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Supplier Performance and Resilience in the South African Public Sector

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ABSTRACT

This study examines public-sector supplier management practices applied to public-sector procurement in a developing country (South Africa [SA]) to delineate practices that have a salutary impact on the performance of the public-sector supply chain. Based on the largest survey conducted in this context (333 Supply Chain Management (SCM) public sector professionals in SA) and grounded in Institutional Theory, analysis was conducted using descriptive and inferential statistics, and hypotheses were tested using Structural Equation Modelling. Results indicate that three SCM practices (collaboration, innovation, and integration) exert a significant positive influence on supplier performance. Further, supplier performance exerted a significant positive influence on supply chain resilience. The managerial implications of the findings are discussed, including practices that deserve attention to improve supplier performance and how supplier performance can be harnessed to enhance the resilience of public sector supply chains in developing economies.

Keywords: *SCM practices; public sector procurement; supplier performance; supply chain resilience; public sector*

1. INTRODUCTION

Akin to developed economies, the public sector in developing countries is also owned and operated by the government on behalf of the public, serving as the machinery through which public goods and services are delivered. It ensures the efficient delivery of goods and services to the general public, promotes sustainable economic development, and improves living standards (Seidu *et al.,* 2014). The goods and services that the public sector provides to the general populace include energy, water, sanitation, health, education, security, communication and infrastructure (Sandada & Kambarami, 2016). These services are provided through public sector organizations (entities) such as government ministries, departments, local governments, public enterprises, and corporations commonly referred to as parastatals (Ambe, 2012; Mazele & Amoah, 2022). The importance and contribution of the public sector to the economy in terms of efficient service delivery are linked to the effectiveness of the public procurement system in place (Ambe, 2012). Additionally, public procurement contributes substantially to the economy, accounting for 13%-20% of GDP in many countries (World Bank, 2020). Thus, in developing countries such as South Africa (SA), public procurement is also seen as a vital tool for economic development. Yet, various scholars (see Mazele & Amoah, 2022) have also identified a host of challenges in public sector supply chain operations such as weak and outdated procurement systems, public procurement remaining an operational activity rather than a strategic activity, lack of transparency and accountability, lack of knowledge and skills, embedded fraud and corruption (per World Bank data this accounts for on overall loss of 10%-25% of the value), political interference and inability to implement appropriate reforms, especially public supply chain management, as inhibiting challenges to efficient public service delivery. In this way, public-sector supply chains in developing countries, such as SA, operate in a uniquely challenging environment. The challenges in this environment cripple the delivery of high-quality services, further eroding public trust and sentiment. As a result, there has been widespread debate and reflection aimed at identifying and implementing strategic approaches to optimise the public sector's supply chain ecosystems (Thorne, 2024; Luckhoff, 2024). Various policy frameworks, strategic interventions, and

performance-monitoring mechanisms have thus been put forward to build stakeholders' confidence and maintain the public sector's service delivery mandate.

Turning specifically to Supply Chain Management (SCM), it has become a popular managerial philosophy in the contemporary business world and an integral strategic tool for ensuring fiscal prudence in procurement activities – see well-known texts such as Chopra and Meindl (2014) and Sarkar (2023). The adoption of SCM has been widespread not only in the private sector but also in public institutions (Ambe & Badenhorst-Weiss, 2012; Ambe, 2016). It is associated with benefits such as improving financial prudence, reducing inventory costs, building new relationships through networking, improving a firm's agility, and improving service delivery (Tufan *et al.,* 2024; Kumar & Kumar, 2022). The prevalence of these benefits contributed to the adoption of SCM in SA's public sector to address deficiencies in the procurement system (Ambe & Badenhorst-Weiss, 2012). In 2004, the National Treasury issued three key policy documents to strengthen the policy framework and assist in the roll-out of the SCM policy in the public sector, ensuring compliance with government objectives and legislative environments to optimize cost-effectiveness and efficiency (Mhlongo, 2014). This being the case, the value proposition of SCM as a framework for managing and regulating the public sector's spending cannot be overstated, given its well-recognized importance. Thus, SCM, as a function, performs a critical role in safeguarding public resources and ensuring that government entities are well-equipped to fulfil their mandates.

Of note, however, is a significant difference between supply chains in the private and public sectors. Unlike most private-sector supply chains, public-sector supply chains are subject to numerous laws and regulations to ensure public welfare and advance social goals (in SA, one of these is the reduction of race-related economic inequities). For example, in SA, legislative provisions governing public-sector supply chains emanate from both the Constitution and legislative frameworks. With regard to the former, public procurement has been granted constitutional status in SA and is recognized as a means of addressing past discriminatory policies and practices (Vabaza, 2015). Further, the host of legislative frameworks and instruments that govern SCM in the SA public sector includes the Public Finance Management Act (PFMA), the Preferential Procurement Policy Framework Act (PPPFA), the Broad-Based Black Economic Empowerment Act (BBBEE), Promotion of Equality and the Prevention of Unfair Discrimination Act (PUDA) 4 of 2000, Prevention and Combating of Corrupt Activities (PCCA) Act (Act No. 12 of 2004), among others (Vabaza, 2015). The National Treasury plays an oversight role in the implementation of legislative measures, as it is responsible for maintaining an effective and efficient procurement and provisioning system (Tshamaano, 2012). Among its responsibilities are promoting socio-economic objectives, seeking value for money, combating corruption, creating an accessible procurement process for all, creating an enabling environment for SMEs, encouraging competition, developing a procurement standards system, and ensuring compliance with the constitution (Ismay, 2008). This conversation emphasizes SCM's value proposition as a catalyst for socio-economic development, enabled by its role in bolstering best practices and the efficient management and control of procurement-related activities within SA's three public government spheres (National, provincial, and local).

In SA, the adoption and implementation of SCM within the public sector have been recognized as an important tool for managing public procurement funds (Myeza, Nkhi & Maroun, 2021). Nonetheless, despite the adoption and implementation of SCM in the SA public sector as a strategic tool for ensuring fiscal wisdom and discipline in government transactions, it has also been documented that several instances of this SCM adoption in the public sector have been critically problematic (Jonathan *et al.,* 2019; National Treasury, 2015).

Problems identified in the public sector include non-compliance with regulations and policies related to procurement and SCM and irregular tendering (Sibanda & Tshikovhi, 2022; Ambe, 2016); excess of cumbersome procedures; corruption; political interference; lack of monitoring and evaluation mechanisms, which have collectively contributed to a poorly performing public sector supply chain (Maepa, Mpwanya & Phume, 2023; National Treasury, 2015). These SCM problems demonstrate a far-reaching lack of resilience that undermines the public sector's strategic role in improving the lives of South Africans. Therefore, there is a need for urgent, ongoing inquiries to identify appropriate solutions to address and improve SA's public-sector supply chains.

Turning now to the extant literature on SCM, there exists an expansive body of empirical work on the application of SCM in SA; an excellent summary of the same, along with research trends, may be found in the recent Special Issue of Supply Chain Forum: An International Journal focused on SCM in Africa (Klibi *et al.,* 2025). However, what sets the current study apart is its focus solely on the potential impact of SCM practices on supplier performance (SP) and supply chain resilience (SCR) in the public sector in SA. This approach is particularly crucial given the well-documented SCM challenges highlighted above, which have been exacerbated since the COVID-19 pandemic. For instance, the country faces severe delivery bottlenecks stemming from its overreliance on imports. Congestion at government-operated seaports has severely disrupted the country's inland distribution of goods (Misra, 2021). Further, the limited capacity of suppliers and the poor resilience and adaptability of public agencies compromise the expected seamless supply of goods and services, including medical supplies and the necessary infrastructure components required for project completion (Zindi & Sibanda, 2022). Additional impediments include tardiness and prolonged bureaucratic red tape, which have hampered the public procurement system in awarding contracts and selecting suitable suppliers (Evans, 2023). While some of these problems are linked to corruption within government agencies, we believe that others can be addressed by improving supplier performance in the public sector. This submission is significant since suppliers in SA's public sector are particularly crucial for the work of numerous ministries and public institutions. One example is how they helped cause service delivery failures, which are prevalent when infrastructure does not work properly, like when municipal projects are not finished, such as water treatment plants,

sewage system maintenance, and road development. It is crucial to find ways to improve supplier performance because they are a major part of delivering good, efficient service.

Based on this, this study focuses on investigating how SCM practices (collaboration, innovation, integration, synergies, information sharing, information quality, and design) impact supplier performance while enhancing the resilience of the SA public sector, which is currently underperforming. The study is premised on the Institutional Theory (see Berthod, 2016 for an introduction and overview), which considers the adoption of SCM practices under normative external pressures in SA's relevant regulations (the PFMA, the Municipal Finance Management Act [MFMA], and the SA's National Treasury regulatory guidelines). These legislative measures regulate public SCM in the country. The study underscores that the effective and efficient application of these SCM practices is essential to improving suppliers' performance and increasing the resiliency of the public supply chain, enabling public institutions to provide superior services to the public.

From an academic standpoint, the current study also addresses a perceived relative dearth in the extant literature on public-sector supply chains in developing countries, as opposed to studies of private-sector supply chains. Available empirical evidence, such as in Chavalala *et al.* (2024), Tuomala and Grant (2022), Bag *et al.* (2022), Mvubu and Naude (2020), and Okoumba *et al.* (2020), has already documented the salutary impact of SCM practices on performance in various private sector environments. Other SCM studies undertaken from the SA's public sector standpoint have studied different perspectives, such as taxation and expenditure (Miloane, 2021); supply chain risks (Mhelembe & Mafini, 2019); service supply chain initiatives (Getele & Ruoliu, 2024); supply chain mapping (Bvuchete *et al.,* 2021). Finally, another set of studies (Maramura & Ruwanika, 2023; Pooe & Munyanyi, 2022; Sibanda *et al.,* 2020; Fourie & Malan, 2020) examined specific SCM activities in isolation and linked them to various organizational and environmental factors.

However, when taken together, the studies noted above nonetheless leave two notable gaps. The first is that the contribution of SCM to suppliers' performance and the resiliency of supply chains in the public sector remains largely unexplored in developing countries. As noted by some scholars (Emon *et al.,* 2024; Yang & Jiang, 2023; Meena *et al.,* 2023), suppliers play a vital role in enabling improved performance in public organizations. Second, in the post-COVID-19 era, supply chain resilience (SCR) has emerged as an important tool in facilitating the long-term success of public supply chains as it ensures their recovery from disruptions (Shen & Sun, 2023; Paul *et al.,* 2023; Nisar *et al.,* 2023). There is thus a need for further empirical research to develop a more comprehensive understanding of the importance of SCR, given its growing prominence as a dominant factor in supply chain success. These knowledge gaps identified above undergird the point of departure of this paper.

In an effort to address the two identified gaps, the study aims to examine the relationships among SCM practices, SP, and SCR in a developing country, using SA's public sector as a test case. Based on a survey of 333 SCM public sector professionals in the Gauteng Province in SA - which, to the best of our knowledge, remains the largest study conducted on public-sector supply chains developing economies - we empirically test the impact of seven SCM best practices identified in the literature (SCC, innovation, and SCI; SCS, information sharing, and quality as well as SCD) on SP and SCR, to provide empirically generated information on how to address the challenges facing the SA public sector. Our key results include: three SCM practices (collaboration, innovation, and integration) positively influence SP, whereas four others (SCS and SCD) do not. Surprisingly, information sharing and quality negatively influence SP. Finally, SP positively influenced SCR.

The current study thus makes several novel contributions to the extant SCM literature. First, the model tested offers a new conceptualization of the linkages among SCM practices, SP, and SCR in public supply chains in developing countries. It further underscores the value proposition of the interplay between SCC, innovation, and SCI as SP and SCR antecedent practices (Benton *et al.,* 2020; Jean *et al.,* 2012; Joshi, 2009; Pooe *et al.,* 2015). Additionally, in determining which SCM practices are critical for improving the performance of public sector suppliers, it also highlights the mediating role of SP in the relationship between SCM and SCR. This association is particularly crucial given suppliers' relevance in boosting operational effectiveness. This view is noteworthy because organizations with competent supply chain partners are likely to demonstrate resilience in responding to sudden market changes and volatility. The study's focus on SCR in the public sector provides fresh insights into this concept, given its prominence during the COVID-19 pandemic. These insights pertain to how SCM implementation affects suppliers' performance and the resilience of the public-sector supply chain in SA.

The remaining paper is divided as follows. The next section details the development of our model and explains the context and rationale for the constructs used, culminating in a summary presentation of the research model we investigate. Thereafter, Section 3 describes the research methodology and design used for the study, followed by Section 4, which discusses the results of our data analysis. Finally, Section 5 is the concluding section of the paper, where we discuss the major findings of our study, summarize the managerial implications thereof and present avenues for future research.

2. MODEL DEVELOPMENT

We begin by reviewing the relevant literature for our model's constructs (predictors, outcomes, and mediators). The study was anchored on the institutional theory, which examines how external pressures influence organizations to adopt certain practices - see Berthod (2016) for an introduction and overview of this impactful theory. The prominent argument in the institutional theory hypothesis is that organizations operating in similar fields tend to adopt the same practices and structures to survive external pressures (Palthe, 2014). These pressures emanate from governments through rules and regulations, customers' expectations, and competitors' success (Sarkis, Zhu & Lai, 2011). In this study, institutional theory has been identified as having potential

value for SCM. The study argues that the relationships among SCM practices, SP, and SCR can be managed to achieve efficiencies in both social and economic areas of an organization. The institutional theory also offers important insights into the adoption and implementation of tools and practices in public sector SCM, thereby enhancing SP and improving SCR.

2.1 Supply Chain Management Best Practices

While there is no universal consensus on the definition of SCM best practices, several scholars have defined them as managerial actions aimed at improving the performance of the integrated supply chain (Sundram *et al.,* 2016). Moreover, van der Vaart and van Donk (2008) described them as tangible activities or technologies relevant to collaborating with a focal firm's suppliers and clients. Other scholars (Al-Shboul *et al.,* 2017) affirm them as a set of actions undertaken by suppliers, manufacturers, distributors, and customers to improve the performance of the integrated supply chain. Public-sector SCM is the part of the government process that involves the provision, procurement, delivery, and allocation of goods and services to and by the government or its citizens. In SA, various SCM practices have been implemented in the public sector. Thatte (2007) identifies SCM practices such as supplier development, strategic supplier relationship management, strategic sourcing, and private-public partnerships procurement as implemented in the SA public sector. Other practices identified include SCI, information sharing, the Just-in-time delivery system, strategic partnerships with suppliers, customer relationships, information quality, and lean internal practices (Koh *et al.,* 2007). Besides, the concept of supply chain synergy (SCS) has recently risen to prominence due to its interrelatedness to collaboration and alliances (Simatupang & Sridharan, 2005). As such, synergy concerns the process of mutual working relationships between two or more partners (Nejati *et al.,* 2017).

Based on the literature cited above, we have focused on the following SCM best practices: SCC, innovation, information sharing and quality, SCD, and SCI and SCS. This has been done because of their relevance in optimizing operational processes and performance in any organizational setting (Baah *et al.,* 2021).

2.1.1 Supply Chain Collaboration

SCC has been defined as two or more supply chain members working together to create a competitive advantage by sharing information, making joint decisions, and sharing benefits, thereby achieving greater profitability by satisfying end customer needs (Rezaei *et al.,* 2015). The practice of SCC is influenced by several factors (drivers) emanating from the organization's external and internal environments. Common benefits of SCC include cost savings, reduced inventory, timely replenishment, and improved forecast accuracy (Baah *et al.,* 2021). Also, SCC helps a business organization coordinate and operate efficiently, including SCM, reduce costs and inventory, and increase customer satisfaction (Teng *et al.,* 2022).

The practice of SCC underscores why it is important for supply chain partners to work together in improving operational efficiency. Collaboration is especially important in the public sector, as service providers and government bodies need to work together to deliver quality services. This kind of teamwork directly helps build better infrastructure and provides essential community services, such as refuse collection and water purification. However, despite the consensus on the strategic importance of SCC as a driver of supplier performance, there are some nuances that point to countervailing arguments. For instance, the coercive and normative nature of the SA public sector environment, which is intended to minimize unethical practices such as coercion and conflicts of interest, tends to shape the collaborative interaction between buying and supplying organizations. In line with this view, some studies (e.g. Horn & Raga, 2012; Naude *et al.,* 2013), observed that buyer-supplier engagement in the SA public sector is more transactional than relational due to the intense scrutiny aimed at curbing unethical behavior among public servants. As such, collaboration within the SA public sector is rather limited due to normative tensions that stem from the need to uphold the integrity of procurement processes, given the fragmentation of bid management into two decision-making chambers: evaluators and adjudicators (who act on final recommendations). This decentralization of decision-making is susceptible to external pressure, such as political interference, which further inhibits the effectiveness of collaborative relationships between customers/clients and service providers, rendering them transactional at best.

2.1.2 Supply Chain Innovation

Supply chain innovation refers to the tools needed to improve organizational processes for effective SCM through interactions with suppliers, manufacturers, distributors, and customers (Lee *et al.,* 2011). Besides, it involves technology-improved processes and procedures in the outbound supply chain, as well as product, process, or service changes that enhance efficiency or improve final customer satisfaction (Asare *et al.,* 2024). Benefits of an innovation-related supply chain include efficient product and service supply to customers, cost reduction, reduced bullwhip effect, competitive advantage, improved supply chain performance, and market performance (Liu *et al.,* 2023). The review underscores the critical importance of innovation in improving the efficiency of public-sector supply chain operations. Several essential benefits demonstrate its importance, such as making administrative processes easier and reducing bureaucratic delays. The goal of digitalizing procurement processes is to make them more efficient, open, and visible across the supply chain, as well as to improve the processes themselves.

The significance of innovation-driven processes and operations is unquestioned, particularly in the public sector, where service optimization is prioritized. Within the SA public sector, notable innovation cases include the eTendering Portal and the Centralized Supplier Database, which are designed to manage and monitor the sector's supplier base. This fact notwithstanding, procurement innovation initiatives in the SA public sector are driven by coercive institutional pressure. This implies that it is compliant-oriented rather than exploratory for service providers. Fourie and Malan (2020) echoed this view, asserting that procurement-related innovation in the SA public sector is more policy-driven rather than market-driven. This lack of free innovation limits the degree to which suppliers can experiment or be creative, as their performance is constrained by policies and regulations.

A plausible illustration of this level of restriction is the rigid, intensive bid specification requirements (technical, functional, and administrative) that demand strict adherence, which may not always translate into positive outcomes.

2.1.3 Information Sharing

Information sharing is the ability of supply chain members to communicate effectively (Sundram *et al.,* 2016). There are many types of information that can be shared within a supply chain, ranging from inventory and sales data to sales forecasting, order information, and product capabilities, to exploitation information on new products (Lotfi *et al.,* 2013). The strategic importance of information is well documented, as it enables companies to access and share data along the supply chain, making supply chain processes more efficient and cost-effective (Liu *et al.,* 2023). The sharing of information in the supply chain enables faster, more accurate business decisions that translate into a source of competitive advantage through reduced total cost of supply chain delivery (Baah *et al.,* 2021).

It is generally acknowledged that the sharing of information is critical for public organizations to meet their goals of identifying and selecting the right suppliers. Also, smooth information sharing between supply chain partners enables all involved players to better understand their needs and how contractors should be assessed, ensuring that the right service providers are hired. Within the SA public sector, the value of information sharing is embedded in regulatory frameworks such as PFMA and BBBEE, which impose coercive requirements for the fair dissemination of information across all role players without favour. In support of this view, Ambe (2012) argues for the need to share formal, relevant project information among all interested parties in the SA public sector procurement process. Such a transactional and unilateral exchange of information minimizes and discourages unfair advantage by certain role players engaged in collaborative information sharing. As a result, opportunities to clarify ambiguous specifications and requirements in contractors' request-for-proposal documents are limited, which helps to minimize instances of collusion. Hence, the mimetic pressure on procurement officers to maintain ethical practices and standards to protect the integrity of procurement functions is sustained.

2.1.4 Information Quality

Information quality encompasses all aspects of managing information and communicating effectively and efficiently, including accuracy, timeliness, adequacy, and credibility (Jonsson & Myrelid, 2016). Access to the right information enables firms to reduce uncertainty and improve planning, improving their profitability. Firms with access to the right information would be more proactive in responding to changes in market conditions, thereby becoming more focused on meeting customer needs (Alzoubi & Yanamandra, 2020). This is supported by other scholars, who note that the quality of information shared in supply chains affects decision-making quality within the organization and product development (Khan *et al.,* 2024). As such, the sharing of high-quality information helps strengthen supply chain operations. This point of view is clear in the way high-quality data and information are provided, making it easier to write accurate bid specifications that meet the needs of public institutions. When specifications are clear and reliable, suppliers can make sure their proposals meet expectations. This, in turn, strengthens the bid evaluation process and speeds up the hiring of preferred suppliers and the provision of the required services.

Information quality is renowned for its role in improving supplier selection. However, according to Nkwanyana and Agbenyegah (2024), within the SA public sector, instances of poor-quality information in the Centralized Supplier Database (CSD) and electronic Tender (eTender) erode the trustworthiness and accuracy of the data in this critical interface system. This lack of consistent quality information compromises the relevance of the data and information used to accurately evaluate suppliers against agreed selection criteria. In addition, providing accurate project requirements does not necessarily translate into superior supplier performance, as supplier performance is assessed on their ability to perform their core duties effectively and efficiently, rather than on the acquisition of quality information. This aligns with the mimetic institutional tenet (the need to benchmark against other standards), as supplier performance benchmarks are evaluated by appointed departments against set performance assessment yardsticks.

2.1.5 Supply Chain Design

SCD is defined as the task of determining the basic, long-term structure of the supply chain by defining its elements, objectives, locations, and key organizations (Leukel & Sugumaran, 2013). It involves decisions about the number of suppliers, supplier proximity, supplier selection and evaluation, planned capacities in each facility, definition of contractual terms, and responses to potential disagreements among channel members (Chopra & Meindl, 2014). SCD activities, such as strategy development, must be based on customer needs so that supply chain choices are customized to the voice of the customer (ibid). In addition, Leeukel and Sugumaran (2013) note that a well-organized SCD significantly impacts the firm's resources and performance. This is supported by other scholars who argue that well-structured and well-designed supply chains drive cost savings by reducing inventory costs (MahmoumGonbadi *et al.,* 2021; Fava & Sampaio, 2020).

The conversation makes it clear how important supply chain dynamism (SCD) is for businesses to change, adapt, and restructure their operations in response to market changes. In the public sector, state-owned businesses can gain significant benefits from carefully planning and positioning their value and supply chain networks. These organizations are better able to continue providing services even when suppliers face problems due to force majeure events or performance-related issues, using strategies such as multi-sourcing and geographically diverse supplier bases. On the contrary, the fixed structural composition and alignment of the SA public sector, as prescribed by policy frameworks such as the National Treasury SCM guidelines, limit the agile segmentation and flexibility of supply chain operations when uncertainties arise. As highlighted by Kuen and Zailani (2019), rigid supply chain structures do not necessarily optimize supplier performance. Instead, coercive pressure arising from fixed SCM policies may be counterproductive, as it results in administrative delays that further retard performance due to late supplier appointments or delayed supplier responses during project execution.

2.1.6 Supply Chain Integration

SCI refers to the degree to which an organization strategically collaborates with its supply chain partners and manages intra- and inter-organizational processes to ensure the effective flow of products, services, information, money, and decisions to provide maximum value to its customers (Cao *et al.,* 2015). SCI can be classified into four groups: supplier, customer, internal, and information integration (Kumar *et al.,* 2017). Naslund and Hulthen (2012) believe that SCI links a firm with its customers, suppliers, and other channel members by integrating their relationships, activities, functions, processes, and locations. Lastly, well-integrated supply chains create shareholder value by decreasing costs and increasing market share. Integration also results in improved decision-making, enhanced knowledge sharing, aligned capabilities, built learning routines, and increased performance of supply chain partners (Feizabadi & Alibakhshi, 2022).

The cited advantages of integrating supply chain operations underscore the need to adopt this strategy to improve municipal organizations' performance. These benefits are especially evident when companies use cross-functional teams to analyse and evaluate supplier requests for proposals (RFPs) and to create service level agreements (SLAs) that ensure needs and specifications are explicit. More benefits are derived from using digital technologies such as electronic procurement (e-procurement) platforms and enterprise resource planning (ERP) systems. These technologies make administrative tasks easier, speed up processing, and help monitor purchase orders (POs), thereby helping eliminate operational bottlenecks.

A critical argument against the merits of SCI is that its structural logic, shaped by coercive and normative institutional parameters, does not align with all public entities' departmental functions. This denotes that the degree of integration of supply chain functions is non-uniform, evidenced by the poor performance of some municipalities (Ambe, 2012). Indeed, adopting an integration strategy requires significant alignment across administrative and operational functions. This alignment often burdens already-constrained resources and increases administrative strain on basic processes, leading to weaker supplier performance.

2.1.7 Supply Chain Synergy

From a supply chain standpoint, the SCS is defined as an organization's ability and capability to work optimally with its network members (Cao & Zhang, 2010). It may also refer to a collaborative merger between two or more organizations, characterized by the sharing of resources, capabilities, and information across their value chains to optimize customer satisfaction requirements (Campos & Vazquez-Brust, 2016). Effective SCS enables more efficient operations by reducing cycle time, improving product delivery, enabling seamless information exchange, and enabling optimal responses to market changes (Rezaee, 2018). In their study on the link between corporate digitalization and SCS, Tian and Shi (2024) found that effective synergy between supply chain networks is vital in ensuring sustainable performance. These performance improvements demonstrate the importance of public organizations using synergistic techniques. When these tactics are used correctly, they may take advantage of this opportunity. This is especially clear when efforts to improve the quality of registered service providers and maintain service delivery standards are made through supplier development programs. Additionally, ongoing monitoring and interaction with the supply base facilitate the prompt identification of underperforming suppliers, thereby mitigating the risk of project failure.

Although a synergistic working environment across public supply chain networks is desirable, given institutional, regulatory, and policy alignment, its practical implementation across the SA public sector remains weak and misaligned (Nzimakwe & Biyela, 2021). Even though SCM policy frameworks advocate for symmetric adoption, SA's public agencies tend to decentralize authority and have conflicting prerogatives (political interference, audit compliance, and preferential procurement compliance), making synergy difficult to achieve. Such misalignment further constrains supplier goal sharing and weakens continuous learning, since performance evaluation in the sector tends to be penalty-driven rather than fostering synergy.

2.1.8 Supplier Performance

SP refers to how well a supplier delivers the required products to the buyer and is manifested in operational outcomes, including quality, delivery, responsiveness, cost, and technical support (Wu *et al.,* 2010). It is essential in supply chains because it significantly affects the maintenance of collaborative relationships, including product quality, operational support service quality, and delivery performance (Saunila *et al.,* 2021). Suppliers are imperative to the overall performance of supply networks, especially in a competitive business environment (Salam, 2021). Organizations must regularly evaluate their suppliers' performance, as effective integration of supply chain activities affects their operations (Patrucco *et al.,* 2022). To properly manage public-sector supply bases, it is important to regularly assess supplier performance. So, supplier evaluations should be based on practical, measurable performance indicators. These evaluations may examine both functional and performance-related aspects, but they should always keep in mind that meeting contractual obligations is the most important, since failing to do so can significantly harm service delivery.

2.1.9 Supply Chain Resilience

SCR is the system's ability to return to its original state after experiencing interruptions, especially those with negative effects, within a reasonable time frame (Day, 2013). It is categorized into two approaches, namely, proactive and reactive (Wieland & Wallenburg, 2013). A proactive dimension of SCR is a system's ability to prevent or resist an event and maintain its functions during internal and external disruptions (Hasani & Khosrojerdi, 2016). Li *et al.* (2017) state that the main critical element of proactiveness is preparedness. The reaction aspect is the ability to quickly adapt to unexpected market changes in a competitive, turbulent, and volatile environment characterized by uncertainty (Golgeci & Ponomarov, 2013). In a world that is volatile, unpredictable, complex, and ambiguous (VUCA), building resilience is no longer just an operational necessity; it is now a strategic imperative. Public organisations that can consistently deliver services, monitor risks, view the entire supply chain, plan to reduce them, and avoid delays by using backup suppliers are better prepared to handle external disruptions and maintain acceptable levels of performance.

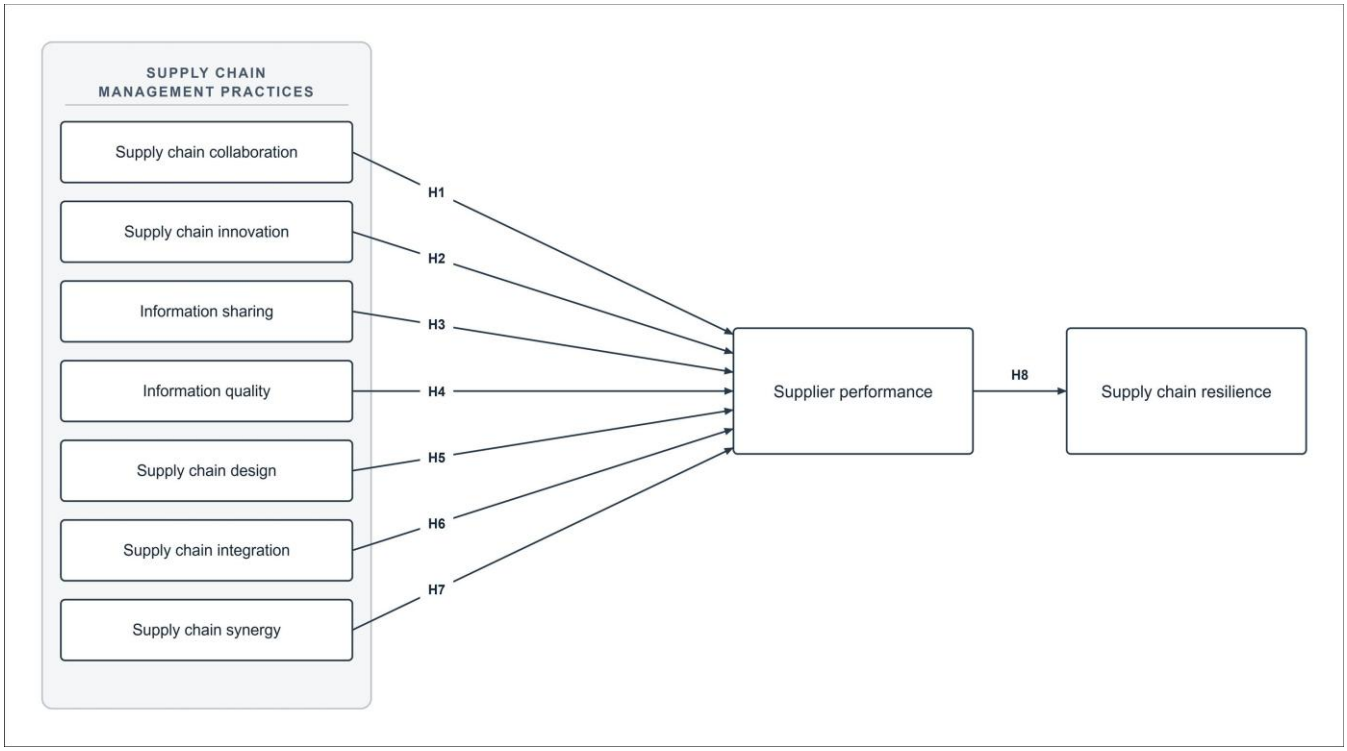


Figure 1 Research Model

2.2 Conceptual Framework and Hypothesis Development

The study conceptualizes the framework (Figure 1), highlighting the proposed association between the identified SCM practices (namely, SCC, innovation, information sharing, information quality, SCD, SCI and SCS) as predictors of SP (mediator) and SCR (outcome). Eight hypotheses (H1 to H8) are put forward to test the causal nexus between the study's dependent and independent constructs.

2.2.1 Supply Chain Collaboration and Supplier Performance

Effective collaborative practices among business partners significantly impact profitability, cost reduction, improved technical cooperation, and enhanced performance for both the supplier and the customer (Carvalho *et al.,* 2012). In addition, Botes *et al.* (2017) noted that sound and efficient SCC between buyer and supplier parties results in better inventory reduction, improved quality and delivery, reduced costs and lead times, greater flexibility, faster product-to-market cycle times, increased responsiveness to market demands, and improved customer service. Cao and Zhang (2011) posit that efficient and effective collaborative practices between buyers and suppliers are fundamental to enhancing supplier performance. Within the SA public administrative landscape, collaboration is at the centre of procurement oversight. This networking regulates and fosters compliance with the procurement regulatory framework, which governs and monitors public spending and ensures effective service delivery by appointed contractors. In light of the discussion above, the following hypothesis was formulated:

H1: Supply chain collaboration has a significant positive impact on supplier performance.

2.2.2 Supply Chain Innovation and Supplier Performance

Lavastre *et al.* (2011) conceptualize innovation (SC) as a set of practices that were previously non-existent in organizations, and that will be generated, developed, and deployed within supply chains to tackle issues such as quality, cost, and lead time. It relies on logistics network reconfigurations, information technology, stock outsourcing, and information systems development (Ageron *et al.,* 2013). Kim and Chai (2017) found that innovation is an important driver of efficient supplier performance, including the seamless supply of goods and services, accurate service delivery, improved product quality, and customer value creation. In addition, Coombs (2012) notes that innovations in supply chains empower organizations and their partners to be resilient and maintain agility and continuity amid rapid changes in the business environment. Therefore, adopting innovation practices in the supply chain enables suppliers to be flexible and agile in responding to the ever-changing business environment. The adoption of innovation practices within SA's public institutions has strengthened supplier compliance and performance. This is supported by the e-tender portal and the CSD, which are designed to evaluate and verify the suitability of supplier firms against predetermined assessment criteria for selecting the most suitable candidates. As such, the following hypothesis was formulated:

H2: Supply chain innovation has a significant positive impact on supplier performance.

2.2.3 Information Sharing and Supplier Performance

Several pieces of empirical evidence have highlighted the importance of information sharing as a driver of supplier performance. Among them is Pooe *et al.* (2015), who found that sharing information and data between supply chain partners significantly improves supplier performance.

Besides, information has been recognized as an effective predictor of supply chain effectiveness (Zhang & Cheng, 2013). Effective exchange of information led to improved coordination among supply chain partners, enhanced responsiveness, and the elimination of the bullwhip effect (Zhang & Chen, 2013). Other scholars found that sound information exchange between supply chain partners influences supplier performance (Mafini *et al.,* 2016). Much of the available data shows that sharing information can help suppliers improve.

However, Lie *et al.* (2001) suggest that large changes in demand-related information can make it harder for underperforming suppliers to manage their inventory. This viewpoint is especially pertinent in public-sector environments, where administrative holdups and bureaucratic protocols frequently hinder the seamless exchange of information across supply chain collaborators. In addition, the lack of institutional trust and poor governance structures within the SA public sector erode the effective and efficient sharing of information (Ngxesha *et al.,* 2024). This is critical as this lack of trust compromises the confidentiality of balanced and equal implementation of public procurement policy and frameworks. Based on the preceding evidence, the following hypothesis was put forward:

H3: Information sharing has a significant positive impact on supplier performance.

2.2.4 Information Quality and Supplier Performance

Organizations need to view their information as a strategic asset and ensure it flows with minimum delay and distortion. Also, the continuous exchange of strategic decisions and key information may result in a certain level of trust, enabling supplier partners to perform well (Zhou *et al.,* 2014). This implies that effective exchange and transfer of up-to-date information across all sections of a firm's supply chain units may enable each link to coordinate its strategic actions more effectively and respond to customers' final orders. Thus, supply chains function optimally through the sharing of quality information. This observation was empirically supported by Nicolaou *et al.* (2013), who found that an increase in the quality of information exchange between organizations positively enhances the level of trust business associates have in one another.

As Bin Aqdas (2023) found, supplier performance is negatively affected by inconsistent quality information, consistent with the typical challenges experienced in the SA public sector, where the exchange of poor-quality information hampers service delivery. Unclear proposal specifications are an example of bad information quality in SA's public sector. Also, it is typical for supplier assessment criteria to be unrealistic and for procurement data to be wrong, both of which make it harder to make good decisions and for suppliers to do their jobs well. Moreover, poorly written and poorly conceptualized bid specifications, which can appear highly technical and ambiguous at times, misalign with how the suppliers understand the scope of projects (Nkwanyana & Agbenyegah, 2024). Such a lack of application can weaken the accuracy and usefulness of the information conveyed, thereby reducing its overall usability. Based on the above-mentioned evidence, the following hypothesis was formulated:

H4: Information quality has a significant positive impact on supplier performance.

2.2.5 Supply Chain Design and Supplier Performance

SCD helps organizations perform and survive by leveraging the capabilities of supply chain partners, whether directly or indirectly involved with the firm, and by developing and fostering appropriate ties with customers and suppliers (Melnyk *et al.,* 2014). With SCD, firms can realize significant benefits, including reduced inventory levels, lower costs, enhanced responsiveness, and improved strategic focus on design, execution, and capital investments (ibid). Empirical evidence by Leukel and Ssugumaran (2013) acknowledged that it contributes to supplier performance through its ability to outline decisions about the number of suppliers, proximity to a supplier, supplier selection, and evaluation. Thus, suppliers owe their success to the design of their supply chains. Awaysheh and Klassen (2010) found that structural complexity in the supply chain, exemplified by multiple supplier tiers, can diminish operational efficiency and lead to subpar supplier performance. This complexity is also present in SA's public sector, where many statutory authorities are responsible for regulating operational processes (decentralization). This often leads to delays and makes it harder to provide good service. Hence, this study formulated the following hypothesis:

H5: Supply chain design has a significant positive impact on supplier performance.

2.2.6 Supply Chain Integration and Supplier Performance

In his study on SCI and supply chain performance, Katua (2014) underlined the impact of an integrative approach towards supply chain partners. The author further observes that SCI activities are necessary to improve information sharing, trust, and commitment among supply chain partners and to help them delegate decision-making. Danese (2013) endorsed this view, stating that SCI facilitates the sharing of complementary resources and information within the supply chain network, as well as the generation of tacit knowledge through collaborative relationships and joint improvement efforts. Also, Huang *et al.* (2014) found that a firm's efforts to integrate its supply chain activities effectively significantly impact its supplier performance. Drawing parallels with the SA's public sector, the integration of critical functional systems, such as procurement and finance, provides a strategic mechanism for optimizing supplier evaluation through cross-functional adjudication teams. Drawn from the preceding review, it is hypothesized that:

H6: Supply chain integration has a significant positive impact on supplier performance.

2.2.7 Supply Chain Synergy and Supplier Performance

Empirical evidence linking SCS and SP has been well-documented (Flynn & Flynn, 2005; Wu *et al.,* 2010; Cao & Zhan, 2011; Lii & Kuo, 2016; O'Connor *et al.,* 2020), particularly because of the role that the seamless transfer of resources, information, and materials plays in optimizing SP. A firm's SP is dependent, among other factors, on a viable, synergistic, and robust value and supply chain environment characterized by close coordination of operations, speed, and flexible information sharing, as well as mutual problem-resolution initiatives (Wu *et al.,* 2010). Nair *et al.* (2021) assert that suppliers will likely perform at their best within a

highly synergized supply chain ecosystem. However, despite the acclaimed positives, the over-specification and redundancy of administrative procedures could be counterproductive within SA's administrations. This is the case where the request for the same supporting documentation for bid applications (such as BBBEE compliance, Tax, Declaration forms, and bank authentication certificates) could prove redundant for suppliers applying for multiple requests for proposals. Thus, it could be hypothesized that:

H7: Supply chain synergy has a significant positive impact on supplier performance.

2.2.8 Supplier Performance and Supply Chain Resilience

A supplier operating at an optimal level is crucial to enabling the buying firm to achieve its performance outcomes by serving its customers more efficiently (Mafini *et al.,* 2016). Supplier performance significantly impacts maintaining collaborative relationships and enhancing integration between supply chain partners (Huang *et al.,* 2014). Well-performing suppliers also play critical roles in improving product quality and delivery performance (Yen, 2012). Huang *et al.* (2014) suggest that organizations must regularly evaluate their suppliers' performance, as effective integration of supply chain activities significantly affects their operations. Thus, supplier performance is critical in supply chains as it influences performance and sustainable competitive advantage.

H8: Supplier performance has a significant positive impact on supply chain resilience.

3. METHODOLOGY AND DESIGN

3.1 Research Design

The study was anchored in positivism and underpinned by deductive reasoning because it sought to assess the association between the proposed constructs. Furthermore, the correlational design employed in this study was intended to test the nexus among SCM practices, namely, SCC, innovation, information sharing, quality, SCD, SCI, SCS, SP, and SCR.

3.2 Sampling Procedure

The study's final sample comprised 333 SA public sector supply chain professionals. The non-probability purposive sampling technique was adopted because a list of respondents was unavailable for this study. Hence, only SCM professionals in public-sector organizations (departments) in the Gauteng province who were willing to participate in the study were included. The final sample size of 333 respondents was deemed suitable based on Nevitt and Hancock's (2001) recommendation that a sample of 200-1000 is an appropriate determination for complex models, with the study testing the predicting effect of SCC, innovation, information sharing, information quality, SCD, SCI, on supplier performance and SCR. Dolnicar *et al.* (2016) recommend a sample of 500 to increase the likelihood of achieving statistical significance.

3.3 Measures and Fieldwork

The questionnaire survey consisted of 54 measurement instruments. SCC used seven items from Fawcett *et al.* (2011), with a Cronbach alpha (α) of 0.76. Innovation used seven items from Golgeci and Ponomarov (2013) and Lee, Lee, and Schniederjan (2011); these studies reported Cronbach's alpha values of 0.76 and 0.811, respectively. Information sharing used seven items adapted from several studies (Cao & Zhang, 2011; Riley *et al.,* 2016), which attained Cronbach alpha values greater than 0.7. Information quality comprised seven items from several previous studies (Sundram *et al.,* 2016), with Cronbach's alpha coefficients ranging from 0.7 to 0.9. At the same time, SCD included five items from Sezen (2008), yielding a Cronbach's alpha of 0.8. Besides, SCI used seven questions from Sezen (2008) and reported Cronbach's alpha values of 0.83 and 0.9. Whereas SP used seven items from studies by Ashenbaum and Maltz (2017), which obtained Cronbach alpha values of 0.7 and 0.83. Lastly, SCR used seven measurement items adapted from Golgeci and Ponomarov (2013); the scale attained Cronbach alpha values of 0.89 and 0.77. It is worth noting that SCS was derived from the exploratory factor analysis (EFA) purification of the SCC scale, as presented in section 4.2, which yielded three items with a reliability of 0.801.

The response options were presented on a seven-point Likert scale, anchored from 1=strongly disagree to 7=strongly agree. An online questionnaire was used to collect data via a link provided to respondents across different public departments. Completed questionnaires were sent back to the researcher with the press of a submission button. The data collection process lasted about 5 months, from April to September 2022. Once submitted, the questionnaires were screened to identify those that had been completed correctly. The final number of questionnaires completed was n=333, yielding a response rate of 66.8%.

3.3.1 Common Methods Variance

Common method variance was tested using Harman's single-factor test, which involves running an unrotated factor analysis of all measurement items. The first factor explained 36.4% of the variance, indicating that common-methods variance posed no serious threat.

4. DATA ANALYSIS AND RESULTS

The first step in the analysis process was to capture the questionnaires into an Excel spreadsheet before exporting them to SPSS (Version 29.0) and Smart PLS (version 4.0) for data analysis. The study's hypotheses were tested using regression analysis within the composite-based structural equation modelling (PLS-SEM) technique.

4.1 Sample Profile

Regarding gender distribution, the number of female respondents (50.2%; n=167) was slightly higher than that of male respondents (49.8%; n=166). Regarding age, most respondents were aged 34-41 (44.7%; n=149). Moreover, blacks were the dominant race group among the participants (73.3; n=244), whereas most respondents were university degree holders (35.1%; n=117). Regarding respondents' employment status, 141 (42.3%) had 3 to 5 years of employment, while 274 (82.3%) were permanently employed, with 113 (33.9%) having 1 to 2 years of SCM experience in the SA public sector.

4.2 Exploratory Factor Analysis

The exploratory Factor Analysis (EFA) was performed to ascertain the dimensionality of the measurement instruments. The EFA results presented in Table 1 were obtained by determining three factors to analyse the scales'

Table 1 Exploratory Factor Analysis Results

Construct Code	Item Codes	Factor Loadings	Mean	KMO Sampling Adequacy	Bartlett's Test of Sphericity	Percentage of Variance Explained
SCC	SCC2	.876	5.23			
	SCC3	.873				
	SCC4	.788				
SCS	SCC5	.672	5.39			
	SCC6	.854				
	SCC7	.854				
INV	INV4	.755	5.28			
	INV5	.839				
	INV6	.792				
	INV7	.821				
IS	IS1	.745	5.49			
	IS2	.761				
	IS3	.781				
	IS4	.763				
	IS5	.787				
	IS6	.704		0.823	X^2=959.054 df=15 P=0.000	59.051%
	IS7	.633				
IQ	IQ1	.720	5.28			
	IQ2	.700				
	IQ3	.751				
	IQ4	.634				
	IQ5	.621				
	IQ7	.680				
SCD	SCD1	.726	5.40			
	SCD2	.795				
	SCD3	.772				
	SCD4	.768				
	SCD5	.749				
SCI	SC12	.713	5.25			
	SCI3	.785				
	SCI4	.800				
	SCI5	.747				
	SCI6	.631				
	SCI7	.516				
SP	SP1	.834	5.17	0.851	X^2=571.199 df=6 P=0.000	65.728
	SP2	.865				
	SP3	.771				
	SP5	.768				
SCR	SCR1	.769	5.23	0.720	X^2=374.361 df=10 P=0.000	48.810
	SCR2	.830				
	SCR3	.781				

Note: SCC= supply chain collaboration; INV= supply chain innovation; IS= information sharing; IQ= information quality; SCD= supply chain design; SCI= supply chain integration; SCS= supply chain synergy; SP= supplier performance; SCR= supply chain resilience.

factorability. These indicators include the Principal Components Technique derived from the Varimax Rotation, the Kaiser-Meyer Olkin (KMO $\geqslant$ 0.50) test, and the Bartlett Test of Sphericity ($\chi 2 = 8105.213$; $p < 0.01$).

Overall, all items loaded well, apart from several garbage ones in SCC1 (SCC), IQ6 (Information quality), SCI1 (SCI), SP4, SP6, and SP7 (Supplier performance), as well as SCR4 and SCR5 that were discarded because of low factor loadings, which were below the required threshold of 0.5 as suggested by Peterson (2000).

A seven-factor structure was extracted from the SCM practices scale, all accounting for 59% of the variance. In this resultant factor structure, a new three-item factor, labelled as 'supply chain synergies' (SCS), accounting for 7% of the variance, emerged. SCS relates to the interactive engagement between two or more organizations to conduct their operational processes effectively (Mesaric *et al.,* 2015). Supplier performance and SCR were found to be unidimensional, accounting for 66% and 49% of the variance, respectively. Factor loadings for all items are acceptable, with scores above the 0.5 threshold (Ferguson & Cox, 1993). The results of the EFA analysis are presented in Table 1.

4.3 Psychometric Properties of Measurement Scales

The study's constructs were evaluated for accuracy and validity using psychometric properties of measurement scales, which were assessed to ensure reliable and valid results. The results are presented in Table 2.

Table 2 Psychometric Properties Results

Research Constructs		Cronbach's Test		CR	AVE	Outer Loadings
		Item-Total	α Value			
SCC	SCC2	0.763	0.860	0.915	0.781	0.893
	SCC3	0.739				0.896
	SCC4	0.701				0.862
SCS	SCS5	0.619	0.802	0.869	0.692	0.919
	SCS6	0.718				0.865
	SCS7	0.608				0.695
INV	INV4	0.658	0.846	0.896	0.684	0.800
	INV5	0.737				0.870
	INV6	0.650				0.826
	INV7	0.685				0.811
IS	IS1	0.635	0.862	0.892	0.543	0.783
	IS2	0.653				0.781
	IS3	0.676				0.812
	IS4	0.655				0.727
	IS5	0.689				0.790
	IS6	0.594				0.654
	IS7	0.517				0.585
IQ	IQ1	0.553	0.773	0.841	0.468	0.693
	IQ2	0.528				0.668
	IQ3	0.586				0.740
	IQ4	0.467				0.643
	IQ5	0.455				0.668
	IQ7	0.520				0.691
SCD	SCD1	0.570	0.820	0.872	0.577	0.668
	SCD2	0.625				0.776
	SCD3	0.624				0.799
	SCD4	0.617				0.804
	SCD5	0.593				0.741
SCI	SCI2	0.556	0.793	0.853	0.495	0.711
	SCI3	0.639				0.761
	SCI4	0.655				0.784
	SCI5	0.587				0.748
	SCI6	0.476				0.603
	SCI7	0.372				0.589
SP	SP1	0.683	0.825	0.869	0.692	0.821
	SP2	0.735				0.856
	SP3	0.601				0.799
	SP5	0.594				0.762
SCR	SCR1	0.554	0.737	0.846	0.648	0.874
	SCR2	0.600				0.794
	SCR3	0.526				0.741

Note: SCC= supply chain collaboration; SCS= supply chain synergies; INV= supply chain innovation; IS= information sharing; IQ= information quality; SCD= supply chain design; SCI= supply chain integration; SCS= supply chain synergy; SP= supplier performance; SCR= supply chain resilience.

The reliability of the item scale was ascertained using three indicators, namely item-to-total correlations, Cronbach's alpha coefficient (α) and composite reliability test (CR). Item-to-total correlations were above the recommended minimum of 0.3 (Howard & Forehand, 1962), thereby confirming scale reliability. Scale reliability is further confirmed when the recommended threshold value is 0.7. The results in Table 2 supported this recommendation, as both indicators (α & CR) met the minimum threshold of 0.7, indicating strong internal consistency.

Validity was assessed using content, convergent, and discriminant validity. Content validity was established through a panel of academics with expertise in SCM, who revised the questionnaire. Besides, feedback from a pilot study comprising 50 questionnaires provided a preliminary assessment of the measurement instruments, enabling slight adjustments to the item scales. This revision was based on reviewing the wording and sentence length to capture the statements' essence better and minimize ambiguity. Meanwhile, convergent validity was tested using outer

Table 3 Discriminant Validity Results Based on the Fornell-Larcker Criterion

Scale	INV	IQ	IS	SCC	SCD	SCI	SCR	SCS	SP
INV	0.827								
IQ	0.598	0.684							
IS	0.611	0.690	0.737						
SCC	0.588	0.529	0.547	0.884					
SCD	0.497	0.648	0.707	0.497	0.759				
SCI	0.503	0.576	0.551	0.475	0.552	0.704			
SCR	0.412	0.427	0.516	0.383	0.476	0.403	0.805		
SCS	0.515	0.537	0.629	0.599	0.592	0.444	0.380	0.832	
SP	0.510	0.443	0.399	0.480	0.402	0.605	0.309	0.363	0.810

Note: SCC= supply chain collaboration; SCS= supply chain synergies; INV= supply chain innovation; IS= information sharing; IQ= information quality; SCD= supply chain design; SCI= supply chain integration; SCS= supply chain synergy; SP= supplier performance; SCR= supply chain resilience.

Table 4 Heterotrait-Monotrait Ratio (HTMT) - Matrix

Scale	INV	IQ	IS	SCC	SCD	SCI	SCR	SCS	SP
INV									
IQ	0.736								
IS	0.714	0.849							
SCC	0.684	0.646	0.632						
SCD	0.592	0.819	0.843	0.581					
SCI	0.605	0.727	0.653	0.572	0.675				
SCR	0.496	0.568	0.650	0.472	0.617	0.508			
SCS	0.597	0.682	0.779	0.689	0.741	0.548	0.471		
SP	0.601	0.543	0.430	0.567	0.459	0.734	0.368	0.380	

Table 5 Model Fit

Model Fit indices	SRMR	NFI
Acceptable threshold values	< 0.10	Between 0 and 1 (NFI value to be closer to 1)
Sources	Petrowski *et al.* (2018)	Schuberth, Henseler and Dijkstra (2018)
Results obtained	0.067	0.689
Decision	Supported	Supported

Note: SRMR = Standardized Root Mean Square Residual; NFI = Norm Fit Index.

loadings and the average Average Variance Extracted (AVE). Anderson and Gerbing (1988) recommended a minimum threshold of 0.5 to confirm effective loading. As observed in Table 1, these indicators satisfied the stated thresholds. AVE values for two constructs (IQ=0.468; SCI=0.495) were marginally lower than the recommended 0.5 limit. However, convergent validity was still considered acceptable, as these two constructs achieved satisfactory Cronbach's alpha, CR, and outer loadings. Hence, all scale items converged well with their respective latent variables, accounting for at least or close to 50% of the intended variance.

Discriminant validity was first determined through the Fornell-Lacker Criterion, which must be supported when the square root of the AVE for each construct is greater than its correlations with other constructs. The results of the discriminant validity using the Fornell-Larcker criterion tests are presented in Table 3.

As revealed in Table 3, all square roots of the AVE values were higher than the correlations for each construct, further confirming the unrelatedness between the study's constructs and their items.

Additionally, the Heterotrait-Monotrait Ratio of Correlations (HTMT) was applied to test for discriminant validity. HTMT correlations should be less than 0.9 to confirm discriminant validity (Roemer *et al.,* 2021). The result is indicated in Table 4.

As indicated in Table 4, all HTMT correlations were lower than the recommended upper cut-off value of 0.9, although three pairs approached the conservative 0.85 threshold (IS-IQ = 0.849, SCD-IS = 0.843, SCD-IQ = 0.819). The results thus confirm that discriminant validity is established in the study, despite conceptual overlapping among these three associations.

4.4 Model Fit Assessment

The fitness of the study's model was measured using the Standardised Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI) (Shi *et al.,* 2019). The results are observed in Table 5.

The model fit results in Table 5 show SRMR and NFI values of 0.067 and 0.689, respectively. These scores conform to the cut-off determination prescribed by Schuberth *et al.* (2018). Thereby confirming the fitness of the study's data to its model.

Table 6 Variance Inflation Factor (VIF Values)

Relationship	VIF
INV -> SP	2.018
IQ -> SP	2.431
IS -> SP	2.889
SCC -> SP	1.951
SCD -> SP	2.415
SCI -> SP	1.740
SCS -> SP	2.061
SP -> SCR	1.000

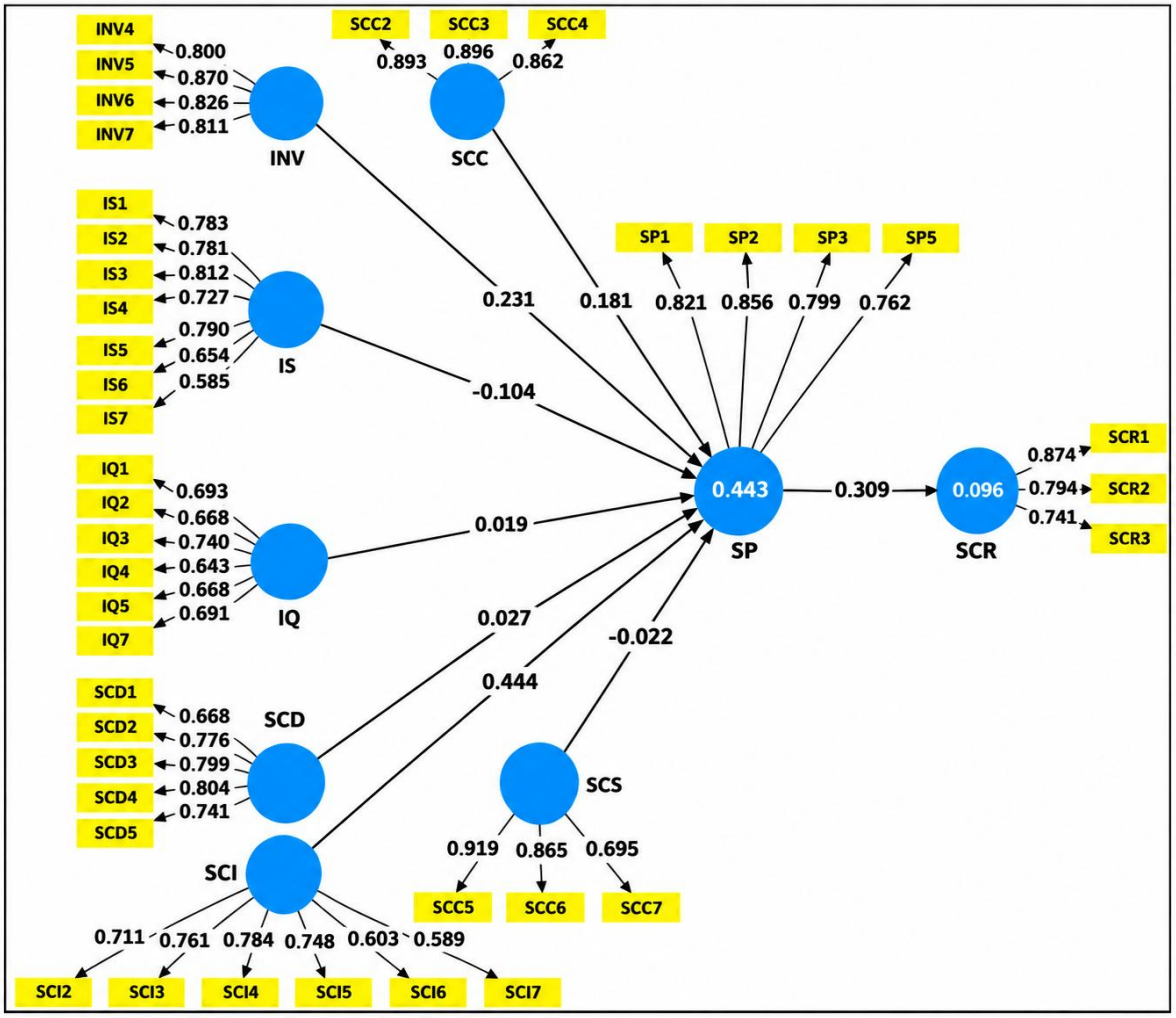


Figure 2 Structural Model Results

4.5 Multicollinearity

Variance Inflation Factor (VIF) values were applied to test for multicollinearity between the predictor constructs. A conservative threshold recommendation of less than 3.3 (Kock, 2017) was applied for VIF values. The VIF results are presented in Table 6.

As indicated in Table 6, all VIF values for the inner model fell below the 3.3 threshold, confirming that there were no critical collinearity issues in the study.

4.6 Path Analysis Results

The path analysis technique was used to test the study's hypothesized associations using PLS-SEM. The graphical model generated by Smart PLS (Figure 2) depicts the path analysis results.

Figure 2 shows the latent and observed variables in the oval and rectangular shapes, respectively. The scores placed in the arrows connecting the latent and observed variables are the factor loadings. Path coefficients are estimated from the inter-latent-variable correlations, demonstrating the explanatory power of the hypothesized relationships. Moreover, the r2 values are presented within the mediating and outcome constructs (SP and SCR). An r2 score of 0.444 (SP) indicates that the identified predicting practices account for 44.4% of the variance in supplier performance. In contrast, 9.6% of the variance in supply chain resilience is contributed by supplier performance (r20.096 = SCR). The modest r2 of 0.096 is considered rather modest as it implies that SP explains less than 10% of the variance in SCR.

Table 7 Results of Structural Equation Model Analysis

Suggested Path	Hypothesis	Path Coefficients β	T Statistics	P Values	Decision
SCC -> SP	H_1	0.181	2.492	0.013	**Supported**
INV -> SP	H_2	0.231	2.801	0.005	**Supported**
IS -> SP	H_3	-0.104	1.383	0.167	Rejected
IQ -> SP	H_4	0.019	0.273	0.785	Rejected
SCD -> SP	H_5	0.027	0.358	0.720	Rejected
SCI -> SP	H_6	0.444	7.609	0.000	**Supported**
SCS -> SP	H_7	-0.022	0.386	0.700	Rejected
SP -> SCR	H_8	0.309	4.713	0.000	**Supported**

*Note: Significance level <0.05; * significance level <0.01; *** significance level <0.001***

By implication, the larger share of variance could be attributed to factors such as budgetary rigidities, coordination between departments, the extent to which entities are prepared for disruptions, the level of political interference, the stability of public procurement policies, the degree of flexibility in regulatory mechanisms, risk governance mechanisms, among others, which typically perform a more significant role in driving resilience in the public sector. Therefore, it is conceivable that other factors beyond those considered in the present study accounted for the remaining variance in supplier performance and supply chain resilience.

The hypothesis test results are presented in Table 7. Table 7 shows that H1: Supply chain collaboration and supplier performance (β=0.181), H2: Supply chain innovation and supplier performance (β=0.231), H6: Supply chain integration and supplier performance (β=0.444), and H8: Supplier performance and supply chain resilience (β=0.000) were supported. On the contrary, H2: Information quality and supplier performance (β=0.019) was rejected, whereas H3: Information sharing and supplier performance (β=-0.104) exerted an inverse influence on inventory performance. H5: Supply chain design and supplier performance (β=0.027) and H7: Supply chain synergies and supplier performance (β=-0.022) were insignificant, with SCS exerting an inverse influence on supplier performance.

5. DISCUSSION OF RESULTS, CONCLUSIONS, AND FUTURE RESEARCH

This section discusses the analytical results presented above and their managerial implications. Additionally, it summarizes the paper's conclusion, discusses the limitations of our study, and proposes avenues for future research.

5.1 Supply Chain Management Practices and Supplier Performance

Based on the hypothesis-testing results, it was confirmed that three of the seven SCM practices exert a positive influence on SP within the South African public sector. These include the association between SCC and SP (β = 0.181; t = 2.492; p = 0.013). The results underscore the ability of SCC to foster confidence in suppliers to perform better by ensuring commitment to relationships with their buying customers. Consistent with these results, Ngxesha *et al.* (2024) found that SCC is predicated on trust and that strong governance and administrative frameworks contribute to improved supplier performance. Similarly, Kim and Lee (2024) and Nguyen *et al.* (2022) established that SCC optimizes supplier performance, emphasizing the importance of inter-organizational cooperation for superior supply chain outcomes. This means that SCC improves both public sector organizations and their supply chain partners. These consequences are evident in the collaboration practices among cross-functional teams within municipal administrations during the preparation and assessment of bid submissions. Additionally, public-private partnerships (PPPs) involving major suppliers outside the company further demonstrate how South African public organizations' collaborative tactics expand their supplier base, especially through supplier development rules. In line with Institutional theory, it could be argued that SA public entities' compliance with regulatory frameworks and policies reflects their degree of adherence to institutional coercive pressure. This is particularly prevalent with the PPPFA, which regulates buyer-supplier collaborative engagement to ensure the best value for money principle is adhered to in the sourcing of service providers. This collaborative rapport further enables suppliers to fully understand and appreciate compliance requirements for bidding applications, evaluation criteria, and key performance indicator standards. The coercive pressure is further evident in supplier development regulations that encourage both public and private organizations to develop small-scale suppliers as part of their corporate social responsibility mandates, aimed at optimizing the supplier-base location.

INV (β = 0.231; t = 2.801; p = 0.005) influenced SP, establishing it as an antecedent of SP in the South African public sector. This deduction further means that public organizations' innovation engagement facilitates flexible procurement systems for sourcing, distribution, and manufacturing, thereby optimizing suppliers' capabilities and competencies. This point is echoed by Uyarra *et al.* (2014), who inferred that public institutions that are flexible and innovation-oriented tend to become more performance-oriented and agile in responding to operational and service requirements from internal and external stakeholders. Makuwa (2024) supports this view by stating that South African public administrations improve supply chain performance by focusing on innovation that improves service delivery. This is especially clear in the expanding number of digitalization projects that different government departments and municipalities are using to make the delivery of fundamental services more efficient and effective. Also, detailed specifications and service-level agreements help suppliers respond more quickly and accurately, which leads to better responsibility and risk

management between the parties. This articulation underlines the normative tenet of institutional theory, which holds that behavioral patterns are influenced by normative factors, such as professionalism and organizational culture. Thus, the need for digitalization, mainly driven by the 4th industrial revolution, has reshaped the global landscape. As such, public and private institutions alike must innovate and digitize their operational processes to provide the best service levels to customers and clients. This is the case with innovative systems, such as e-procurement and ERP via the e-tender Publication Portal, designed to monitor and manage supplier-based activities and enhance compliance and performance outcomes.

Lastly, SCI ($\beta = 0.444$; $t = 7.609$; $p = 0.000$) was found to positively influence SP. The results imply that SCI enhances the achievement of supply chain performance (SCP) objectives in public-sector supply chains. This aligns with Salema and Buvik's (2016) suggestion that early supplier integration improves supplier performance. Furthermore, Tarigan *et al.* (2021) postulated that integration activities in a buyer-supplier environment foster organizational trust and supply chain innovativeness. These observations corroborate Mathu's (2019) overall assessment that integration efforts through public-private partnerships are an important driver of SCP. In agreement, Tshabalala (2024) observes that poorly integrated supply chain networks within SA's public sector influence the performance of potential suppliers. It is necessary, then, to ensure that all requests for proposals clearly articulate the instructions and specifications that enable service providers to accurately determine the project's scope and identify appropriate responses, thereby sustaining the overall quality of project outcomes. The results align with Institutional Theory in that they underscore both coercive and mimetic tenets, as public departments are mandated to integrate their operational processes and procedures in line with governing regulations, such as the PFMA, Municipal Finance Management Act (MFMA), Public Procurement Act (PPA), and SCM Framework as set out by National Treasury, to guide their operational activities. Compliance aspects, such as supplier registration in the CSD, are a plausible illustration of a regulatory mechanism designed to ensure the effective vetting of the public sector supplier base against the prerogatives outlined in the aforementioned governance frameworks.

However, four practices in information sharing and quality, SCD, and SCS were found to exert no influence on SP (IQ and SP [$\beta = 0.019$; $t = 0.273$; $p = 0.785$)]; SCD and SP [($\beta = 0.027$; $t = 0.358$; $p = 0.720$]); with information sharing and SCS exerting an inverse relationship on SP (IS and SP [$\beta = -0.104$; $t = 1.383$; $p = 0.167$]; SCS and SP ($\beta = -0.022$; $t = 0.386$; $p = 0.700$]). Several factors may explain these unexpected results, particularly regarding IS and IQ, which are generally regarded as key determinants of SCP. This study shows that a lack of trust, poor governance (as evidenced by lengthy administrative processes for contract checking and awarding), and a strict regulatory framework established by the PFMA and the MFMA have all had a significant impact on the results. Both frameworks aim to make public finances more accountable, transparent, and well-managed. The PFMA is responsible at the national level, while the MFMA is responsible at the local and municipal levels. Because they cover the same areas and are used in the same way, implementing them can be challenging, often resulting in administrative delays for public officials. Rules that limit how suppliers can collaborate with departments to combat misconduct or favouritism make these problems even worse. In addition, poorly written project criteria and key performance indicators (KPIs), as well as other systemic problems in SA's public sector, may have also contributed to these results.

The adherence of these respective coercive and mimetic institutional pressures may not necessarily translate into optimal performance gains, given the environmental dynamics that characterized the SA public sector. Notable evidence, as argued in this study, includes lengthy bureaucratic processes, the decentralization of decision-making structures, and mere compliance with rules and regulations as a ticked-box exercise without proper implementation safeguards. These challenges could deter effective information sharing, distorting the quality of information conveyed across departments' supply chain networks. Fundamentally, the sharing of quality information may not necessarily translate into performance by suppliers, given that their level of diligence depends on normative pressures ascribed to their core competencies, which must be vetted and evaluated accordingly by the bid evaluation committee and adjudicated as a normative tenet. Furthermore, the insignificance of the connection between supply chain design and supplier performance indicates that structural composition and process delimitations entrenched, overseen, and governed by coercive and normative institutional logic restrain supplier adaptive capabilities. This means that the structural rigidity of the compliance framework (supplier vetting against predetermined evaluation criteria, such as registration with the SA Revenue Service, BBBEE certification, etc.) and bureaucratic dispensations, namely, different levels of approval for requisitions or bid awards (evaluation and adjudication committees), restrict supplier flexibility. These stiff structural institutional pressures reinforce methodological compliance with few avenues for flexibility. The same observation holds for the insignificant association between supply chain synergy and supplier performance. By implication, coercive and normative adherence to limiting engagement with suppliers prior to tender submission seeks to uphold the integrity of the tendering process, minimize the potential for conflicts of interest, and ensure a fair evaluation in line with policy, regulatory standards, and best practices.

5.2 Supplier Performance and Supply Chain Resilience

H8 results indicated that SP positively influenced SCR in the South African public sector ($\beta = 0.309$; $t = 4.713$; $p = 0.000$). This indicates that an increase in suppliers' performance levels correlates with a more resilient supply chain and value chain within public administrations. This observation is supported by Gu and Huo's (2017) findings, which recommended that an organization's resilience is based on its suppliers' and customers' resilience. Mahache *et al.* (2025) also found that highly performing suppliers tend to share relevant data and information, innovate, and strategically partner with customers to align with municipal entities' requirements, thereby making municipal supply

chains more resilient. As noted by Shishodia *et al.* (2019), highly performing suppliers can deliver robust, reliable (on-time within the stipulated timeframes and within the prescribed scope and specifications) project outcomes with minimal breakdowns (such as roads and water infrastructure). It is therefore likely that organizational resilience in the South African public sector depends largely on the performance of suppliers of its supply chain networks. The marginal strengthens the established nexus, indicating that resilience capabilities are derived from a multitude of drivers other than a performing set of suppliers. Linking this view to institutional theory, one could argue that the perceived and established performance appraisal of suppliers, in instances where effective service delivery is rendered to sustain public trust and constitutional obligations, highlights mimetic pressure to sustain public entities' performance.

5.3 Linkage to Institutional Theory

The Institutional Theory posits that organizations' strategy implementation depends on externally induced regulatory pressure. This draws parallels with the study's context, whereby the governance of public administrations and entities in SA's public sector is guided by various SCM regulatory frameworks (e.g., PFPM and MFMA) and the National Treasury Regulations. In this way, the results demonstrate that adopting SCM practices such as SCC, INV, IS, and SCI affects suppliers' performance and the supply chain's resilience to turbulence. The findings underscore the value of collaborative practices in cross-functional decision-making and the role of integrative SCM functions in boosting SP. Included in this collaborative stream is the strategic role of innovation-driven strategies in the advanced digitalization of operating systems (e-procurement, centralized supplier database, integrated bid evaluation systems, etc.), in sustaining efficient service delivery.

5.4 Conclusions and Implications

This study explored the link between SCM practices, SP, and SCR in the South African public sector. It was established that SCC, innovation, and integration are antecedent factors of SP, which, in turn, contributed to SCR. However, information sharing, quality, SCD, and SCS were not viable predictors of SP. Thus, they exerted no indirect influence on the resilience prospect of public administrations in SA.

The study offers a valuable perspective on the merits of SCC, innovation, and integration as important concepts for facilitating resiliency in the public-sector supply chain ecosystem, notwithstanding information sharing and SCS's inverse role in SP. This is done by empirically validating the critical factors to be adopted to optimize public organizations' SP and resilience through collaborative engagement, innovation adoption, and integration across their value and supply chain operations. An interesting observation is the inverse relationship between information sharing and SP (as shown in Table 5 and Figure 2). This finding provides an opportunity for the public sector to develop innovative approaches to managing information sharing to ensure it leads to improvements rather than limiting supplier performance. This could be achieved by using advanced technologies based on artificial intelligence (AI), such as chatbots, smart notifications, automated reports, and AI-based Just-in-Time systems, among others. Possible paybacks include efficiencies in asset management, real-time project performance monitoring, smart replenishment and supplier selection and management.

5.5 Future Research

Since the current study included various public sector departments, future studies should consider specific government entities, such as state-owned enterprises, municipalities, constitutional bodies, and public universities and technical colleges. Expanding the study's scope to different provinces of South Africa could yield different results, providing a basis for comparison. Another unexplored area for future studies is testing the direct relationship between SCM practices and SCR. Such an investigation may produce interesting results regarding the impact of the four factors that were statistically insignificant in this study, namely, Information sharing and quality, SCD, and SCS. It may also be worthwhile to test the relationships among SCM practices, as this might reveal how they influence one another. Moreover, since the current study employed a quantitative methodology, an alternative would be to conduct similar research using a mixed-methods approach, which includes a qualitative component involving interviews. The results of such a study could be informative, as respondents' views can be included and compared. Future studies can also be undertaken based on other relevant resource-driven theories, such as the Dynamic Capabilities theory, the Resource-Based View, and resilience theories, to provide well-rounded theoretical underpinnings.

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CONFLICTS OF INTEREST

The authors do not have any conflict of interest to declare. No funding support was received for this work.

DATA AVAILABILITY STATEMENTS

Data collected was under the assurance of anonymity and guarantee that it would not be shared outside of the authors.

ETHICAL CONSIDERATIONS

In this study, research ethics were observed throughout all processes, from the formulation of the research topic to the literature review, data collection, and the final research document. The university librarian of Vaal University of Technology checked if there had been a prior similar study. In the literature review, efforts were made to acknowledge and reference all sources cited in the study to avoid plagiarism. During the data collection process, ethical considerations such as informed consent, privacy, confidentiality, respondents' anonymity, and voluntary participation were observed. Finally, the research was submitted to a plagiarism test using the Turnitin software

package, which produced acceptable margins per the university ethics committee standards. In terms of data collection, the following ethics were followed upon approval by the Ethics Committee of Vaal University of Technology.

INFORMED CONSENT

In this study, informed consent was obtained by seeking permission to conduct research in the public sector. Also, formal consent was obtained from respondents before they answered the questions. Respondents were asked to sign the questionnaire cover letter to acknowledge that they understood the research and participated. Copies of both letters are available upon request.

CONFIDENTIALITY AND ANONYMITY

In this study, research respondents and their organisations identities were not required in the questionnaire to ensure they are protected and confidential and participants were assured that their responses would not be shared with any parties except the authors. This was done to protect respondents from being victimised or any harm that may result from participating in the study.

VOLUNTARY PARTICIPATION

In this study, all respondents were provided with full details of the research and informed that their participation was voluntary and not coerced. Respondents were also informed that they were free to withdraw from the study. A copy of the letter is available upon request.

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