources, such as solar and wind power, holds great potential for reducing the industry's dependence on the national power grid. Investing in renewable energy infrastructure can provide a reliable and sustainable energy supply, reducing the vulnerability of FMCG supply chains to load-shedding. A study by Bahati *et al*. (2021) emphasises the importance of transitioning to renewable energy as a long-term solution to mitigate load-shedding challenges. Naidoo (2023) suggests that, in response to load-shedding, FMCG companies need to explore alternative energy sources to reduce their reliance on the national power grid. The integration of renewable energy solutions, such as solar panels and wind turbines, offers a sustainable and reliable energy supply. Nyirenda (2019) highlights the potential of renewable-energy systems to enhance the resilience of FMCG supply chains in South Africa and reduce their vulnerability to load-shedding. Inglesi-Lotz (2023) states that energy-storage systems offer resilience by supplying backup power during load-shedding, which guarantees continuous operations and lessens the effects of power outages. The aforementioned findings emphasise the importance of investing in advanced energy-storage technologies as a key component of resilient supply chains in the FMCG sector. Technological innovations also play a critical role in the future of FMCG supply chains in South Africa. Yuan *et al*. (2024) attest to the transformative potential of digital technologies in improving the resilience of FMCG supply chains during load-shedding challenges. Accurate demand forecasting and effective inventory management play a critical role in building resilient FMCG supply chains. By leveraging advanced data analytics and predictive modelling, FMCG companies can anticipate shifts in demand patterns during load-shedding and adjust inventory levels accordingly (Yuan *et al*., 2024). The future success of resilient FMCG supply chains in South Africa involves fostering collaborative partnerships and supplier relationships (Wiese and van der Westhuizen, 2024). Building strong relationships with suppliers, logistics providers and other stakeholders allows for effective risk sharing, contingency planning and resource pooling. Collaboration with suppliers and other stakeholders is essential for building resilient FMCG supply chains in the face of load-shedding challenges. Engaging in collaborative partnerships enables the sharing of resources, knowledge and best practices, leading to improved supply chain visibility and flexibility. Collaborative efforts enable FMCG companies to address load-shedding challenges collectively and enhance the overall resilience of their supply chains (Bahati *et al*., 2021).

Heinemann (2019) asserts that the controlled interruption of electricity supply has a profound impact on various industries, and one sector significantly affected is the FMCG industry. This is because FMCG supply chains rely heavily on a continuous and reliable power supply to ensure the smooth flow of production, distribution and customer service (Pillay *et al*., 2024). Load-shedding disrupts these operations, leading to significant challenges and consequences for the FMCG sector. Load-shedding causes uncertainty and unpredictability, affecting all stages of the supply chain, from raw material procurement to manufacturing, warehousing and delivery (Ahmadipour *et al*., 2023). A Nedbank (2023) report observes that one of the immediate impacts of load-shedding is decreased production capacity and output. FMCG companies often operate on tight production schedules to meet consumer demands. However, power interruptions disrupt these schedules, leading to reduced productivity and delays in meeting production targets. This, in turn, affects the availability and timely delivery of products to retailers and consumers. Furthermore, load-shedding introduces additional costs for FMCG companies. These financial burdens can strain the profitability and viability of FMCG businesses, particularly for SMEs. Customer satisfaction and brand reputation are also at risk during load-shedding. Inconsistent product availability, delayed deliveries and compromised service levels lead to dissatisfied customers (Ghotbi-Maleki *et al*., 2023). The inability to meet consumer demands promptly can result in lost sales and, more critically, damage to the company's reputation, which may take considerable time and effort to recover.

Load-shedding highlights the vulnerabilities within FMCG supply chains. The reliance on a single source of power makes supply chains susceptible to disruptions. The lack of backup power solutions and contingency plans further exacerbates the challenges faced during load-shedding episodes. Load-shedding has a significant impact on FMCG supply chains, disrupting production, increasing costs, diminishing customer satisfaction, and highlighting vulnerabilities within the industry. Load-shedding disrupts FMCG manufacturing operations, leading to production delays, decreased productivity and increased costs. Masondo (2022) investigated the implications of load-shedding on FMCG distribution on logistics networks and identified challenges including delayed deliveries, increased transportation costs, inventory management issues and the potential for stockouts in retail stores. Load-shedding introduces a significant element of unpredictability and uncertainty into FMCG supply chains. Power outages can occur with little or no prior warning, causing interruptions in manufacturing processes, distribution

operations and retail activities (Ebrahimi and Ahmadi, 2023). For FMCG manufacturers, load-shedding disrupts production schedules, forcing unplanned downtime and leading to reduced output. This, in turn, affects the availability and timely delivery of products to retailers and ultimately to consumers. The impact of load-shedding on FMCG supply chains extends to distribution and logistics operations. Interruptions in electricity supply hinder the efficient functioning of warehouses, distribution centres and transportation fleets. Without electricity, essential activities such as order processing, inventory management and temperature-controlled storage become challenging to execute. Inadequate power supply can also compromise the effectiveness of cold-chain logistics, potentially compromising product quality and safety (Mhlanga *et al*., 2023). Disruptions can lead to increased costs, including the need for backup power solutions such as generators, increased maintenance expenses, and the potential loss of perishable goods (Mhlanga *et al*., 2023; Naidoo, 2023). These additional expenses that businesses incur in response to load-shedding are often passed on to consumers through higher prices, further affecting their purchasing power and overall economic well-being.

Methodology

A descriptive qualitative research was used to provide rich, detailed descriptions of the lived experiences of multiple participants from a large population on their perspective on a specific phenomenon (Doyle *et al*., 2020). The research design in qualitative research plays a critical role in shaping the overall study, by guiding data collection and analysis methods, and ensuring the trustworthiness and rigour of the findings (Creswell and Creswell, 2023). Semi-structured interviews with purposively selected participants were used as the primary data-collection method in this study. Semi-structured interviews generate a wealth of qualitative data that requires careful analysis (Adu, 2021). Twenty-five (25) FMCG retail supply chain procurement specialists were carefully selected based on the calibre of the information each participant gave as well as their experience in the sector. Table 1 details the inclusion and exclusion criteria. Table 2 outlines the interview process. The point of data saturation was reached after the 12th interview.

Table 1: Selection criteria for participants

Category	Included	Excluded
Role in supply chain	All participants (including but not limited to manufacturers, suppliers, retailers, logistics companies and supply chain managers) had to have been participating actively in the FMCG supply chain.	Individuals whose roles did not influence or interact with supply chain operations, or who were not directly involved in the FMCG supply chain.
Experience with load-shedding	Participants who have personally dealt with how load-shedding affected supply chain operations.	Individuals without any first-hand understanding or experience of the consequences of load-shedding on supply networks.
Geographic location	Participants from different parts of South Africa (to guarantee a thorough grasp of regional variations in the effects of load-shedding).	Participants from outside of South Africa.
Organisational level	In order to gather a variety of viewpoints, participants came from a variety of organisational levels, including middle management, top management, executive and operational staff.	Individuals without any knowledge of or authority to make decisions about the supply chain procedures.
Company size and type	Participants from FMCG companies of all sizes (to comprehend how various organisations handle resilience).	Participants that worked for businesses not in the FMCG industry.

Source: Authors' compilation

Table 2: Interview process

Preparation	**Literature review:** To create the interview guide, a comprehensive analysis of the body of literature on South African load-shedding and FMCG supply chains was carried out. **Interview guide:** Created an open-ended, semi-structured interview guide to encourage in-depth conversations. The conversation covered load-shedding experiences, resilience techniques, problems encountered and suggested fixes.
Participant recruitment	**Outreach:** Utilised social media, trade associations and professional networks (LinkedIn) to find and enlist possible participants. **Screening:** To make sure participants fitted the requirements for selection, preliminary screening calls or emails were conducted. **Informed consent:** Gained informed consent from each participant, making sure they were aware of their rights, the interview process and the goal of the study.

Conducting interviews	**Mode of interviews:** The interviews were conducted in-person, over the phone, or by video conference (Zoom, MS Teams), depending on the interests of the participants and logistical factors. **Duration:** Aimed to keep interview durations between 45 and 60 minutes in order to facilitate in-depth conversations without wearing out participants. **Recording:** All the interviews were recorded with the participants' permission so that they could be accurately transcribed and analysed. Guaranteed all recordings' secrecy and safe keeping.
Interview structure	**Introduction:** Started with a succinct explanation of the study's goals and a check to make sure participants were comfortable. **Opening questions:** In order to establish rapport, I began by asking generic questions about the positions and firms of the participants. **Core questions:** The interviewees were asked detailed questions regarding the effects of load-shedding on their supply chain operations, resilience-building techniques, and any difficulties they may have had. **Probing:** Probing questions were used to go further into responses and extract specific insights. **Closing:** Concluded by summarising the main ideas raised and inviting attendees to provide any further ideas or queries.
Post-interview process	**Transcription:** To guarantee proper data analysis, the researcher wrote the interview transcripts verbatim. **Data analysis:** Employed thematic analysis and other qualitative analytical techniques to find recurring themes and patterns in the data. **Feedback:** Gave a synopsis of the results to the participants and asked for input to confirm the findings.

Thematic analysis, according to the steps recommended by Braun and Clarke (2022), was employed to analyse the data gathered in this study. ATLAS.ti 23 was used to assist in coding and analysing the data that had been gathered. The process of coding was done by finding and classifying themes and patterns in the transcribed data. Coding helps the researcher to make sense of the data without losing its meaning (Adu, 2019; Saldaña, 2024). This was accomplished by carefully going over the transcribed material word by word and line by line. After that, the data was divided into comprehensible portions, and those parts were given initial codes. Next, a thorough list of codes and their definitions was created (Adu, 2021; Saldaña, 2024). Then came thematic analysis, which was followed by a review and improvement of the data. The next stage was to classify the list of codes, then merge the related codes, based on how frequently they appeared, to form themes (Adu, 2021). Through this approach we systematically examined qualitative data in order to derive insightful knowledge pertinent to the study issues. Themes that gave the data context emerged from the updated codes and organised patterns (Braun and Clarke, 2022). The final themes were examined and determined based on how well they fitted the research questions and objectives for the study. The relevant research ethics committee at the researchers' institution gave its approval for the study. The participants were informed that their participation in the study was optional and that they could withdraw at any time if they so desired. Their anonymity was assured and so was the confidentiality of the information provided.

Ensuring trustworthiness and rigour is a key consideration in qualitative research design. Strategies such as prolonged engagement, member checking, peer debriefing and triangulation were employed to enhance the credibility, dependability, confirmability and transferability of the findings. Frequent debriefing sessions were held with supply-chain professionals and specialists in research methodology. Iterative questioning, through the question discussion guide, contributed to the consistency, authenticity and rigour of the study. To ensure reliability and validity, trustworthiness was a key consideration. Trustworthiness was attained by maintaining a detailed audit trail, including the interview transcripts and recordings, as well as the initial coding procedure, which is directly related to the concepts of transferability and dependability (Adler, 2022; Coleman, 2022; Straus, 2017). Confirmability was achieved by making sure that the findings and conclusions were based on the data, rather than the subjectivity or bias of the researchers throughout the research process, through highlighting the experiences and meanings of the participants rather than the attributes of the researchers.

The study provided thorough, dependable and informative data on developing resilient FMCG supply chains during load-shedding difficulties in South Africa by adhering to these selection criteria and implementing a systematic interview approach.

Research Findings

As discussed, this study data was collected through semi-structured interviews with 25 supply chain practitioners, spanning senior managers, chief executives and directors. Six themes emerged from the primary data analysis,

namely: corruption, skills shortage, lack of government will, sabotage, dilapidated infrastructure, and strikes and service-delivery protests. The principal finding revealed that persistent load-shedding was caused by high corruption and poor infrastructural maintenance in South Africa. Each of the themes is discussed, in turn, in the subsections that follow.

Theme 1: Corruption

Corruption emerged as a theme from primary data. According to the participants, this was the core reason for load-shedding, which cost the industry approximately 270 days between 2022 and 2023. In this regard, a few participants expressed the following sentiments:

> *"It's frustrating to see how corruption has taken its toll on Eskom. The mismanagement of funds has worsened load-shedding, impacting our daily lives. Corruption has plunged Eskom into darkness both literally and metaphorically. The lack of accountability is blinding the progress we need to solve load-shedding."* (P5, regional supply chain manager, male).

> *"As load-shedding continues, it's hard to ignore the whispers of corruption within Eskom. In South Africa, the phrase 'load-shedding' is now widely used and causes annoyance and dissatisfaction among the populace. The more we uncover, the clearer it becomes that corruption is a major driver of this crisis. Eskom's load-shedding is a stark reminder of the consequences of corruption. Our electricity grid is suffering because of the greed of a few."* (P8, regional supply chain manager, male).

> *"I'm tired of the excuses and the power cuts. It's high time we address corruption at Eskom if we ever want to see an end to load-shedding. Load-shedding is the result of a corrupted system at Eskom. The funds meant for infrastructure improvements seem to vanish into thin air. Eskom's corruption isn't just stealing money; it's stealing our basic needs and opportunities. Load-shedding is a consequence of this theft."* (P15, store manager, male).

Corruption refers to the misuse of power or authority for personal gain or to achieve an unfair advantage (Mlambo, 2023). It involves dishonest or unethical behaviour by individuals or groups, often in positions of authority or within institutions, to manipulate systems, processes or decisions for personal or private benefits (du Venage, 2020). Corruption can contribute to load-shedding in South Africa through several interconnected mechanisms. When corruption is rampant, funds that should be allocated to the maintenance, expansion and improvement of the power infrastructure may be siphoned off by corrupt officials or entities (Muller, 2023). This misallocation can lead to the inadequate maintenance of power plants, transmission lines and distribution networks, reducing their efficiency and increasing the likelihood of breakdowns and power outages. Corruption can deter foreign and domestic investors from putting money into the energy sector (du Venage, 2020).

The resilience of supply chains can be seriously weakened by corruption in a number of ways, such as higher costs and inefficiencies, compromised quality and safety, untrustworthy partners and suppliers, disrupted operations, operational inefficiencies, regulatory and policy failures, and infrastructure and maintenance deficiencies. Corruption can lead to a lack of accountability in the energy sector. If individuals responsible for maintaining and managing the power infrastructure are engaged in corrupt practices, they might prioritise personal gain over the well-being of the power system. This can result in neglecting important maintenance tasks and operational inefficiencies, which contribute to load-shedding. This points to the fact that corruption can lead to political interference in the energy sector's operations. Decisions may be made for personal or political gain instead of based on the best interests of maintaining a stable power supply. This can disrupt long-term planning and hinder effective solutions to address load-shedding. Stamping out corruption and its impact on load-shedding requires comprehensive reforms in governance, transparency and accountability. In this regard, corruption weakens the resilience of supply chains and power-supply networks. Corrupt practices can divert funds away from necessary projects and lead to mismanagement of resources, further exacerbating load-shedding (Kaplan, 2023).

Theme 2: Skills shortage

Skills shortage emerged as the second theme that participants felt was a huge factor leading to load-shedding. In that respect the participants reflected as follows:

> *"Eskom's load-shedding crisis is exacerbated by a skills shortage. Without a skilled workforce, maintaining and upgrading the power infrastructure becomes a massive challenge. The skills shortage at Eskom is like trying to put out a fire without water. Load-shedding won't end until we address the lack of expertise in the energy sector."* (P16, supply chain coordinator, female).

> *"It's evident that load-shedding is linked to a lack of specialised skills within Eskom. We need to invest in training and development to overcome this challenge. The skills shortage has left Eskom struggling to keep the lights on. It's time to prioritise education and training to ensure a brighter energy future. Load-shedding is a symptom of the skills shortage plaguing Eskom. Without a capable workforce, we're left in the dark both figuratively and literally."* (P9, senior buyer, male).

A skills shortage may contribute to load-shedding in South Africa in several ways. Skilled technicians and engineers are essential for troubleshooting and resolving technical issues that arise in power plants and distribution networks. A lack of skilled personnel can lead to longer downtime when problems occur and delays in identifying and addressing issues that could otherwise be resolved quickly. A skills shortage may lead to delays in the construction and implementation of new power-generation projects (Kaplan, 2023). This includes delays in building new power plants or expanding existing ones. As a result, the energy supply may not keep up with the growing demand, increasing the likelihood of load-shedding during periods of high consumption. A skills shortage can lead to a "brain drain", by which skilled professionals leave the country to seek better opportunities abroad (Umar and Kunda-Wamuwi, 2019). This exacerbates the shortage of skilled workers, leaving the energy sector with even fewer experts to address its challenges. A skills shortage can hinder the adoption of advanced technologies that could improve energy efficiency, reduce waste and enhance the reliability of the power supply. The transition to renewable energy sources requires specialised skills in areas such as solar, wind and hydroelectric power. A lack of skilled personnel in these fields can slow down the adoption of clean energy sources and the integration of renewables into the energy mix.

Theme 3: Lack of government political will

Participants echoed the sentiment that the perceived lack of political will among government officials to implement effective solutions will only worsen load-shedding, raising questions about the commitment and capacity of political leaders to address this critical issue. In this regard, some of the statements from the participants included:

> *"The persistent load-shedding points to a lack of political will within the government to truly address the issues at Eskom. It's time for them to step up. Load-shedding is a glaring outcome of the government's lack of political will to tackle Eskom's problems head-on. Our patience is wearing thin. The government's inaction regarding Eskom's challenges is directly proportional to the frequency of load-shedding. It's a clear lack of political will."* (P1, store manager, male).

> *"It's frustrating to witness the lack of political will translating into prolonged load-shedding. We need leaders who prioritise fixing Eskom. Load-shedding isn't just an inconvenience; it's a consequence of the government's lack of political will to overhaul Eskom. Eskom's load-shedding crisis reflects the government's indifference and lack of political will to find a lasting solution. It's time for real action."* (P13, group executive supply chain management, male).

Most of the participants intimated that, without strong political will, there might be a lack of accountability within governmental agencies responsible for the energy sector. This can lead to a lack of transparency, oversight and enforcement of measures to prevent load-shedding. Weak political will may lead to political interference in the management of the energy sector. Decisions might be influenced by political considerations rather than technical and operational requirements. This can disrupt long-term planning and effective management, contributing to load-shedding. The lack of government political will may contribute to load-shedding in several ways. Without strong political will, governments may hesitate to invest in critical energy infrastructure, such as power-generation plants, transmission lines and distribution networks (Mlambo, 2023; Muller, 2023). A lack of political will can result in inadequate efforts to address corruption within the energy sector.

Theme 4: Sabotage

Sabotage emerged as another theme from the primary data. The theme emerged following expressions from the participants such as the following:

> *"The constant load-shedding raises suspicions of sabotage within Eskom. It's disheartening to think that our energy supply might be a victim of internal conflicts. Sabotage might be lurking in the shadows of Eskom's load-shedding crisis. It's concerning to think that internal factors could be worsening the situation. Load-shedding feels like a result of sabotage from within. It's time to uncover the truth and address any internal conflicts undermining our energy stability."* (P3, inventory manager, female).

> *"Sabotage is a bitter possibility behind Eskom's load-shedding woes. It's hard to believe that internal factors might be driving us into darkness. The thought of sabotage within Eskom adds another layer to the load-shedding crisis. We need to ensure the integrity of our energy infrastructure. Load-shedding's roots might lie in sabotage within Eskom. It's crucial to investigate and root out any actions undermining our power supply."* (P10, online category manager, female).

These statements describe how the energy infrastructure may be prone to further breakdowns and outages at the hands of saboteurs. Sabotage, in this context, may involve deliberate acts of physical damage to power generation plants, transmission lines, substations and other critical components of the energy infrastructure. This damage can lead to equipment failures, breakdowns and disruptions in the flow of electricity, resulting in reduced capacity for power generation and distribution (Mlambo, 2023). For power plants that rely on fossil fuels, sabotage could target the fuel supply chain, such as pipelines, storage facilities or transportation routes. Disrupting the supply of fuel can lead to a reduction in power-generation capacity, in turn, contributing to load-shedding (Kaplan, 2023). Sabotage incidents can erode public confidence in the energy sector and the government's ability to provide a reliable power supply.

Theme 5: Dilapidated Infrastructure

The following sentiments are examples of statements that led to the development of the fifth theme:

> *"Load-shedding is a stark reminder of the consequences of neglecting Eskom's infrastructure. Dilapidated systems simply can't handle our energy demands. Eskom's dilapidated infrastructure is at the heart of the load-shedding crisis. It's time to invest in modernisation to prevent further disruptions. Load-shedding highlights the urgent need to address Eskom's crumbling infrastructure. Without proper upkeep, power supply will always be at risk."* (P7, buyer, male).

> *"The link between load-shedding and dilapidated infrastructure is undeniable. Eskom's neglect is pushing us into darkness. Dilapidated infrastructure has left Eskom vulnerable to load-shedding. It's time to revamp and ensure our energy systems can meet the demand. Load-shedding is a wake-up call to fix Eskom's crumbling infrastructure. We can't afford to be left in the dark due to neglect."* (P12, buyer, male).

Some of the participants suggested that, if infrastructure is not properly maintained on account of neglect or budget constraints, its reliability and performance deteriorate further. They also pointed out that a lack of regular maintenance can lead to frequent breakdowns and a higher likelihood of load-shedding in order to avoid overloading the system. Eskom's dilapidated infrastructure contributes to load-shedding in several significant ways. Old and poorly maintained power-generation plants may experience lower efficiency and reduced capacity owing to wear and tear (Kaplan, 2023). This leads to a situation in which these plants are unable to produce as much electricity as is required, especially during peak demand periods, resulting in a shortfall of available power and the need for load-shedding. Dilapidated infrastructure is more prone to breakdowns and failures. Ageing equipment and facilities are more likely to experience malfunctions, mechanical failures and unexpected outages.

Theme 6: Strikes and service-delivery protests

The primary data led to the development of this theme, as some of the participants had the following to say:

> *"The connection between strikes, protests, and load-shedding is undeniable. Our energy security suffers when internal conflicts take centre stage. Load-shedding becomes more than just a power cut when you realise that strikes and protests exacerbate the problem. We need a balance between grievances and energy stability. Strikes and service-delivery protests are contributing to the load-shedding crisis. It's vital to address these issues without compromising our energy supply."* (P3, director/owner, female).

> *"Strikes and service-delivery protests only worsen the load-shedding situation. It's frustrating that our energy stability is compromised by internal conflicts. Load-shedding is aggravated by strikes and protests,*

> *leaving us caught in the middle. It's crucial to find ways to resolve conflicts without disrupting power. Service-delivery protests and strikes directly impact our energy supply, pushing us deeper into load-shedding. It's time for a more collaborative approach."* (P11, department manager, male).

These participants mentioned that strikes can affect industries that are major electricity consumers. Reduced production or temporary shutdowns in these industries can lead to a decrease in overall electricity demand. Protests and strikes therefore lead to unpredictable fluctuations in energy demand. For example, businesses might close during protests, leading to reduced demand. Strikes by energy-sector employees, including technicians, engineers and plant operators, can disrupt the day-to-day operations of power plants, transmission networks and distribution systems (Spocter, 2023). Protests that disrupt transportation and supply-chain networks can impact the delivery of fuel to power-generation plants (Chule, 2023). However, these disruptions can also result in uncertainty, reduced investor confidence and long-term economic setbacks that might hinder energy-sector investments and improvements (Heinemann, 2019). These actions can directly damage energy infrastructure, disrupt operations and lead to increased downtime and load-shedding (Chule, 2023).

Discussion and Recommendations

FMCG organisations should explore alternative, renewable energy sources, such as wind and solar energy, to be included in the energy mix. By diversifying, companies will be less dependent on the national grid and be able to supply power to the sector in case of load-shedding. Investing in on-site renewable energy generation can help mitigate the impact of load-shedding on operations and ensure a more resilient supply chain. Uninterruptible power supply (UPS) systems and high-capacity generators should be installed at important sites to ensure uninterrupted operations during load-shedding episodes. It is important that these backup options are routinely inspected and maintained to ensure their dependability. FMCG companies should use cutting-edge technology, such as IoT and AI, for predictive analytics and real-time monitoring. The supply chain can become more efficient overall with streamlined procedures and fewer manual errors thanks to automation. These technologies will assist companies to create adaptable and flexible logistical plans that can handle hiccups. For example, during load-shedding, they may use GPS and route-optimisation tools to find alternative routes and make sure that deliveries are made on time.

Enhancing demand-forecasting capabilities and implementing efficient inventory-management practices can help FMCG organisations optimise stock levels and minimise the impact of disruptions caused by load-shedding. By accurately predicting demand patterns and ensuring efficient stock replenishment processes, organisations can better manage their inventory and mitigate the risk of stock-outs during power outages. In addition, companies should improve their inventory-control procedures to guarantee that essential FMCG items are kept in adequate stock. They may use just-in-time inventory systems to reduce the effect of load-shedding-related supply-chain interruptions. Given the dynamic nature of load-shedding challenges, FMCG organisations need to monitor the situation continuously, stay informed about scheduled power outages, and adapt their supply-chain strategies accordingly. Proactive infrastructure planning is needed, with regular maintenance and upgrades, to ensure reliable and robust infrastructure that can withstand disruptions and support seamless operations. To reduce the risk of disruptions at any one source, FMCG organisations should diversify their supply base. Developing trusting connections with a number of suppliers will assist in guaranteeing a consistent flow of both completed items and raw resources. FMCG organisations can build resilience by establishing collaborative relationships with suppliers, distributors, and retailers. By working closely with supply-chain partners, organisations can share information, coordinate efforts and develop contingency plans to manage the impact of load-shedding collectively. Collaborative partnerships can also facilitate the sharing of backup power resources, logistics capacities and knowledge to overcome supply-chain disruptions. Working together can result in pooled resources and solutions that are advantageous to the FMCG industry as a whole.

Policies that prioritise infrastructure investment and maintenance are crucial for resilient FMCG supply chains. This includes investments in transportation networks, power grids and communication systems. Energy policies play a significant role in supply-chain resilience, particularly in regions susceptible to power disruptions. Policymakers should focus on diversifying energy sources, promoting renewable energy adoption, and ensuring a reliable and stable power supply. In addition, policies that incentivise energy-efficient practices and demand-side management can reduce the strain on the power grid and mitigate the impact of energy-related disruptions on FMCG supply chains. Policies that promote risk management and contingency planning are vital for enhancing supply-chain resilience. Encouraging the sharing of information, best practices and lessons learnt can enhance the end-to-end

visibility of supply chains, facilitate coordinated responses to disruptions and foster a culture of resilience. Through the implementation of these principles, FMCG companies operating in South Africa may establish more robust supply chains that are able to resist the difficulties caused by load-shedding, so guaranteeing uninterrupted operations and client contentment.

Despite adding to the body of knowledge, this study has many drawbacks. Although the data was gathered from seasoned supply-chain experts, it might be challenging to find accurate and up-to-date information about the precise effects of load-shedding on FMCG supply chains in South Africa. The present study data might not be current enough or sufficiently detailed, which could impair the accuracy of any analysis or suggestions. Moreover, research on South Africa in general may overlook regional differences within the nation. Therefore, the results might not apply equally to all areas. Directions for future research could therefore involve allocating substantial resources towards data gathering in order to guarantee precise and current data regarding the effects of load-shedding. This could entail optimising supply-chain operations and forecasting interruptions using big data analytics and machine learning. To discover effective methods and establish best practices, comparative studies with other nations confronting comparable energy difficulties should also be carried out. It is also crucial to undertake longitudinal research to comprehend load-shedding's long-term effects on supply-chain resilience. A thorough stakeholder study should be conducted to comprehend the requirements and viewpoints of each supply chain player.

Conclusion

The core data analysis revealed six themes. Moreover, the key findings showed that high levels of corruption and inadequate upkeep of infrastructure in South Africa were the root causes of ongoing load-shedding. Supply-chain interruptions occur frequently as a result of corruption, which also raises prices, interferes with manufacturing and threatens the stability of the power supply. Ineffective management and repair of the electrical infrastructure, owing to a lack of experience, exacerbates load-shedding and compromises supply-chain continuity. In the absence of robust political commitment, vital infrastructure projects are stalled, exacerbating power-supply problems and causing instability in supply chains. Sabotage can result in unanticipated power outages and damage, which seriously interrupt supply chains and raise operating expenses. The inability of outdated infrastructure to satisfy demand results in frequent load-shedding and an unstable power supply, both of which are harmful to the dependability of the supply chain. Protests and strikes disrupt businesses, cause financial losses, and create an uncertain business climate, all of which make it more difficult for supply chains to run efficiently. It is imperative that these fundamental concerns be addressed if South Africa is to develop robust FMCG supply chains. Addressing corruption, allocating resources for skill enhancement, exhibiting political resolve, safeguarding infrastructure, modernising antiquated systems and lessening the effects of labour disturbances are crucial measures to guarantee a dependable power supply and steady supply networks amid load-shedding difficulties. The FMCG sector can learn valuable lessons and adopt best practices from the experiences of industry leaders to enhance resilience. By implementing these lessons and practices, FMCG companies can build robust and adaptable supply chains capable of withstanding disruptions and maintaining operational continuity. However, through implementing energy-storage systems, FMCG companies can ensure uninterrupted operations, minimise productivity losses, and mitigate the negative impact on inventory management and customer service. These technologies enable the efficient utilisation of stored energy, reducing reliance on the power grid and enhancing supply-chain continuity. Collaborative partnerships and strong supplier relationships are vital in navigating load-shedding challenges.

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