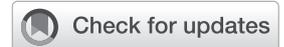


Dimensional impact of supply chain management on service delivery quality in South African municipalities



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Background: South African municipalities face numerous supply chain management (SCM) challenges that limit their effectiveness and efficiency in executing their service delivery mandate. Applying appropriate SCM models is an important step towards optimising service delivery quality (SDQ).

Objectives: The aim of the study is to investigate the impact of SCM dimensions on SDQ in selected South African municipalities.

Method: A quantitative method was employed using 315 purposively selected SCM role-players drawn from municipalities in two South African provinces. The collected data were analysed using partial least squares structural equation modelling to test the hypothesised relationships.

Results: The results show that the SCM dimensions, which include strategic supplier partnership, information sharing and supply chain innovation, positively impacted supply chain robustness (SCR) and, in turn, positively linked with SDQ. However, customer relationships, cross-functional teams, strategic sourcing and internal lean practices negatively impacted SCR. Similarly, SCR significantly mediated the relationships between information sharing, strategic supplier partnership, supply chain innovation and service delivery.

Conclusion: The study identifies SCM dimensions that are critical drivers of municipal service delivery. It further reveals how the robustness of municipal supply chains enriches service delivery by mediating its relationship with SCM.

Contribution: This study emphasises the importance of SCM in the fulfilment of service delivery imperatives in municipalities. Its results will aid in the strategic implementation of relevant SCM practices in South African municipalities.

Keywords: service delivery; South African municipalities; supply chain management; supply chain management practices; supply chain robustness.

Introduction

South African municipalities are mandated by the South African Constitution to provide basic services such as sewerage management, supply of drinking water, refuse removal, roads, storm-water drainage and electricity, among others to their constituencies (Mudzusi, Muzhedzi & Mahole 2024; Vala 2022). Supply chain management (SCM) plays an integral part in the execution of these service delivery programmes and the achievement of socio-economic obligations by South African municipalities. Since the rise of democracy in 1994, the South African government has been under pressure to rectify the economic disparities emanating from many years of apartheid, which led to the country's public sector undergoing various procurement reforms to address its policy and socio-economic objectives (Mabotja, Molokomme & Ngcobo 2024). In doing so, SCM was adopted as a strategic instrument to promote good governance. However, the implementation of SCM in the country's public sector has been far from successful, with numerous challenges emerging that should be resolved if the economic growth and development goals set by the government are to be attained.

Within the local government space, severe SCM disparities and impediments that hinder the productivity, sustainability and competitiveness of South African municipalities have been found. These discrepancies include fruitless and wasteful expenditure, poor leadership, a lack of SCM skills and corruption (Phakathi, Schutte & Mulati 2024; Yekani, Ngcamu & Pillay 2024).

The result of these challenges is the inability of municipalities to deliver the services required in their communities. As reported in the media, most communities have had to contend with deteriorating infrastructure and amenities and the shortage of basic services such as electricity, sewerage and water (Sutcliffe & Bannister 2023). Some studies (Maramura & Ruwanika 2023; Zindi & Sibanda 2022) trace these ills back to ineffective and inefficient municipal SCM, which is the primary function responsible for procuring the required goods and services and their distribution in communities. Various reports developed by the Auditor General South Africa (AGSA) consistently show lacklustre results in municipal finance and governance processes. For instance, in 2023, several municipalities received disclaimed audit opinions, as this is the worst possible audit outcome. Makana, Merafong City, Madibeng and Ratlou Local municipalities were among those found to be underperforming, with numerous irregularities being identified in the SCM area (AGSA 2023). In response, residents of numerous underserved communities have resorted to mass protest actions to demonstrate their dissatisfaction with the level and quality of services their municipalities provide. Makoe (2023) highlights that widespread service delivery protests hamper the progress of society. For instance, protests by the residents of District Six in the Johannesburg Metropolitan Municipality in October 2023 resulted in blocked drains and burst pipes, which left their homes damaged. Another recent protest was reported by Masson (2023), which showed the residents of Khayelitsha Township in Cape Town demanding improved provision of sewerage infrastructure, ablution facilities, water and electricity. Similarly, service delivery protests erupted across the country during the May 2024 general elections, depicting the frustrations of communities that were unhappy with the deteriorating road infrastructure, poor disaster management, especially flooding, and uncollected refuse in their neighbourhoods (Moloi 2024). Such protests have almost become a norm in South Africa.

The above background provides the rationale for this study, which seeks to determine how SCM can be harnessed to improve service delivery quality (SDQ) in South African municipalities. There is a need for more effective interventions and solutions to this situation in the country's local government SCM. Continuous empirical research efforts could be an important source of information on the required solutions. Numerous research works have focused on addressing the municipal service delivery challenges through the SCM lever. Examples include a study by Nzama, Moloi and Marx (2023), which identifies SCM as one of the performance-enhancing measures that non-performing municipalities in South Africa could apply. A previous study by Ramphoma (2020) also proposes a framework for SCM practices that may enhance service delivery within South African municipalities.

The aim of the study is to test the relationship between SCM dimensions, supply chain robustness (SCR) and SDQ in

selected South African municipalities. Given their well-acknowledged challenges, South African municipalities can strategically align themselves with supply chain (SC) strategies that can improve their efficiency and effectiveness in the delivery of services. As suggested by Cahyono et al. (2023), it is essential for municipalities to develop their understanding of those SCM practices critical to enhancing both operational and organisational performance in their unique context. Previous studies have applied some of these practices (e.g. Azmi et al. 2017; Janaki, Izadbacksh & Hatefi 2018). Notably, while some studies on SCM within South African municipalities exist, evidence of the combined application of these seven practices in a single South African study is rare, indicating a gap in knowledge. This study addresses this gap by testing a conceptual model composed of SCM practices, SCR and SDQ in the South African local government environment. The study further contributes to the body of knowledge by contextualising SCM in a developing country experiencing complex socio-economic and political dynamics. The study thus offers a unique perspective that directs attention to the importance of public sector SCM in shaping the quality-of-service delivery in South African municipalities.

Research objectives

The primary objective

The aim of the study is to investigate the impact of SCM dimensions on SDQ in selected South African municipalities.

Secondary objectives

Specifically, the study addressed the following secondary objectives:

- To analyse the relationship between SCM practices and SCR;
- To examine the influence of SCR and SDQ in selected South African municipalities;
- To test the mediating effects of SCR on the relationship between SCM practices and service delivery in selected South African municipalities.

Literature review

Supply chain management dimensions

In general, SCM dimensions are viewed as a set of undertakings carried out in an organisation to promote the effective management of its supply chain (Ngo et al. 2024). Various scholars have conceptualised SCM differently. However, this study adopted Sanders' (2018) view of SCM as the design and management of flows of products, information and funds throughout the supply chain. It involves coordinating and managing all the activities of a supply chain. The SCM is further conceptualised as a multidimensional construct comprising various practices (Dzikriansyah, Masudin & Zulfikarijah 2023).

To account for SCM in the study, seven SCM practices relevant to South African municipalities, that is, strategic

supplier partnership (SSP), strategic sourcing (SS), cross-functional teams (CFTs), information sharing (IS), customer relationship (CR), internal lean practices (ILPs) and supply chain innovation (SCI), were identified (Chavan & Jindal 2024; Gutierrez-Broncano et al. 2024). These SCM dimensions were applied broadly (although differently) in previous studies (Ngo et al. 2024; Sukati et al. 2012). The seven SCM practices are directed to the upstream (SSPs) and downstream (CRs) sides of the supply chain, information flows across the supply chain (IS) and internal supply chain processes (ILPs, SCI, CFTs and SS) (Dzikriansyah et al. 2023; Li et al. 2006). The practices considered in the study were selected as they lie at the heart of municipal operations, enabling the procurement of goods, services and works required for delivering basic services. Including these SCM practices in the study thus facilitated the identification of best practices and innovative approaches that can be benchmarked across municipalities to improve overall performance, alignment with broader local government development objectives and provision of actionable insights. The next sections discuss the seven SCM practices used in this study.

Strategic supplier partnership

A strategic supplier partnership is described as a contract between the supplier and buyer to be on the same page regarding the products' production and demand, which eventually helps increase the operations and SC performance (Fauziah, Rahardjo & Utami 2019). A productive partnership with suppliers is forged by the purchasing organisations through SSP. Strategic partnerships with a few key suppliers enable the organisation to work more effectively, and as such, parties involved are willing to share responsibility and accountability for the success of products rendered (Altaf 2023). In South African municipalities, SSP, in the form of collaborative partnerships, can place municipalities in a position to strategically deliver services by leveraging the stakeholder's core competencies and resources to address their failures and optimise the creation of social value (Tauté 2020).

Customer relationship

Customer relationship refers to how an organisation or business relates with its customers to improve their experience (Kaondera et al. 2023). It is a key part of business success and can be used to build customer loyalty and retention (Hussain et al. 2018). Kaondera et al. (2023) confirm that building a working relationship with customers is key to the long-term success of an organisation or a business. Having a strong connection based on effective communication and trust supports customers to feel more connected with a brand (Masitenyane & Mokoena 2023). Customer satisfaction improves when the organisation proactively seeks customers' needs and requirements (Makamedi & Faku 2024). In South Africa, municipalities are expected to deliver excellent service to increase the satisfaction of the residents of their constituencies, who are the customers.

Cross-functional teams

Cross-functional teams are groups that develop opportunities requiring diverse expertise and encourage people from different functions to work together, establishing and communicating the rewards for collaborative behaviour (Igbinenikaro, Adekoya & Etukudoh 2024; Pimenta, Da Silva & Tate 2014). Cross-functional efforts are characterised by cross-functional buying teams and team-based management. Key suppliers may be included to advise on new product development, assist in solving joint problems or establish quality standards (Igbinenikaro et al. 2024). The municipal SCM regulations prescribe that CFTs at the municipal level should include a bid specification committee (BSC), bid evaluation committee (BEC) and bid adjudication committee (BAC) from various functional management areas of the municipality. The SCM unit of the municipality cooperates with these bid committees within the ambit of the law to perform numerous tasks such as supplier selection negotiation, negotiation of prices and conditions, determination of supply levels and evaluation of supplier's performance (Chatterjee et al. 2023). These bid committees may be permanent or else exist only for a specific period or until a specific task has been completed. South African municipalities are applying CFTs to reach decisions that are best for SDQ.

Strategic sourcing

Strategic sourcing is a process of developing supply channels at the lowest total cost, not just the lowest purchase price (Frederico 2023; Kerruish 2016). It expands upon traditional organisational purchasing activities to embrace all activities within the procurement cycle, from specification to receipt and payment for goods and services (Kerruish 2016). Strategic sourcing helps to create a synergy between organisations and their suppliers (Frederico 2023; Patowarya 2019). Suppliers feel encouraged to enhance their performance when they are valued and considered in various sourcing decisions to meet the organisation's objectives. The sourcing strategies for the South African municipalities are primarily regulated by legislation such as the Preferential Procurement Policy Framework Act (PPPFA), Treasury Regulations and Broad-Based Black Economic Empowerment (B-BBEE), (Kalamaris 2023; Setino & Ambe 2016). Strategic sourcing can help the government, including municipalities, to achieve its B-BBEE programmes. This can be achieved by reinforcing the focus on the core capabilities of the suppliers and assuring the suitable suppliers for the right sourcing objective.

Internal lean practice

Lean thinking practices involve the reduction of waste, time, effort and cost while perfecting the quality of products and services towards improved customer satisfaction (Chavez et al. 2022; Govender & Jasson 2018). Public sector organisations require a set of lean tools and strategies to manage wasteful expenditure, dissatisfied customers and fruitless performance by enforcing an efficient and effective practice of lean thinking.

Lean practices are described as product and service quality, dependability, speed and cost efficiency from the view of the customer (Chavez et al. 2022; Govender & Jasson 2018). The goal of the lean system is to eliminate waste. South African municipalities are under increasing pressure to do more with fewer taxpayer revenues, and as the public demands more services with limited taxpayer support, no public sector organisation has the luxury of being wasteful (Chavez et al. 2022). Municipalities struggle with challenges in lean implementation and practice. The operational efficiency of South African municipalities through waste reduction and value creation can increase by improving quality as a core business strategy (Govender & Jasson 2018).

Information sharing

'Information sharing refers to the activity of exchanging good-quality information or knowledge among partners who work collaboratively as a single entity in the supply chain' (Diem Le et al. 2021). It reduces different types of uncertainties related to demand, product and technology that add costs to supply chain processes among the supply chain partners. Furthermore, IS enhances better coordination between different departments and supply chain members and improves control of the supply chain processes (Hassan & Naserredin 2018; Tang et al. 2021). Most South African municipalities operate in a highly political terrain. Political influence may pose serious barriers to the effectiveness of inter-organisational IS (Dikotla 2019). Any organisation regards information as an essential resource. Information sharing impacts the organisation's survival, especially in municipalities where citizens expect the delivery of basic services. Therefore, integrating effective IS with effective SCM practices becomes critical for enhancing supply chain performance.

Supply chain innovation

Supply chain innovation is a change in a supply chain network, supply chain technology or supply chain process that can occur in a company function, within a company, in an industry or in a supply chain to enhance new value creation for stakeholders (Bhatti et al. 2024). Supply chain innovation increases competitiveness, customer service and broader stakeholder value (Kwak, Seo & Mason 2018). Organisations involved in innovation must develop processes and practices that support their quest to transform new ideas into processes, services and goods. This applies to SCM as it emphasises the creation of superior end-customer value through commercial significance. This study aims to understand how South African municipalities can enhance their ability to intentionally and consistently generate 'innovative solutions' and ensure they have the necessary resources to deliver them. In South Africa, the government is starting to value the strategic importance of SCM in service delivery, value creation, socio-economic transformation and fiscal prudence. Innovation results in different approaches to the commodities used in some sectors (Solaimani & Van der Veen 2022).

Supply chain robustness

Supply chain robustness is the ability of companies to cope with external and internal disruptions and disturbances (Monostori 2018). Robustness is the capacity of the supply chain to oppose change and involves a proactive expectation of progress before it happens (Marculetiu, Ataseven & Mackelprang 2023). Through strategic planning, robustness can be built to construct a supply chain network; for that, it needs to design a value-creating supply chain network that can resist the operation before and after the unwanted event (Marculetiu et al. 2023). A robust supply chain can work despite a few unsettling influences, as it withstands and adapts to stuns by holding its dependability when changes happen (Marculetiu et al. 2023). Generally, the robustness of the supply chain may be determined by its ability to adequately respond to various kinds or categories of risks or disturbances, thus inspiring an organisation to innovate. Policymakers at different levels of government have a potential role in assessing supply chain risks to avoid domestic and international crises. South African municipalities have limited resources; thus, the focus should be on the most severe types of risks that could strongly impact supply chains. Saisridhar, Thurer and Avittathur (2023) posited that organisations should simultaneously develop capabilities such as responsiveness, resilience and robustness to hedge against risks while staying competitive.

Service delivery quality

The term service delivery is used to connote the distribution of basic communal needs and services, notably housing, water and sanitation, land, electricity and infrastructure, which local communities have taken for granted and become dependent on for their daily existence (Reddy 2016). South African municipalities are responsible for providing infrastructure and services, which are essential for the welfare of citizens and are mandated by law to oversee and manage public funds. Supply chain management is critical for obtaining and delivering goods, services and infrastructural works to meet the needs of citizens and is a core realm of public administration practice (Setiono & Hidayat 2022; Sibanda, Zindi & Maramura 2020). Service delivery quality becomes a critical element of success because customer contact is one of the most important business processes for recognising and meeting customer expectations (Zygiaris et al. 2022). Service delivery quality in municipalities is the extent to which a municipality provides basic services to its citizens in a timely, safe and accessible manner (Setiono & Hidayat 2022). In this study, tangibles, reliability and responsiveness are dimensions of SDQ.

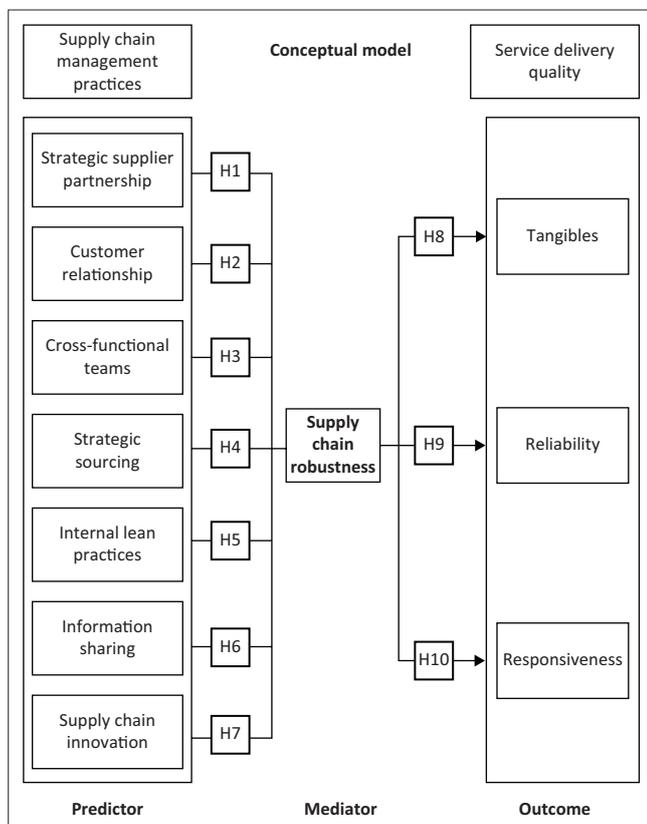
In a municipality, 'service delivery tangibles' refer to the physical, visible aspects of services provided to residents, such as clean water supply, well-maintained roads, street lighting, refuse collection, public parks, sewage disposal systems and electricity access (Ruwanika & Maramura 2024). Reliability refers to the consistency and dependability with which a municipality provides essential services such as

water, electricity, sanitation, waste collection and road maintenance to its residents (Ruwanika & Maramura 2024). Responsiveness in municipalities is the ability to provide essential services to communities in a timely, efficient and effective manner (Setiono & Hidayat 2022).

South African municipalities are mandated constitutionally to drive transformation along a sustainable developmental trajectory in service delivery terms and thus use supply chains to procure works, goods and services for the public good. In doing so, SCM systems are expected to promote and ensure greater efficiency and accountability (Van Der Waldt 2016). Execution of SCM practices ensures that the value at each stage of procurement is added through the municipal SCM system in the sense that the bulk of the activities in municipalities are concentrated around SCM. The degree to which socio-economic objectives and the level of service delivery to citizens are promoted are significantly and directly frustrated or aided by the level at which municipalities' SCM practices and robustness of supply chains are implemented.

Research framework

The research framework is presented in Figure 1 and consists of the seven predictor variables, namely, SSP, customer relationship, CFTs, strategic sourcing, information sharing, ILP and SCI, followed by the mediator, SCR, and the outcome variable, service delivery quality.



SCMP, supply chain management practice; SCR, supply chain robustness; SDQ, service delivery quality; H, hypotheses.

FIGURE 1: Research model: Supply chain management practice, supply chain robustness and service delivery quality.

The above-mentioned constructs are listed as the drivers of service delivery. The framework suggests that SCM practices have a direct predictive influence on SCR (H1–H7). In turn, SCR has a direct influence on SDQ (H8–H10).

Supply chain management practices and supply chain robustness

The study focuses on the SCM practices as predicting constructs in the research framework to the SCR. The SCM practices are defined as the set of activities undertaken by an organisation to promote effective management of its supply chain (Chileshe & Phiri 2022). The SCM practices are proposed to be a multi-dimensional concept, including the upstream and downstream parts of the supply chain. The literature highlights that SCM practices affect not only the performance of the organisation but also the levels of output and the performance of the resources available within the organisation (Saad, Elgazzar & Mlaker Ka 2022). To ensure long-term viability across the SC, management actions need to incorporate the entire breadth of disruptions, inclusive of frequent, low-magnitude events and unknown, high-magnitude events (Mackay, Munoz & Pepper 2020). The changing environment in which businesses and their supply chains are involved makes the study of how to manage risk and how to confront the effects of such uncertainty of special importance (Adenso-Diaz, Mar Ortiz & Lozano, 2018). Given this background, the following hypotheses were formulated:

- H1:** Strategic supplier partnership (SSP) exerts a positive influence on supply chain robustness (SCR).
- H2:** Customer relationships positively affects SCR.
- H3:** Cross-functional teams (CFTs) positively influence SCR.
- H4:** Strategic sourcing positively affects SCR.
- H5:** Internal lean practice (ILP) has a significant relationship with SCR.
- H6:** Information sharing positively influences SCR.
- H7:** Supply chain innovation (SCI) positively affects SCR.

Supply chain robustness and service delivery quality

The literature supports the view that SCR as a mediating construct may positively influence service delivery. Generally, building a robust supply chain begins with being quick to identify potential risks within the value chain. For municipalities to maintain the stability of SC performances, it is necessary to design robust supply chains (Chileshe & Phiri 2022). To enhance service delivery and to improve the firm's supply chain performance, Szczepański (2021) posits that there is a need for an increased awareness of the existence of SC disturbances, sources of vulnerability as well as the implementation of redesign strategies. Szczepański (2021) opined that government authorities can also actively use public procurement (with a combination of SCM practices) to create stable demand for critical goods, enhance service delivery and provide financial means to develop resilient and robust supply chains. Based on these insights, the following hypotheses were proposed:

H8: Supply chain robustness (SCR) positively mediates tangibles.

H9: Supply chain robustness (SCR) positively mediates reliability.

H10: Supply chain robustness (SCR) positively mediates responsiveness.

Research method and design

The study followed a quantitative method based on a deductive reasoning approach, following consistently from positivism, as it required testing the link between various concepts and hypotheses. A combination of a survey and correlational design was adapted including the cross-sectional analysis (Cresswell & Creswell 2018).

Sampling method, population and sample size

In this study, the non-probability sampling method was used. Respondents were selected using the purposive sampling technique to ensure that only those individuals with the desired knowledge were included in the study. The targeted population included management and staff who are SCM role players employed from the selected municipalities in Gauteng and Northwest Provinces. The SCM role-players are referred to as the SCM officials, municipal executives and functional management teams (Ambe 2016; National Treasury 2005). Their selection was based on the premise that these SCM role-players are the sources of knowledge about SCM, have strategic influence on SCM decision-making processes and are tasked with monitoring and evaluating the implementation of SCM processes within a municipality. The sampling frame was obtained from the list of SCM role players in selected municipalities in the Gauteng and North-West Provinces. A valid sample size of 315 for this study was deemed acceptable as it was well above the minimum recommended cut-off values (150) for quantitative studies (Hair et al. 2018).

Measurement instruments

Measurement scales were adapted from previous studies. The seven SCM practices and SCR were measured using five items each, whereas the SDQ dimensions were measured using four items each from the SERVQUAL model. The questions were adapted from various previous studies, as follows:

- **Strategic supplier partnership (SSP):** Li et al. (2006), Al-Madi et al. (2021)
- **Customer relationship:** Singh and Singh (2019), Al-Madi et al. (2021)
- **Cross-functional teams (CFTs):** Gevers and Van Weele (2016), Van Weele (2016)
- **Strategic sourcing:** Eyaa and Ntayi (2010), Willy and Njeru (2014)
- **Internal lean practice (ILP):** Li et al. (2006); Antony, Snee and Hoerl (2017), Govender and Jason (2018)
- **Information sharing:** Singh and Singh (2019)
- **Supply chain innovation (SCI):** Seo, Dinwoordie and Kwak (2014), Kwak et al. (2018)

- **Supply chain robustness (SCR):** Kwak et al. (2018); Shamout (2019), El Baz and Ruel (2021)
- **Service quality:** KO and Chou (2021), Kowalksa and Ostrega (2020)

A self-administered online survey questionnaire was used in the data collection process. Response options were presented in six choice Likert-type scales anchored by (1) strongly disagree and (6) strongly agree. For this study, a pilot test was conducted, which included 43 SCM role players before the full-scale survey was launched. The pilot test provided an opportunity to improve the response options from the questionnaire, which were changed from a five to a forced choice six-point to ensure that respondents took a definite position, another crucial factor in data quality and to resolve any remaining problems. The questionnaire was reviewed by two experts in municipal SCM. Data were collected between November 2023 and January 2024. The online survey was developed using Google Forms and distributed to targeted respondents through emails.

Data analysis

Descriptive and inferential statistics were analysed using the SPSS version 27.0 and Smart-PLS version 4.0, to test the hypotheses of data collected from the survey questionnaire.

Ethical considerations

An application for full ethical approval was made to the Graduate School of Business Leadership, RERC Institution: University of South Africa, and ethics consent was received on 30 November 2023, with the ethics approval number: 2023_SBL_DBL_026_FA_1465.

Results

Demographic profile of respondents

Out of 350 questionnaires administered, 315 responses were valid for analysis representing a response rate of 90%. This response rate is 'acceptable' by Wang et al. (2020). An analysis of the biographic profile of respondents revealed that 47% ($n = 148$) of the respondents were male and 53% ($n = 167$) were female. It emerged that approximately 32% ($n = 99$) were aged below 35 years. Approximately, 41% ($n = 129$) of the respondents were holders of a first degree. In terms of race, 75% ($n = 237$) were Africans, 14% ($n = 44$) were whites, 9% ($n = 27$) were mixed race and 2% ($n = 7$) were Indians. With regard to the provinces, most respondents were based in the Gauteng Province at 65% ($n = 204$), whereas 35% ($n = 111$) were based in the North-West Province. Notably, most of the respondents (60%; $n = 188$) had been employed in the organisation for more than 10 years. In addition, in terms of the position held, 0.6% ($n = 2$) of the respondents were executive directors, 9% ($n = 28$) were supply chain professionals, 31% ($n = 99$) were divisional managers or assistant directors, 9% ($n = 28$) were divisional technicians, 6% ($n = 20$) were superintendents, 3% ($n = 8$) were operations managers and 41% ($n = 130$) occupied other positions such as directors, deputy directors and town planners among others.

Common methods bias

To minimise common methods bias, the study used a survey questionnaire comprising five sections with clear instructions. Different scales were used to measure responses and ensure that all responses were kept anonymous. A pilot study was conducted to remove any ambiguities in measurement items. Harman's single factor was used to check for the CMB, which showed ten factors accounting for 73.156% of the variance, with the factor accounting for the highest variance achieving 42.702%. Therefore, no single factor appeared, and the first factor did not capture most or more than 50% of the variance.

Psychometric properties of measurement scales

Reliability and validity analysis

Reliability was measured using three indicators, namely item-total correlations, Cronbach's alpha test (Cronbach's α), Rho_A and composite reliability (CR) test as per the results in Table 1. The values range from 0 to 1 (Cheung, Cooper-Thomas & Lau 2023); thus, the higher value indicates higher reliability level. The scale item-total correlation scores demonstrate an acceptable relationship of items with the dimensions. Items ranged from 0.485 to 0.897, thus displaying satisfactory scores higher than 0.3 (Karakaya & Kiliç 2021). One item SCR (Item 5) was less correlated with an index score of 0.285. This suggests that all measurement scales were internally consistent. Cronbach's alpha and CR values of all constructs exceeded the recommended minimum threshold of 0.7 (Barbera, Naibert & Pentecost 2020). Item CFT 5 was discarded to improve alpha to 0.928; item SS5 was discarded to improve alpha to 0.712 and item RES2 was discarded to improve alpha to 0.729. As per the common rule of thumb, the Rho_A values should be above 0.7 (Qiao et al. 2023). The measurement scales shown in the Rho_A reliability analysis demonstrate that the scores were higher than the recommended lowest value of 0.7. The values ranged from 0.781 to 0.993. These suggest that the requirements for CR were met. The scores of CRs ranged from 0.854 and 0.949, which were greater than the critical lowest value of 0.7, Hair et al. (2021), indicating high reliability.

In research, the 'square root ($\sqrt{}$) of AVE' (average variance extracted) is a statistical measure used to assess discriminant validity between latent constructs. It helps to determine whether different constructs in a study are distinct enough from each other and not overly correlated. Basically, it assesses whether each construct is measuring a unique concept rather than capturing the same variance from other constructs. This method of assessing discriminant validity using the $\sqrt{\text{AVE}}$ is known as the Fornell-Larcker criterion. The discriminant validity for each item in the instrument was evaluated by assessing the Fornell-Larcker criterion, which prescribes that the square root of the AVE value for each construct must be higher than the highest correlation between that construct and the rest of the constructs.

As indicated in Table 2, all $\sqrt{\text{AVE}}$ values in bold font for each construct were higher than its correlations with other constructs, indicating that the study's requirement for discriminant validity was satisfied (Langton & Mafini 2023). Thus, the CFT with a $\sqrt{\text{AVE}} = 0.907$, CR = 0.791, ILP = 0.835, IS = 0.873, REL = 0.805, RES = 0.814, SCI = 0.878, SCR = 0.846, SS = 0.903, SSP = 0.862 and TAN = 0.874 are all greater than their correlations with other constructs, indicating that the study's requirement for discriminant validity was satisfied. Thus, the scores in bold are the $\sqrt{\text{AVE}}$ scores, which are all above the correlation coefficients between measures, indicating that discriminant validity testing was acceptable.

Model fit analysis

Model fit measures discrepancies between observed and model-implied data (Stanley & Edwards 2016). Model fit indices can be used with either thresholds or hypotheses testing to reject or retain the proposed model (Sarmiento & Costa 2019). The saturated model assesses correlations between all constructs, whereas the estimated model is based on a total effect scheme and considers the model structure (West et al. 2023). Therefore, the saturated model is restricted to the sample data and is unsuitable for making inferences about the targeted population. The estimated model is more suitable for such inferences because its parameters are estimated based on observed data. The standardised root means square residual (SRMR) and the normed fit index, including the exact fit criteria (i.e. d_{ULS} and d_{G}), were used to evaluate the model fit. The SRMR value less than 0.10 or 0.08 is considered a good fit (Pavlov et al. 2021), and a summary of the model fit is presented in Table 3.

The estimation result of the model, as shown in Table 3, for SRMR, is 0.075, indicating that the model used has an acceptable fit.

Path analysis

Path analysis using Structural Equation Modeling (SEM) was applied to test the relationship between SCM practices, SCR and SDQ. Path analysis is a statistical technique for examining and testing relationships among a set of observed variables (Valenzuela & Bachmann 2017). The application of path analysis included checking the path coefficients, which are represented by a path coefficient (beta [β]). For a hypothesis to be supported and significant, the path coefficient must be positive or negative (Hair et al. 2021) (Langton, Maotoawe & Mafini 2023). Figure 2 displays the path model among the research constructs.

The results in Figure 2 show path coefficients ranging between -0.036 and 0.747 , representing the associations between the constructs. The results indicate that all other associations were positive, although differing in magnitude, except for CR, which had a negative effect on SCR.

TABLE 1: Accuracy analysis statistics.

Research construct	Item-total statistics	Cronbach Alpha	Rho A	CR	AVE	\sqrt{AVE}	Factor loading
SSP	-	0.88	0.91	0.92	0.74	0.86	-
SSP2	0.74	-	-	-	-	-	0.92
SSP3	0.61	-	-	-	-	-	0.86
SSP4	0.71	-	-	-	-	-	0.93
SSP5	0.62	-	-	-	-	-	0.73
CR	-	0.85	0.87	0.89	0.63	0.79	-
CR1	0.86	-	-	-	-	-	0.79
CR2	0.90	-	-	-	-	-	0.63
CR3	0.48	-	-	-	-	-	0.73
CR4	0.81	-	-	-	-	-	0.88
CR5	0.85	-	-	-	-	-	0.89
CFT	-	0.93	0.99	0.95	0.82	0.91	-
CFT1	0.50	-	-	-	-	-	0.88
CFT2	0.54	-	-	-	-	-	0.89
CFT3	0.62	-	-	-	-	-	0.93
CFT4	0.52	-	-	-	-	-	0.93
SS	-	0.74	0.78	0.90	0.81	0.90	-
SS1	6.65	-	-	-	-	-	0.89
SS2	0.63	-	-	-	-	-	0.91
ILP	-	0.89	0.90	0.92	0.70	0.83	-
ILP1	0.69	-	-	-	-	-	0.79
ILP2	0.75	-	-	-	-	-	0.86
ILP3	0.73	-	-	-	-	-	0.87
ILP4	0.59	-	-	-	-	-	0.80
ILP5	0.62	-	-	-	-	-	0.84
IS	-	0.89	0.90	0.93	0.76	0.87	-
IS2	0.52	-	-	-	-	-	0.78
IS3	0.61	-	-	-	-	-	0.87
IS4	0.56	-	-	-	-	-	0.92
IS5	0.46	-	-	-	-	-	0.91
SCI	-	0.93	0.93	0.94	0.77	0.88	-
SCI1	0.78	-	-	-	-	-	0.83
SCI2	0.88	-	-	-	-	-	0.89
SCI3	0.80	-	-	-	-	-	0.88
SCI4	0.70	-	-	-	-	-	0.90
SCI5	0.88	-	-	-	-	-	0.89
SCR	-	0.90	0.90	0.93	0.72	0.85	-
SCR1	0.82	-	-	-	-	-	0.86
SCR2	0.71	-	-	-	-	-	0.90
SCR3	0.72	-	-	-	-	-	0.90
SCR4	0.70	-	-	-	-	-	0.88
SCR5	0.28	-	-	-	-	-	0.67
TAN	-	0.78	0.83	0.86	0.61	0.78	-
T1	0.75	-	-	-	-	-	0.75
T2	0.65	-	-	-	-	-	0.88
T3	0.79	-	-	-	-	-	0.90
T4	0.40	-	-	-	-	-	0.55
REL	-	0.81	0.83	0.88	0.65	0.80	-
REL1	0.71	-	-	-	-	-	0.86
REL2	0.60	-	-	-	-	-	0.64
REL3	0.67	-	-	-	-	-	0.85
REL4	0.67	-	-	-	-	-	0.85
RES	-	0.76	0.83	0.85	0.66	0.81	-
RES1	0.65	-	-	-	-	-	0.86
RES3	0.76	-	-	-	-	-	0.81
RES4	0.69	-	-	-	-	-	0.77

SSP, strategic supplier partnership; CR, customer relations; CFT, cross-functional teams; SS, strategic sourcing; ILP, internal lean practice; IS, information sharing; SCI, supply chain innovation; SCR, supply chain robustness; TAN, tangibles; REL, reliability; RES, responsiveness; AVE, average variance extracted.

TABLE 2: Discriminant validity analysis.

Variable	CFT	CR	ILP	IS	REL	RES	SCI	SCR	SS	SSP	TAN
CFT	0.91†	-	-	-	-	-	-	-	-	-	-
CR	0.26	0.79†	-	-	-	-	-	-	-	-	-
ILP	0.21	0.54	0.83†	-	-	-	-	-	-	-	-
IS	0.20	0.62	0.78	0.87†	-	-	-	-	-	-	-
REL	0.23	0.45	0.68	0.66	0.80†	-	-	-	-	-	-
RES	0.20	0.35	0.40	0.35	0.40	0.81†	-	-	-	-	-
SCI	0.18	0.55	0.77	0.76	0.63	0.39	0.88†	-	-	-	-
SCR	0.20	0.48	0.70	0.73	0.69	0.36	0.70	0.85†	-	-	-
SS	0.20	0.51	0.62	0.66	0.52	0.34	0.58	0.57	0.90†	-	-
SSP	0.22	0.53	0.72	0.72	0.62	0.39	0.67	0.69	0.63	0.86†	-
TAN	0.20	0.52	0.73	0.71	0.78	0.39	0.689	0.75	0.54	0.68	0.78†

SSP, strategic supplier partnership; CR, customer relations; CFT, cross-functional teams; SS, strategic sourcing; ILP, internal lean practice; IS, information sharing; SCI, supply chain innovation; SCR, supply chain robustness; TAN, tangibles; REL, reliability; RES, responsiveness.

†, Significance level: $p < 0.05$.

TABLE 3: Model fit summary.

Variable	Saturated model	Estimated model
SRMR	0.07	0.07
d_ULS	6.22	7.23
d_G	2.31	2.41
Chi-square	3867.95	3990.45
NFI	0.77	0.76

NFI - Normed Fit Index, normed fit index; SRMR, standardised root means square residual.

Discussion

This study investigated the relationship between SCM practices, SCR and SDQ in selected South African municipalities. Table 4 presents the results of the study, showing the path coefficient (β), t -statistics (t) and the p -values (p) of the hypothesised path.

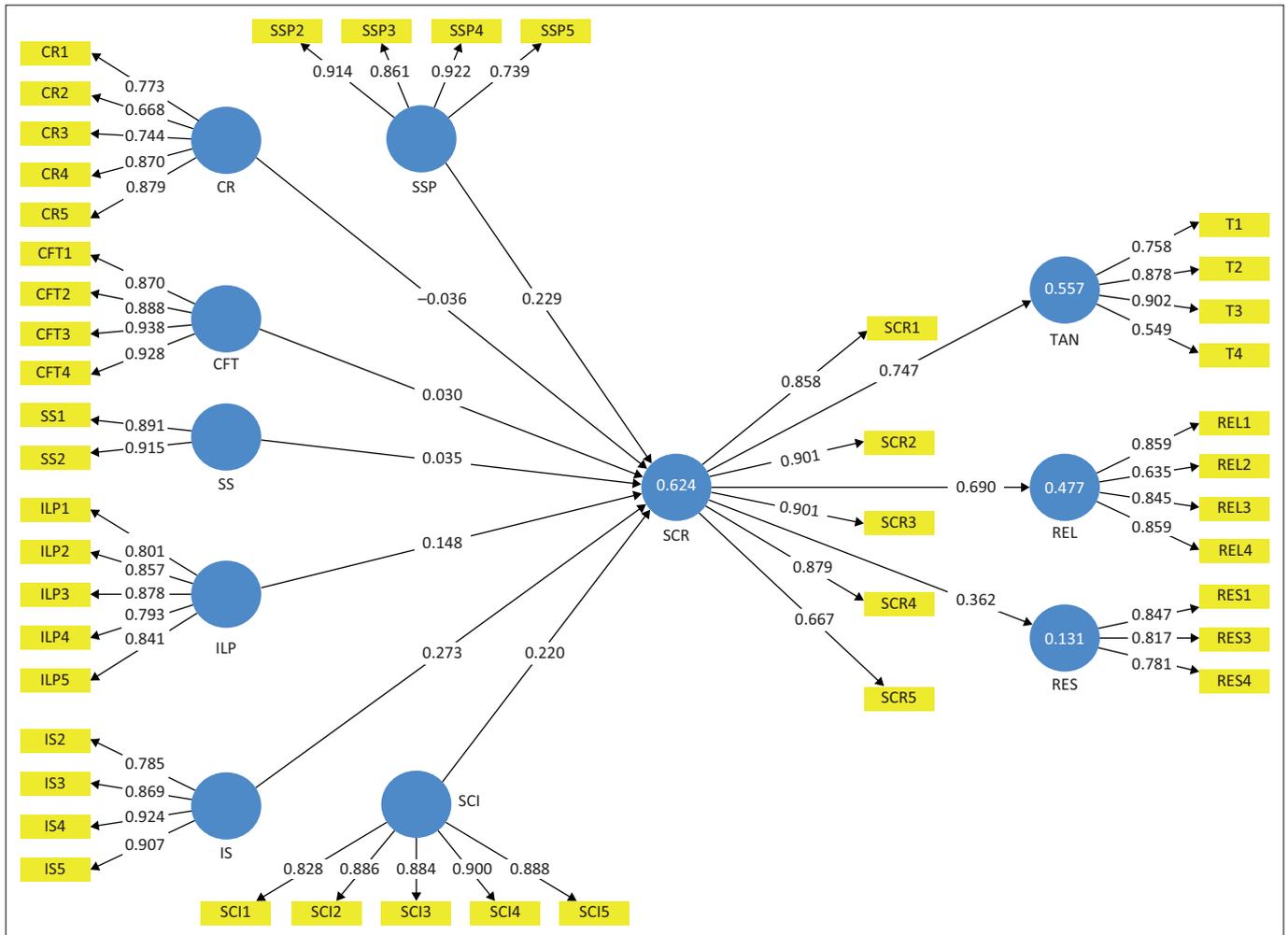
Four of the tested hypotheses (H) were rejected for having p -values greater than 0.05, that is: H2; H3; H4 and H5, while six paths were highly significant with $p < 0.001$, that is: H1; H6; H7; H8; H9 and H10. The results showed significant positive outcomes between three SCM practices and SCR. These are: (1) SSP and SCR at ($\beta = 0.229$; $t = 3.622$; $p = 0.000$); (2) IS and SCR at ($\beta = 0.273$; $t = 3.970$; $p = 0.000$) and (3) SCI and SCR at ($\beta = 0.220$; $t = 3.446$; $p = 0.001$). The results suggest that strengthening these three SCM practices leads to the higher robustness of the municipal supply chain. Nzimakwe (2023) alluded that SSPs encourage long-term relationships between public sector institutions and suppliers, aiming to leverage suppliers' strategic and operational capabilities to enhance supply chain performance. According to Todo et al. (2023), IS and collaboration promote the robustness of supply chains because they generate considerable mutual benefits from sustainable supply chains, whereas Shamout (2019) highlighted that SCI offers considerable latitude for planning, monitoring, forecasting and replenishment, resulting in accurate, concrete and fast decision-making in the event of crises, thereby strengthening robustness and resilience of firms against (un)expected shocks.

The result of the study suggests that municipalities should consider SSP, IS and SCI to be high-priority prerequisites for

achieving a robust supply chain. Municipalities should regard suppliers as strategic in that partnerships with suppliers are necessary instead of transactional relationships. Regarding IS, this outcome could mean that South African municipalities that adopted IS in their supply chains are able to foresee and respond to disruptive events better before they become catastrophic, providing them with robust supply chains. Municipalities are not generally seen as initiators of innovation. The results regarding the SCI construct may be attributed to South African municipalities being likely to adopt product or service innovations developed elsewhere to address the problems that emanate from a municipality's day-to-day service and management responsibilities to improve the robustness of their supply chains.

Furthermore, the results showed insignificant relationships between four SCM practices and SCR, namely, CR: ($\beta = -0.036$; $t = 0.751$; $p = 0.453$); CFT: ($\beta = 0.030$; $t = 0.907$; $p = 0.364$); SS: ($\beta = 0.035$; $t = 0.625$; $p = 0.532$) and ILP: ($\beta = 0.148$; $t = 1.910$; $p = 0.056$), respectively. These results contradict previous results by Astuty, Pasaribu and Rahayub (2021) and Ahmad et al. (2024), where a connection between CR and SCR was established. Both studies highlight the importance of CRs as a critical success factor in supply chain performance to attain robust supply chains. This study, however, suggests that implementing these four SCM practices does not enhance the robustness of municipal supply chains.

The insignificant relationships between CR, CFT, SS, ILP and SCR may be attributable to a number of factors, such as the: (1) misalignment of CRM processes in municipalities and an inability to change behaviour regarding new systems and process adoption (Singh 2021), (2) the consequence of the instability of municipal bid committees because of inadequate support of employees who work in CFTs by the municipal leadership to enable collaborative working in SCM in addition to their anchor department, (3) ineffective utilisation of procurement plans when procuring services and goods, long lead times when procuring goods and services and high volumes of deviations from SCM processes by South African municipalities and (4) difficulty to adopt ILP in municipal supply chains because of challenges of poor data quality and a lack of understanding of the process involved.



SSP, strategic supplier partnership; CR, customer relations; CFT, cross-functional teams; SS, strategic sourcing; ILP, internal lean practice; IS, information sharing; SCR, supply chain robustness; TAN, tangibles; REL, reliability; RES, responsiveness; SCI, supply chain innovation.

FIGURE 2: Path model: Supply chain management practice, supply chain robustness and service delivery quality.

TABLE 4: Path coefficient, *t*-statistics and the *p*-values.

Path	Path coefficient (β)	<i>T</i> -statistics (<i>t</i>)	Significance (<i>p</i>)	Result
H1: SSP → SCR	0.23	3.62	0.000	Supported and significant
H2: CR → SCR	-0.04	0.75	0.453	Not supported and insignificant
H3: CFT → SCR	0.03	0.91	0.364	Not supported and insignificant
H4: SS → SCR	0.03	0.62	0.532	Not supported and insignificant
H5: ILP → SCR	0.15	1.91	0.056	Not supported and insignificant
H6: IS → SCR	0.27	3.97	0.000	Supported and significant
H7: SCI → SCR	0.22	3.47	0.001	Supported and significant
H8: SCR → REL	0.35	26.18	0.000	Supported and significant
H9: SCR → RES	0.16	8.11	0.000	Supported and significant
H10: SCR → TAN	0.37	31.98	0.000	Supported and significant

SSP, strategic supplier partnership; CR, customer relations; CFT, cross-functional teams; SS, strategic sourcing; ILP, internal lean practice; IS, information sharing; SCR, supply chain robustness; TAN, tangibles; REL, reliability; RES, responsiveness.; SCI, supply chain innovation; H, hypotheses.

Supply chain robustness and service delivery quality

The results showed a positive and significant relationship between SCR and SDQ dimensions, namely Tangibles (TAN) and Reliability (REL) as follows: (1) SCR and TAN at ($\beta = 0.370$; $t = 31.981$; $p = 0.000$), (2) SCR and REL at ($\beta = 0.349$; $t = 26.176$; $p = 0.000$) and (3) SCR and RES at ($\beta = 0.165$; $t = 8.114$; $p = 0.000$), respectively. The results denote that SCR positively influences SDQ in South African

municipalities. The results align with the study by Frederico (2021) that organisations constantly revisit their strategies to establish a robust framework that mitigates the adverse effects of disruptions and readily adopts proactive measures, suggesting that organisations that optimise the robustness of their supply chains achieve cost savings or higher quality products and services. A study by El-Baz and Ruel (2021) supports this outcome, as these authors emphasised that robust supply chains can withstand extreme adversities while ensuring the continued delivery

of products or services and meeting the demands of their customers. This implies that South African municipalities have, in their quest to achieve robust supply chains, developed a robust framework that seeks to address the deficiencies in their supply chains with a view to improving service delivery, suggesting that proactive SCM measures were adopted and implemented to enhance service delivery. This result could further mean that the SCR may have been achieved by applying multi-sourcing strategies in their supply chains in response to service delivery challenges.

Mediation analysis

The mediation analysis results are presented in Table 5. The results demonstrated that SCR mediated the relationships between IS and SDQ (REL and TAN), with REL: ($\beta = 0.095$; $t = 3.057$; $p = 0.002$) and TAN at ($\beta = 0.101$; $t = 3.226$; $p = 0.001$), respectively. These results indicate that SCR increases the impact of IS on REL by a margin of 9.5%. It also magnifies the impact of IS on TAN by 10.1%. Conversely, a significant indirect effect was found that SCR mediated the relationships between SCI and SDQ (REL and TAN) and SSP and SDQ (REL and TAN), respectively. These results indicate that SCR enhances the impact of SCI and SSP on SDQ.

Elsewhere, no mediation was observed, implying that the existence of both SCR in the other relationships considered in the study has no indirect effects or is simply inconsequential. It can be concluded that the adoption of IS, SCI and SSP as SCM practices contributed significantly to improving service delivery and creating robust supply chains in selected South African municipalities.

TABLE 5: Mediation analysis of the research constructs.

Relationship	Mediating effect	t-values	p-value	Decision
CR -> SCR -> REL	-0.01	0.80	0.424	No mediation
CR -> SCR -> RES	-0.01	0.72	0.473	No mediation
IS -> SCR -> REL	0.09	3.06	0.002	Full mediation
IS -> SCR -> RES	0.04	1.87	0.062	No mediation
CR -> SCR -> TAN	-0.01	0.82	0.414	No mediation
SCI -> SCR -> REL	0.08	2.82	0.005	Full mediation
SCI -> SCR -> RES	0.04	1.63	0.103	No mediation
IS -> SCR -> TAN	0.10	3.23	0.001	Full mediation
SS -> SCR -> REL	0.01	0.62	0.535	No mediation
SS -> SCR -> RES	0.01	0.56	0.577	No mediation
SCI -> SCR -> TAN	0.08	3.03	0.002	Full mediation
SS -> SCR -> TAN	0.01	0.63	0.530	No mediation
CFT -> SCR -> REL	0.01	0.83	0.406	No mediation
CFT -> SCR -> RES	0.00	0.73	0.468	No mediation
ILP -> SCR -> REL	0.05	1.82	0.068	No mediation
ILP -> SCR -> RES	0.02	1.37	0.171	No mediation
CFT -> SCR -> TAN	0.01	0.86	0.391	No mediation
ILP -> SCR -> TAN	0.05	1.80	0.071	No mediation
SSP -> SCR -> REL	0.08	2.89	0.004	Full mediation
SSP -> SCR -> RES	0.04	1.69	0.090	No mediation
SSP -> SCR -> TAN	0.08	3.01	0.003	Full mediation

SSP, strategic supplier partnership; CR, customer relations; CFT, cross-functional teams; SS, strategic sourcing; ILP, internal lean practice; IS, information sharing; SCR, supply chain robustness; TAN, tangibles; REL, reliability; RES, responsiveness; SCI, supply chain innovation.

Theoretical and practical implications

The study explored the impact of various dimensions of SCM practices, namely SSP, CR, CFT, ILP, IS, SS and SCI as predictors of SCR in improving the SDQ in South African municipalities. This study proposed a model to expand on how the SCM practices impact SCR, which further influences SDQ. Based on the results, this study makes several specific theoretical contributions. Firstly, the study generates new information on the relationship between the constructs. Secondly, it increases the body of knowledge on municipal SCM, particularly SCR and thirdly, the study highlights that while all SCM practices are important in creating SCR and improving SDQ in South African municipalities, their individual impact varies. While research constructs, such as the SCM practices, namely, SSP, CR, CFT, ILP, IS, SS and SCI, were substantially researched to measure their impact on organisational performance, this study could represent a pioneering attempt to assess the relationships between SCM practices, SCR and SDQ in South African municipalities. The study shows that a robust municipal SC is an important driver of SDQ. Furthermore, the study suggests that SCR mediates the impact of three SCM dimensions, IS, SCI and SSP, on two service quality components, TAN and REL. The study, therefore, created theoretical groundwork for future empirical studies in South Africa.

This research empowers SCM professionals in South African municipalities with a practical SCM implementation tool for an inclusive and sustainable decision-making process in SCM. The study helps municipalities to identify additional dimensions of SCM practices that can be incorporated into the implementation model to improve SDQ and provides guidance and solutions on which SCM factors are important to strengthen the robustness of municipal supply chains to improve SDQ in South African municipalities. The study is also valuable for the diagnosis of performance problems in municipalities.

Limitations and implications for future research

There are certain limitations of this study worth mentioning that future research can address. It is important to mention that the sample size used in this study was small, at 350. The study focused specifically on selected South African municipalities in two Provinces, namely Gauteng and North West and targeted the SCM role-players in the respective municipalities. Restricting the study to five South African municipalities limited the geographic scope of the study. The cross-sectional nature of the current data makes it imperative that the interpretation of the results be limited to the municipalities examined in this study, even though efforts were made to maintain representativeness within the sample. The study was quantitative in nature, with its results dependent strictly on the collected numeric data apart from the secondary data collected through the literature review.

The study has several implications for future research. Future studies could be conducted using enlarged sample sizes as

well as wider geographical scopes. Future studies could also use different research methodologies, such as mixed methods research or qualitative research, to gain new insights that could not be captured in the study and provide a more comprehensive understanding of the relationships between the factors considered in the current research. Another study can also be conducted to test the dimensions of SCM practices (CR, CFT, ILP and SS) that did not impact SCR. In contrast to this study, which employed a cross-sectional analysis, future research could consider conducting time series studies to monitor changes in the same relationships over different periods of time.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

G.N. contributed to the writing of the whole article. C.M. is the senior researcher who substantially contributed to data analysis and provided guidance in the manuscript write-up. I.L. contributed to the review of the article.

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Data availability

The data that support the findings of this study are not openly available because of confidentiality and are available from the corresponding author, G.N. upon reasonable request.

Disclaimer

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References

- Adenso-Díaz, B., Mar-Ortiz, J. & Lozano, S., 2018, 'Assessing supply chain robustness to links failure', *International Journal of Production Research* 56(15), 5104–5117. <https://doi.org/10.1080/00207543.2017.14195>
- Ahmad, N., Sham, R., Yahaya, S. & Ameir Alhajri, N.O., 2024, 'Influence of customer relationship on supply chain performance in telecommunication industry', *Environment-Behaviour Proceedings Journal* 9(27), 19–25. <https://doi.org/10.21834/e-bppj.v9i27.5647>
- Al-Madi, F., Alfalah, T., Al Shraah, A. & Abu-Rumman, A.A., 2021, 'Supply chain practices and organizational performance: Evidence from Jordanian medical devices firms', *Uncertain Supply Chain Management* 9, 831–840. <https://doi.org/10.5267/j.uscm.2021.8.006>
- Altaf, R., 2023, *The power of strategic supplier partnerships: Building resilient supply chains*, viewed 06 February 2024, from <https://www.linkedin.com/pulse/power-strategic-supplier-partnerships-building-resilient-altaf/>.
- Ambe, I.M., 2016, 'Insight into supply chain management in a municipal context', *Public and Municipal Finance* 5(2), 20–29. [https://doi.org/10.21511/pmf.5\(2\).2016.02](https://doi.org/10.21511/pmf.5(2).2016.02)
- Antony, J., Snee, R. & Hoerl, R., 2017, 'Lean Six Sigma: Yesterday, today and tomorrow', *International Journal of Quality & Reliability Management* 34(7), 73–1093. <https://doi.org/10.1108/IJQRM-03-2016-0035>
- Astuty, W., Pasaribu, F.Z. & Rahayub, S., 2021, 'The effects of customer relationship management, human resource competence and internal control systems on the effectiveness of supply chain management in the Indonesian public sector', *Uncertain Supply Chain Management* 9, 595–602. <https://doi.org/10.5267/j.uscm.2021.6.001>
- Auditor General South Africa (AGSA), 2019, *Consolidated general report on the local government audit outcomes – MFMA 2018/19*, viewed 09 July 2021, from <https://www.agsa.co.za/Portals/0/Reports/MFMA/201819/GR/MFMA%20GR%202018-19%20Final%20View.pdf>.
- Azmi, I., Hamid, A.N., Hussain M.D. & Ibtishamiah, M., 2017, 'Logistics and supply chain management: Importance of integration for business process', *Journal of emerging economies and Islamic Research* 5(4), 73–80. <https://doi.org/10.24191/jeeir.v5i4.8838>
- Barbera, J., Naibert, N., Komperda, R. & Pentecost, T.C., 2020, 'Clarity on Cronbach's Alpha use', *Journal of Chemical Education* 98(2), 257–258. <https://doi.org/10.1021/acs.jchemed.0c00183>
- Bhatti, S.H., Hussain, W.M.H.W., Khan, J., Sultan, S. & Ferraris, A., 2024, 'Exploring data-driven innovation: What's missing in the relationship between big data analytics capabilities and supply chain innovation?', *Annals of Operations Research* 333(2), 799–824. <https://doi.org/10.1007/s10479-022-04772-7>
- Cahyono, Y., Purwoko, D., Koho, I., Setiani, A., Supendi, S., Setyoko, P. et al., 2023, 'The role of supply chain management practices on competitive advantage and performance of halal agroindustry SMEs', *Uncertain Supply Chain Management* 11(1), 153–160. <https://doi.org/10.5267/j.uscm.2022.10.012>
- Chatterjee, S., Chaudhuri, R., Vrontis, D. & Thrassou, A., 2023, 'Revisiting the resource-based view (RBV) theory: From cross-functional capabilities perspective in post COVID-19 period', *Journal of Strategic Marketing* 1–16. <https://doi.org/10.1080/0965254X.2023.2182447>
- Chavan, L. & Jindal, P., 2024, 'The power of cross-functional collaboration and market knowledge integration to achieve competitive advantages in the automobile sector', in I. Lee (ed.), *Innovative technologies for increasing service productivity*, pp. 233–243, IGI Global, Hershey, PA.
- Chavez, R., Yu, W., Jajja, M.S.S., Song, Y. & Nakara, W., 2022, 'The relationship between internal lean practices and sustainable performance: Exploring the mediating role of social performance', *Production Planning & Control* 33(11), 1025–1042. <https://doi.org/10.1080/09537287.2020.1839139>
- Cheung, G.W., Cooper-Thomas, H.D. & Lau, R.S., 2023, 'Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations', *Asia Pacific Journal of Management* 41, 1–39. <https://doi.org/10.1007/s10490-023-09871-y>
- Chileshe, M.J. & Phiri, J., 2022, 'The impact of supply chain management practices on performance of small and medium enterprises in developing countries: A case of agro-dealers in Zambia', *Open Journal of Business and Management* 10(2), 591–605. <https://doi.org/10.4236/ojbm.2022.102033>
- Creswell, J.W. & Creswell, J.D., 2018, *Research design: Qualitative, quantitative and mixed methods approach*, 5th edn., Sage, Los Angeles, CA.
- Diem Le, C.T., Pakurár, M., Kun, I.A. & Oláh, J., 2021, 'The impact of factors on information sharing: An application of meta-analysis', *PLoS One* 16(12), 1–24. <https://doi.org/10.1371/journal.pone.0260653>
- Dikotla, M.A., 2019, 'Knowledge sharing in selected municipalities of Limpopo Province, South Africa', *South African Journal of Libraries and Information Sciences* 85(1), 1–11. <https://doi.org/10.7553/85-1-1808>
- Dzikriansyah, M.A., Masudin, I., Zulfikarjah, F., Jihadi, M. & Jatmiko, R.D., 2023, 'The role of green supply chain management practices on environmental performance: A case of Indonesian small and medium enterprises', *Cleaner Logistics and Supply Chain* 6, 100100. <https://doi.org/10.1016/j.clscn.2023.100100>
- El Baz, J. & Ruel, S., 2020, 'Can supply chain risk management practices mitigate the disruption impacts on supply chains' resilience and robustness? Evidence from an empirical survey in a COVID-19 outbreak era', *International Journal of Production Economics* 233, 1–12. <https://doi.org/10.1016/j.ijpe.2020.107972>
- Eyaa, S. & Ntayi, J.M., 2010, 'Procurement practices and supply chain performance of SMEs in Uganda', *African Journal of Business Management* 4(2), 102–112.

- Fauziah, S., Rahardjo, K. & Utami, H.N., 2019, 'The effect of strategic supplier partnership and customer relationship on supply chain integration and business performance (study of red onion farmers in east java)', *Jurnal Sosial dan Humaniora* 22(1), 33–41.
- Frederico, G.F., 2021, 'Towards a supply chain 4.0 on the post-COVID-19 pandemic: A conceptual and strategic discussion for more resilient supply chains', *Rajagiri Management Journal* 15(2), 94–104. <https://doi.org/10.1108/RAMJ-08-2020-0047>
- Frederico, G.F., 2023, 'Rethinking strategic sourcing during disruptions: A resilience-driven process contribution to knowledge on supply chains', *Knowledge and Process Management* 30(1), 83–86. <https://doi.org/10.1002/kpm.1742>
- Gevers, J.M.P. & Van Weele, A.J., 2016, 'The impact of procurement on the success of project-based organizations', *Journal of Purchasing and Supply Management* 22(3), 179–188.
- Govender, C.M. & Jasson, C.C., 2018, 'Lean practices for efficiency in the South African hospitality sector', *African Journal of Hospitality, Tourism and Leisure* 7(2), 1–14.
- Gutierrez-Broncano, S., Rubio-Andres, M., Jimenez-Estevez, P. & Opute, J., 2024, 'Cross functional teams', in *Lean manufacturing in Latin America: Concepts, methodologies and applications*, pp. 515–538, Springer Nature Switzerland, Cham.
- Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E., 2018, *Multivariate data analysis*, 8th edn., Cengage Learning, Boston, MA.
- Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., Danks, N.P. & Ray, S., 2021, 'Evaluation of reflective measurement models', in M. Sarstedt, C.M. Ringle & J.F. Hair (eds.), *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook*, pp. 75–90, Springer, Cham.
- Hassan, A. & Nasereddin, H., 2018, 'Importance of information sharing in supply chain and knowledge leakage', *Transylvanian Review* 26(26), 6769–6775.
- Hussain, Z., Jusoh, A.B., Sarfraz, M. & Wahla, K.U.R., 2018, 'Uncovering the relationship of supply chain management and firm performance: Evidence from textile sector of Pakistan', *Information Management and Business Review* 10(2), 23–29. <https://doi.org/10.22610/imbr.v10i2.2389>
- Igbinenikaro, O.P., Adekoya, O.O. & Etukudoh, E.A., 2024, 'Fostering cross-disciplinary collaboration in offshore projects: Strategies and best practices', *International Journal of Management & Entrepreneurship Research* 6(4), 1176–1189. <https://doi.org/10.51594/ijmer.v6i4.1006>
- Janaki, D., Izadbacksh, H. & Hatefi, S., 2018, 'The evaluation of supply chain performance in the oil products distribution company using information technology indicators and fuzzy TOPSIS technique', *Management Science Letters* 8(8), 835–848. <https://doi.org/10.5267/j.msl.2018.6.004>
- Jordan, P.J. & Troth, A.C., 2020, 'Common method bias in applied settings: The dilemma of researching in organizations', *Australian Journal of Management* 45(1), 3–14. <https://doi.org/10.1177/0312896219871976>
- Juma, L., 2021, 'The role of strategic sourcing in facing uncertainty of the manufacturing business environment during COVID-19', *International Journal of Innovation, Creativity and Change* 15(2), 532–546.
- Kalamaris, B., 2023, *Benefits of strategic sourcing and supply chain management*, viewed 06 February 2024, from <https://www.linkedin.com/pulse/benefits-strategic-sourcing-supply-chain-management-bill-kalamaris/>.
- Kaondera, P.R., Chikazhe, L., Munyi, T.F. & Nyagadza, B., 2023, 'Buttressing customer relationship management through digital transformation: Perspectives from Zimbabwe's commercial banks', *Cogent Social Sciences* 9(1), 2191432. <https://doi.org/10.1080/23311886.2023.2191432>
- Karakaya, N. & Kiliç, M., 2021, 'Turkish adaptation of the workplace breastfeeding support scale: A validity and reliability study', *Samsun Sağlık Bilimleri Dergisi* 6(10), 721–736. <https://doi.org/10.47115/jsbs.1029188>
- Kerruish, C., 2016, *Supply management: Strategic sourcing*, Springer, New York, NY.
- Ko, C-H. & Chou, C-M., 2021, 'Apply the SERVQUAL instrument to measure service quality for the adaptation of ICT technologies: A case study of nursing homes in Taiwan', *Healthcare Journal* 9(108), 1–16. <https://doi.org/10.3390/healthcare8020108>
- Kowalska, K. & Ostreğa, A., 2020, 'Application of lean management in the construction industry: A case study', *Procedia Manufacturing* 46, 233–240. <https://doi.org/10.1016/j.promfg.2020.03.034>
- Kwak, D.W., Seo, Y.J. & Mason, R., 2018, 'Investigating the relationship between supply chain innovation, risk management capabilities and competitive advantage in global supply chains', *International Journal of Operations & Production Management* 38(1), 2–21. <https://doi.org/10.1108/IJOPM-06-2015-0390>
- Langton, I. & Mafini, C., 2023, 'Small and medium business transformational leadership and supply chain management', *Journal for Transdisciplinary Research in Southern Africa* 19(1), a1347. <https://doi.org/10.4102/td.v19i1.1347>
- Langton, I., Maotoawe, N. & Mafini, S., 2023, 'Financial performance and green supply chain management in a South African national electrical energy provider', *Southern African Business Review* 27, 13564. <https://doi.org/10.25159/1998-8125/13564>
- Li, S., Ragu-Nathan, B., Ragu-Nathan, T. & Rao, S.S., 2006, 'The impact of supply chain management practices on competitive advantage and organisational performance', *Omega* 34(2), 107–124. <https://doi.org/10.1016/j.omega.2004.08.002>
- Mabotja, T., Molokomme, K. & Ngcobo, N., 2024, 'Reforming public sector supply chains in Limpopo: Unveiling governance challenges and strategic imperatives', *International Journal of Research in Business & Social Science* 13(10), 25–37. <https://doi.org/10.20525/ijrbs.v13i10.3749>
- Mackay, J., Munoz, A. & Pepper, M., 2020, 'Conceptualising redundancy and flexibility towards supply chain robustness and resilience', *Journal of Risk Research* 23(12), 1541–1561. <https://doi.org/10.1080/13669877.2019.1694964>
- Makamedi, M.E. & Faku, E.M., 2024, 'Relationship between municipality supply chain management practices and the strategies for managing information systems in South African municipalities', *African Journal of Public Administration and Environmental Studies (AJOPAES)* 3(2), 221. <https://doi.org/10.31920/2753-3182/2024/v3n2a11>
- Makoe, T., 2023, 'Widespread service delivery protests hamper our society's progress', *Sunday Independent*, 08 October, viewed 11 December 2024, from <https://iol.co.za/sundayindependent/analysis/2023-10-08-widespread-service-delivery-protests-hamper-our-societys-progress/>
- Maramura, T.C. & Ruwanika, J.M., 2023, 'Identifying the challenges in SCM: Evidence from Mangaung Metropolitan Municipality', *Cogent Business & Management* 10(2), 1–17. <https://doi.org/10.1080/23311975.2023.2217640>
- Marculetiu, A., Ataseven, C. & Mackelprang, A.W., 2023, 'A review of how pressures and their sources drive sustainable supply chain management practices', *Journal of Business Logistics* 44(2), 257–288. <https://doi.org/10.1111/jbl.12332>
- Masitenyane, L.A. & Mokoena, B.A., 2023, 'Dimensional analysis of service fairness on service quality and customer satisfaction: A local municipality study', *African Journal of Inter/Multidisciplinary Studies* 5(1), 1–12. <https://doi.org/10.51415/ajims.v5i1.1056>
- Masson, E., 2023, 'Data shows that service delivery protests will increase, intensify in 2023', *Mail & Guardian*, 02 February, viewed 11 December 2024, from <https://mg.co.za/news/2023-02-02-data-shows-that-service-delivery-protests-will-increase-intensify-in-2023/>
- Moloi, N., 2024, 'A look at service delivery protests across the nation', *South African Broadcasting Corporation*, 19 March, viewed 08 January 2025, from <https://elections.sabc.co.za/elections2024/news/infographic-a-look-at-service-delivery-protests-amid-2024-elections/>
- Monostori, J., 2018, 'Supply chains' robustness: Challenges and opportunities', *Procedia CIRP* 67, 110–115. <https://doi.org/10.1016/j.procir.2017.12.185>
- Mudzusi, T.N., Munzhezzi, P.H. & Mahole, E., 2024, 'Governance challenges in the provision of municipal services in the Vhembe District Municipality', *Africa's Public Service Delivery & Performance Review* 12(1), 10. <https://doi.org/10.4102/apsdpr.v12i1.749>
- National Treasury, 2005, *Implementation guidelines: SCM: A guide for accounting officers of municipalities and municipal entities*, viewed 11 June 2021, from <http://mfma.treasury.gov.za/Circulars/Pages/Circular25.aspx>.
- Ngo, V.M., Quang, H.T., Hoang, T.G. & Binh, A.D.T., 2024, 'Sustainability-related supply chain risks and supply chain performances: The moderating effects of dynamic supply chain management practices', *Business Strategy and the Environment* 33(2), 839–857. <https://doi.org/10.1002/bse.3512>
- Nzama, L., Moloi, T.M. & Marx, B., 2023, 'Measures that may assist non-performing municipalities in improving their performance', *Journal of Local Government Research and Innovation* 4, 1–15. <https://doi.org/10.4102/jolgriv4i0.136>
- Nzimakwe, T.I., 2023, 'Procurement in state-owned enterprises and its implications on service delivery in South Africa', *African Journal of Public Affairs* 14(1), 1–18.
- Patowarya, J., 2019, *Ultimate guide to contract management: Benefits & best practices*, viewed 13 September 2021, from <https://publication.sipmm.edu.sg/major-considerations-mitigating-procurement-crisis/>.
- Pavlov, G., Shi, D., Maydeu-Olivares, A. & Fairchild, A., 2021, 'Item desirability matching in forced-choice test construction', *Personality and Individual Differences* 183, 111114. <https://doi.org/10.1016/j.paid.2021.111114>
- Phakathi, P.S., Schutte, D.P. & Mulati, S.P., 2024, 'An assessment of the drivers of unauthorised, irregular, and wasteful expenditure in the City of Tshwane Metropolitan Municipality', *Southern African Journal of Accountability and Auditing Research* 26(1), 1–14. <https://doi.org/10.54483/sajaar.2024.26.1.8>
- Pimenta, M.L., Da Silva, A.L. & Tate, W.L., 2014, 'Developing and managing cross-functional teams: A multi-case study of Brazilian manufacturing companies', *Journal of Technology Management & Innovation* 9(2), 1–16. <https://doi.org/10.4067/S0718-27242014000200001>
- Qiao, X., Mahmood, F., Ahmad, B., Bashir, M. & Bari, M.W., 2023, 'Workplace conflicts and knowledge hiding: Mediating role of relational psychological contract breach', *Heliyon* 9(7), 1–12. <https://doi.org/10.1016/j.heliyon.2023.e17683>
- Ramphoma, S.S., 2020, 'Supply chain management for service delivery in the Lejweleputswa municipal district', PhD thesis, University of the Free State.
- Reddy, P.S., 2016, 'The politics of service delivery in South Africa: The local government sphere in context', *Journal for Transdisciplinary Research in Southern Africa* 12(1), 337. <https://doi.org/10.4102/td.v12i1.337>
- Ruwanika, J.M. & Maramura, T.C., 2024, 'Role of service providers in ensuring effective service delivery in Mangaung Metropolitan Municipality', *Cogent Business & Management* 11(1), 2315695. <https://doi.org/10.1080/23311975.2024.2315695>
- Saad, N., & Elgazzar, S. & Mlaker Kač, 2022, 'Linking supply chain management practices to customer relationship management objectives: A proposed framework', *Business: Theory and Practice* 23, 154–164. <https://doi.org/10.3846/btp.2022.15475>
- Saisridhar, P., Thurer, M. & Avittathur, B., 2023, 'Assessing supply chain responsiveness, resilience and robustness (Triple-R) by computer simulation: A systematic review of the literature', *International Journal of Production Research* 62(4), 1–31.
- Sanders, M.N.R., 2018, *Supply chain management: A global perspective*, 2nd edn., Wiley, New York, NY.
- Sarmiento, R.P. & Costa, V., 2019, *Confirmatory factor analysis - A case study*, viewed 06 February 2024, from <https://doi.org/10.48550/arXiv.1905.05598>

- Seker, M. & Muller, E., 2023, 'Municipalities, innovation and resilience', *Open Journal of Business and Management* 11, 3332–3342. <https://doi.org/10.4236/ojbm.2023.116181>
- Seo, Y.J., Dinwoodie, J. & Kwak, D.W., 2014, 'The impact of innovativeness on supply chain performance: Is supply chain integration a missing link?', *Supply Chain Management: An International Journal* 19(5/6), 733–746.
- Setino, R. & Ambe, I.M., 2016, 'Supply chain management practices in state-owned enterprises environment', *Risk governance & Control: Financial Markets & Institutions* 6(4–3), 380–391. <https://doi.org/10.22495/rcgv6i4c3art3>
- Setiono, B.A. & Hidayat, S., 2022, 'Influence of service quality with the dimensions of reliability, responsiveness, assurance, empathy and tangibles on customer satisfaction', *International Journal of Economics, Business and Management Research* 6(9), 330–341. <https://doi.org/10.51505/IJEBMR.2022.6924>
- Shamout, M.D., 2019, 'Does supply chain analytics enhance supply chain innovation and robustness capability?', *Organizacija* 52(2), 95–106. <https://doi.org/10.2478/orga-2019-0007>
- Sibanda, M.M., Zindi, B. & Maramura, T.C., 2020, 'Control and accountability in supply chain management: Evidence from a South African metropolitan municipality', *Cogent Business & Management* 7(1), 1785105. <https://doi.org/10.1080/23311975.2020.1785105>
- Singh, S., 2021, 'The efficacy of strategic customer relationship management in South African business-to-business organisations', Master's dissertation, University of Witwatersrand.
- Singh, S. & Singh, S., 2019, 'Supply chain management practices: Impediments to service delivery in the department of justice and constitutional development', *Expert Journal of Business and Management* 7(2), 209–220.
- Solaimani, S. & Van der Veen, J., 2022, 'Open supply chain innovation: An extended view on supply chain collaboration', *Supply Chain Management: An International Journal* 27(5), 597–610. <https://doi.org/10.1108/SCM-09-2020-0433>
- Stanley, L.M. & Edwards, M.C., 2016, 'Reliability and model fit', *Educational and Psychological Measurement* 76(6), 976–985. <https://doi.org/10.1177/0013164416638900>
- Sukati, I., Abdul Hamid, A.B., Baharun, R., Tat, H.H. & Said, F., 2012, 'A study of supply chain management practices: An empirical investigation on consumer goods industry in Malaysia', *International Journal of Business and Social Science* 2(17), 166–176.
- Sutcliffe, M. & Bannister, S., 2023, 'Local government in 2023: How full is the glass?', *The African*, 29 December, p. 1.
- Szczepański, M., 2021, *Resilience of global supply chains Challenges and solutions*. European Parliamentary Research Service, viewed 13 May 2023, from [https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698815/EPRS_BRI\(2021\)698815_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698815/EPRS_BRI(2021)698815_EN.pdf).
- Tang, L., Yang, T., Tu, T. & Ma, Y., 2021, 'Supply chain information sharing under consideration of bullwhip effect and system robustness', *Flexible Services and Manufacturing Journal* 33, 337–380. <https://doi.org/10.1007/s10696-020-09384-6>
- Tauté, N., 2020, 'The use of collaborative partnerships to improve service delivery in South African local government', *Journal of Contemporary Management* 17(2), 62–85. https://doi.org/10.35683/jcm20_8.132
- Todo, Y., Oikawa, K., Ambashi, M., Kimura, F. & Urata, S., 2023, 'Robustness and resilience of supply chains during the COVID-19 pandemic', *World Economy* 46(6), 1843–1872. <https://doi.org/10.1111/twec.13372>
- Vala, B., 2022, 'Assessment of the efficacy of the legislative framework for greywater management in three selected municipalities in South Africa', Doctoral dissertation, Cape Peninsula University of Technology.
- Valenzuela, S. & Bachmann, I., 2017, 'Path analysis', in *International Encyclopedia of communication research methods*, John Wiley and Sons, New Jersey, NJ.
- Van der Walldt, G., 2016, *Managing for excellence in the public sector*, 3rd edn., Juta, Cape Town.
- Wang, B., Van Fan, Y., Chin, H.H., Klemes, J.J. & Liang, Y., 2020, 'Emission-cost Nexus optimization and performance analysis of downstream oil supply chains', *Journal of Clean Production* 266(12), 18–31. <https://doi.org/10.1016/j.jclepro.2020.121831>
- West, S. G., Wu, W., McNeish, D., & Savord, A., 2023, 'Model fit in structural equation modeling'. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling*, 2nd edn., pp.184-205, Guilford Press, New York.
- Willy, M. & Njeru, A., 2014, 'Effects of procurement planning on procurement performance: A case study of agricultural development corporation, Nairobi', *International Journal of Business and Commerce* 3(12), 58–68.
- Yekani, B., Ngcamu, S.B. & Pillay, S., 2024, 'Management and leadership considerations for managing effective monitoring and evaluation systems in South African municipalities', *Journal of Local Government Research and Innovation* 5, 1–8. <https://doi.org/10.4102/jolgr.v5i0.154>
- Zindi, B. & Sibanda, M.M., 2022, 'Barriers to effective supply chain management: The case of a metropolitan municipality in the Eastern Cape', *Journal of Local Government Research and Innovation* 3, 54. <https://doi.org/10.4102/jolgr.v3i0.54>
- Zygiaris, S., Hameed, Z., Ayidh Alsubaie, M. & Ur Rehman, S., 2022, 'Service quality and customer satisfaction in the post pandemic world: A study of Saudi auto care industry', *Frontiers in Psychology* 13, 842141. <https://doi.org/10.3389/fpsyg.2022.842141>