Assessing the influence of supply chain collaboration on the performance of manufacturing SMEs in Rwanda

Alexis Uwamahoro
University of Rwanda, Kigali, Rwanda
Simon Peter Nadeem
Centre for Supply Chain Improvement, University of Derby, Derby, UK, and
Noor Shale Ismail and Elizabeth Wachiuri
Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya

Abstract

Purpose – This research examines how supply chain collaboration, underpinned by stakeholder trust, information sharing and strategic partnerships, impacts the performance of manufacturing SMEs in Rwanda. The focus on manufacturing SMEs is due to their vital role in the economy and their distinctive resource dynamics.

Findings – The study demonstrates that supply chain collaboration, particularly through strategic partnerships and stakeholder trust, positively impacts supply chain performance. While information sharing's influence is currently limited by technological constraints, the findings highlight the need for a comprehensive approach to address existing challenges and emphasise the crucial roles of stakeholders and policymakers in supporting SMEs' performance.

Research limitations/implications – This research contributes to a broader understanding of supply chain collaboration, its impact on performance, its interactions with other organisational factors and its implications for managerial decision-making, academic research and supply chain partnerships.

Originality/value – This research is one of the few to demonstrate the impact of supply chain collaboration on the performance of manufacturing SMEs in developing countries, particularly Rwanda.

Keywords Strategic partnership, Stakeholder trust, Information sharing, Manufacturing SMEs

Paper type Research paper

1. Introduction

The global business environment has changed the dynamics of businesses to strive on the basis of their supply chain (SC) competitiveness (Panahifar *et al.*, 2018). Collaboration within the

SC is crucial to enhance the organisational and operational performance of companies and their respective SC. In Rwanda's developing manufacturing sector, understanding the impact of SC collaboration on the performance of manufacturing SMEs is essential. Collaboration refers to a model where organisations work together to satisfy customers, while integration describes a model where an organisation meets customer needs without a unified structure (Fernando and Wulansari, 2020). Information sharing enables the integration through different techniques such as Vendor-Managed inventory (VMI), Collaborative Planning Forecasting and Replenishment (CPFR), and Efficient Consumer Response (ECR) (Panahifar *et al*., 2018). By effectively managing supply chains, companies can strategically create value and gain a competitive edge (Baah *et al*., 2022; Nguyen Thi and Nguyen Thi Thu, 2022). Therefore, understanding the influence of SC collaboration on the performance of manufacturing SMEs is crucial for stakeholders and policymakers to develop a comprehensive and strategic approach to existing challenges (Lixu Li *et al*., 2023).

Practitioners and researchers emphasise collaboration and integration as essential elements in the SC to enhance long-term organisational performance (Zhong *et al*., 2023; Fernando and Wulansari, 2020). Collaboration between firms can yield benefits beyond financial gains, such as improved product development and expanded customer networks, leading to increased customer satisfaction (De Oliveira *et al*., 2022; Nguyen Thi and Nguyen Thi Thu, 2022). It can also help reduce transaction costs and clarify uncertainties through information sharing, which is essential for resolving operational issues related to product delivery, order replenishment, and other processes (Lixu Li *et al*., 2023). Although collaboration with partners can offer numerous benefits, it may be insufficient if not paired with technology to maximise learning outcomes and improvements (Huo *et al*., 2021; Kamble *et al*., 2020). Manufacturing firms can achieve performance while sharing timely and accurate data (Panahifar *et al*., 2018) as the quality of information significantly influences collaboration between partners (Baah *et al*., 2022). At the same time, visibility helps build trust and loyalty, which is essential for productive collaboration (Kauppi *et al*., 2023). Leveraging the benefits of Supply Chain Collaboration (SCC) can help companies reduce overall costs and enhance SC performance, ultimately leading to increased profitability and competitiveness in the market (Zhong *et al*., 2023; Fernando and Wulansari, 2020).

Understanding the reasons for manufacturing SMEs' underperformance is crucial. Previous research on SCC in SMEs has primarily focused on the importance and impact of SCC on key performance measures. For instance, Biraori Oteki (2021) examined the impact of collaboration on SC performance by studying a manufacturing SME in Uganda. Kospir *et al.* (2022) examined the factors affecting manufacturing sectors in Kenya, while Sundram *et al.* (2020) demonstrated minimal collaboration and its repercussions in Malaysian SMEs. Baah *et al.* (2022) investigated and identified barriers to SME collaboration in Ghana. SMEs must overcome global challenges to adopt SCC. These challenges may vary between developed and developing countries. SMEs in developed economies generally have access to superior technology and more readily available government assistance. Conversely, SMEs in developing countries often perceive these factors as substantial obstacles to effective collaboration (Kamble *et al*., 2020). In the context of Rwanda (Sentama, 2014), "*Imihigo*" (performance contracts) promotes participation, accountability, and performance through target-setting and monitoring, which can enhance SCC.

Manufacturing SMEs in Rwanda play a critical role in the country's economic development (IMF, 2022). They make up more than 75% of the industry and are responsible for creating job opportunities. However, their performance can be significantly impacted by the efficiency of their SCs. According to the International Finance Corporation (IFC) (2022) report, Rwandan SMEs have an average return on investment (ROI) of 20%. Compared to other African countries, Rwanda's favourable business environment and government support for SMEs have contributed to their impressive average ROI of 20%. Despite this, the manufacturing sector's contribution to the economy is still lower than other industries, such as agriculture, energy, ICT, financial services, and transportation. It is worth noting that over 70% of registered firms

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in developing countries are known to shut down during their first two years of operation (IMF, 2022; National Bank of Rwanda *et al*., 2020). However, studies by Mofokeng and Chinomona (2019) Sudusinghe and Seuring (2022) have indicated that one of the factors hindering the competitiveness of manufacturing SMEs in developing countries is their reluctance to collaborate with other partners. These include long-term partnerships, integration to ensure timely responses and quality, and collaboration for flexibility and unique capabilities. Although previous studies have highlighted the benefits of collaboration, there is still much to learn. Scholars argue that the full impact of cooperation on firm performance is not fully explored, especially in developing countries. Additionally, some manufacturing SMEs have not realised the performance gains of collaboration and integration (Mofokeng and Chinomona, 2019). Authors argue that previous research has focused largely on developed countries and that the unique challenges faced by SMEs in developing countries like Rwanda have not been adequately explored. Therefore, this study sought to contribute to the literature by examining the relationship between information sharing and SCC specifically in the context of Rwandan manufacturing SMEs. By doing so, the study aims to provide insights that could be useful for policymakers and practitioners working to support SMEs in similar contexts. The study focused on the following research questions:

RQ1. How does strategic partnership influence the SC performance of manufacturing SMEs in Rwanda?

RQ2. What is the role of stakeholder trust in improving the SC performance of manufacturing SMEs in Rwanda?

RQ3. How does information sharing impact the SC performance of manufacturing SMEs in Rwanda?

The study has important implications for both the academia and the industry. It contributes to the empirical studies in SC management and the overall performance of manufacturing SMEs. It also highlights the different types of strategic collaboration that can improve SMEs' performance and evaluates various performance measures. The study offers valuable guidance to managers and owners of SMEs, emphasising the importance of a collaborative culture, careful partner selection, and utilisation of modern technologies for communication and information sharing.

The rest of the paper is organised as follows: section 2 discusses the relevant literature on SCC, stakeholder trust, information sharing, and SC strategic partnerships. Section 3 outlines the research design, data collection methods, and analysis techniques used to conduct the study. Section 4 presents the findings including the key drivers of SCC and their influence on SC performance. Section 5 interprets the results and compares them to previous research; it also discusses the implications for managers and policymakers. Section 6 concludes the main findings of the study and provides recommendations for future research.

2. Theoretical background

2.1 Supply chain collaboration

Barratt (2004) defines the term "Collaboration" as the joint efforts by two or more companies to share assets, finance, resources, and operational practices to achieve predefined goals and gain benefits. Studies show that SC Collaboration is the only way to sustain SC competitiveness (Panahifar *et al*., 2018). Collaborative SCs generally have the following characteristics: collaboration communication, shared platforms, transparency, goals, and integration of information systems. SC collaboration has primarily concentrated on determining the best structure to lower operational costs associated with ordering quantities or assessing levels under particular demand assumptions (Linze Li *et al*., 2024). Despite significant advancements in collaborative methodologies over the last 25 years, challenges

continue to arise when working with stakeholders. (Barratt, 2004). The common characteristic shared by most of these collaborative systems is that sharing information takes precedence over internal information retention. Scholars and professionals advocate that improved communication throughout a SC is essential for collaboration. The benefits include mitigating bullwhip impact, reduced costs of production, shipping, and inventory, and enhanced coordination. The study uses the Resource-based View Theory (RBV) and the Relational View Theory (RV) to theoretically understand the linkage between collaboration integration and SC performance. The RBV theory affirms that SC networks offer distinctive resources that allow businesses a competitive advantage (Porter, 1985). For instance, SC collaboration is essential for offering relational rent. The theories also argue that SC network has unique capabilities allowing investments in assets, developing inter-firm knowledge sharing, exploiting opportunities, and promoting a culture of shared activities and risks (Rahman, 2023; Porter, 1985).

Scholars such as Sudusinghe and Seuring (2022) and Panahifar *et al*. (2018) stress that managing the operational complexity of supply networks requires collaborative solution formation. Lixu Li *et al*. (2023) argue that more comprehensive strategies are needed to encourage cooperation amongst SC players in the upstream, midstream, and downstream domains. Effective SC partnerships require collaboration among all stakeholders, including third-party logistics, to create a competitive edge. The findings support the argument of Shin *et al*. (2019) that collaboration can increase production by reducing costs and improving operational capabilities. Vergara *et al*. (2023) further affirm that collaborative integration can improve production efficiency while reducing costs, enhancing operational capabilities, and incorporating environmental sustainability practices. This approach emphasises long-term partnerships and sustainable production practices (Shah and Soomro, 2021). However, the focus of these studies being mainly on financial performance overlooks the importance of environmental sustainability in evaluating collaborative success.

2.2 Strategic partnership and performance
In strategic SC partnerships, manufacturers, suppliers, and customers are the key players and pillars (Mofokeng and Chinomona, 2019). By focusing on both internal and external supply chains, strategic partnerships can help businesses optimize their operations, reduce costs, and minimise risks and uncertainties related to SC activities. SC partnerships promote collaboration, trust, and transparency, keeping participants informed about market changes (Mofokeng and Chinomona, 2019; Formentini and Romano, 2016). Strategic partnerships focus on long-term contracts establishing the terms and conditions, relationships, and specific clauses, with flexibility in the terms of the contract for mutual benefits facilitating SC coordination (Shin *et al*., 2019; Sudusinghe and Seuring, 2022). SC partnership also enables cooperation and increases profitability, and system efficiency for all stakeholders (Panahifar *et al*., 2018). On the other hand**,** Panahifar *et al*. (2018) and Nguyen Thi and Nguyen Thi Thu (2022) suggest that a business can only achieve its objectives by focusing on its responsiveness to suppliers and customers. Building trust with partners is essential for open communication and collaboration within the supply chain. Hence, it is essential to find solutions, work through problems, and encourage ongoing collaboration and communication (Panahifar *et al*., 2018). Clear partnership goals are essential for fostering collaboration and enhancing supply chain performance. Therefore, the first hypothesis is developed that:

H1. Strategic partnership positively and significantly influences the SC performance of manufacturing SMEs in Rwanda.

2.3 Stakeholder trust and supply chain performance
Building strong relationships in the supply chain requires trust and effective information management (Ruel *et al*., 2018). Ruel *et al*. (2018) and Kauppi *et al*. (2023) highlight three

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qualities that make up trust: *dependability, fairness*, and *reliability*. Firstly, it is important to establish trust with SC partners to encourage collaboration. Secondly, a long-term partnership agreement should be in place to reduce the difficulties in keeping partners' confidence. Thirdly, Managers can play a crucial role in eliminating mistrust between SC partners and creating a positive and collaborative environment (Kauppi *et al.*, 2023; Baah *et al.*, 2022). A SC based on trust can reduce transaction costs, risks, and uncertainty. A reliable environment fosters competitiveness, knowledge sharing within and between businesses, and flexibility in response to shifting market conditions. The trust mechanism necessitates that the company allocate significant resources to studying the market and its trends (Ruel *et al.*, 2018), ensuring that it remains well-informed and responsive to changing conditions.

In the context of business relationships, the importance of interpersonal interactions in partnership trust is an essential element that promotes cooperation (Panahifar *et al.*, 2018). Trust is fundamental to all contacts in the electronic market and can be used to promote supplier-customer cooperation in SC management (Zhong *et al.*, 2023; Koolwijk *et al.*, 2022; Formentini and Romano, 2016). A trusting environment serves as a mechanism for intra-firm and inter-firm knowledge dissemination, thereby promoting competitive advantage and adaptability to market fluctuations (Panahifar *et al.*, 2018). Focusing on "Imihigo" (performance contracts) in Rwanda, David Booth *et al.* (2018) helped to align the efforts of different actors in the SC towards a common goal, which in turn resulted in improved collaboration and trust. The literature review suggests that trust plays a pivotal role in enhancing SC performance, fostering improved communication between suppliers and customers, and cultivating commitment, cooperation, and knowledge exchange among SC stakeholders. Therefore, the second hypothesis for this study is defined as:

H2. Stakeholder trust positively and significantly influences the SC performance of manufacturing SMEs in Rwanda.

2.4 Information sharing and supply chain collaboration

Scholars such as Lixu Li *et al.* (2023) Vafaei-Zadeh *et al.* (2020) and Nguyen Thi and Nguyen Thi Thu (2022) argue that real-time SC data offers a trustworthy indicator of information quality in the SC. Zhong *et al.* (2023) argue that both internal and external information sharing downstream and upstream must be balanced in the pursuit of SC performance. Insufficient data for planning and forecasting weakens the trust between parties and makes it easier for the SC system to make inaccurate decisions (Kauppi *et al.*, 2023). Scholars such as Nguyen Thi and Nguyen Thi Thu (2022) and Lixu Li *et al.* (2023) underscored that an information-centred collaborative SC should incorporate data on inventory, demand, forecasts, production and shipment schedules, ongoing activities and data accuracy, timeliness, and transparency to reduce information asymmetry. Panahifar *et al.* (2018) highlight that sharing-centred collaboration, like CPFR, cannot work without a secure IT infrastructure for information sharing. It indicates that working together is essential, and safe information-sharing tools are part of that. It makes sense that certain partners could be hesitant to contribute sensitive data, such as financial reports, manufacturing schedules and plans, and inventory levels and values, to platforms in case the integrated systems are not secure enough.

Enhanced information sharing fosters supply chain collaboration, leading to increased agility, flexibility, and cost reductions while mitigating the bullwhip effect and improving coordination for faster responses (Panahifar *et al.*, 2018). To reduce lead times and inventory costs, collaborative systems like Vendor Managed Inventory (VMI) and CPFR are enabled due to information-sharing. The exchange of data regarding inventory levels helps decision-makers make better choices regarding transshipment, order replenishment, and where to put safety stock. VMI helps to oversee the supplier activities and share accurate information. At the same time, VMI helps the supplier monitor the movement of the stock and advises the

client on important issues, such as replacing inventory. In this instance, managing information sharing and security is necessary to optimise the benefits of business collaboration. In this context, a third hypothesis for this study is defined as:

H3. Information sharing positively influences the SC performance of manufacturing SMEs in Rwanda.

2.5 Supply chain collaboration and supply chain performance

The term "supply chain performance" refers to the degree to which a company's SC effectively handles all activities required to serve the final customer in the SC (Flynn *et al.*, 2010). They include order-taking, purchasing, production, packaging, quality controls, and outbound logistics activities. The metrics to measure the performance of the SC include production rate, input and output levels, and environmental sustainability (Shah and Soomro, 2021). Modern technology assists in increasing SC visibility and enhances shareholders' trust (Tiwari, 2021; Tarigan *et al.*, 2021). A few major technologies utilised are Radio Frequency Identification Devices (RFID), Artificial Intelligence (IT), Internet of Things (IoT) and others to improve workflow and communication. Integrated information systems and data-sharing structures among SC partners improve operation performance. VMI and CPFR offer significant potential for manufacturing firms to optimize their supply chains, reduce costs, and improve sustainability (Panahifar *et al.*, 2018). Nevertheless, it may be difficult for many suppliers to embrace the advantages of teamwork when they do not share accurate information (Betti and Basso, 2019). There is still confusion over the number of collaboration partners, the duration of the agreements governing the cooperation, and the total number of investments made. Building and maintaining long-term, profitable, mutually rewarding relationships between the stakeholders is crucial for organisational success and customer satisfaction (Zhong *et al.*, 2023).

The evaluation of manufacturing organisations involves assessing whether the strategic goals they set are aligned with and provide relevant data and insights for measuring the performance of their SCs. (Saleheen and Habib, 2023). These characteristics provide a framework for locating and evaluating solutions that help satisfy the needs for choices that improve business operations. Performance measuring is the process of determining the effectiveness and efficiency of an action. Metrics include things like process management within the organisation, clear roles and duties, continuous learning, and model success (Takayabu, 2024). It is essential to evaluate each SC's performance independently to consider industry-specific regulations. There are two types of approaches to measure the performance of manufacturing firms, financial and non-financial. Information technology integration, safety stock, feedback, and self-evaluation are some of the techniques (Zhou and Li, 2020) to measure performance. Among the many methods used in modern performance measurement are return on assets (ROA), return on investments (ROI), and customer satisfaction. Balanced Scorecard proposes four main perspectives for evaluating performance, gathering different viewpoints on finances, customers, business operations, and organisational learning.

Smooth and timely exchange of accurate information among SC networks is essential to the performance of the SC (Daghar *et al.*, 2021; Zhong *et al.*, 2023). Research shows that SC networks with larger information volumes outperform those with lower information volumes (Min *et al.*, 2005; Panahifar *et al.*, 2018; Lixu Li *et al.*, 2023). SC collaboration enhances stakeholder visibility, improves performance, and facilitates flexibility through reduced costs and better market adaptability (Panahifar *et al.*, 2018). Tools like CPFR, VMI, and joint planning software can support these efforts. Furthermore, SC integration and visibility can significantly reduce the bullwhip effect, leading to more efficient operations and reduced costs. Figure 1 below explains how SCC influences SC performance through strategic partnerships, stakeholder trust, and information sharing.
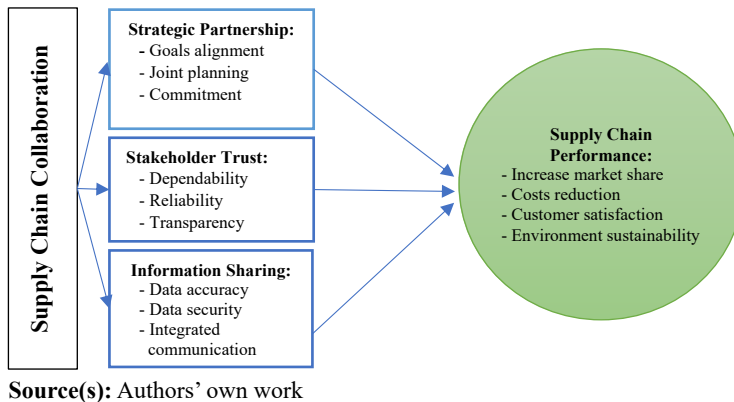
Source(s): Authors' own work

Figure 1. Conceptual model

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3. Research sample and methodology

The research focused on manufacturing SMEs operating in Kigali City, Musanze, Rwamagana, and Muhanga Towns of Rwanda for at least three years. A total of 682 manufacturing SMEs were categorised into seven clusters based on their primary products: wood, lumber, leather, food and beverage, rubber and plastic, stationery, textiles, and others. The study's population was managers, chief executive officers, assistant managers, and presidents of the manufacturing SMEs as they are in the best position to share knowledge about the relationship between organisational performance and SC performance.

A random sample of 252 firms was selected from four provinces: Rwamagana, Muhanga, Kigali City, and Musanze. Purposive sampling was used to identify key informants within these firms, including CEOs, managers, and SC professionals with experience in procurement, sales, and supplier/customer management. Data was collected using a mixed-methods approach. An open-ended questionnaire was distributed both in person and electronically. Additionally, semi-structured interviews were conducted with selected CEOs and managers to gain deeper insights into organisational and SC performance.

A team of research assistants, trained by the project's lead academic, spent four months (March to June 2023) collecting data. After scrutiny and screening of 227 completed questionnaires, 14 were excluded due to incomplete responses, resulting in a valid response rate of 94% (213 questionnaires), the respondent's profile is presented in Table 1.

Questionnaire items were measured using a five-point Likert scale, from one being strongly disagree to five being strongly agree (Gunasekaran *et al.*, 2017). Open-ended questions were included to allow respondents to provide additional context and insights. SPSS (Statistical Package for the Social Sciences) was used for data analysis, including descriptive statistics, inferential statistics, correlation analysis, regression analysis, and factor analysis. The aim was to analyse the connection between SC collaboration and SCP of manufacturing SMEs. In addition to quantitative data, semi-structured interviews were conducted with manufacturing SME managers and owners. The interview data was thematised to provide a comprehensive analysis of the collected information, as shown in Figure 2.

3.1 Non-response bias, common method bias

The common method bias was assessed using Harman's one-factor test to ensure the sufficiency of the model constructs measures. Exploratory factor analysis (EFA) was conducted on all observable variables. Harman's one-factor test results indicate whether a single component explains the majority (more than 50%) of the cumulative variation. A *T*-test

Table 1. The respondents' profile

| Firms characteristics	Frequency	Percentage (%)
Number of employees		
<10	12	5
11–50	35	17
51–100	49	23
101–500	44	21
>500	73	34
Total	*213*	*100*
Products types		
Food and beverage	49	17
Textile and garments	36	16
Metal and allied	10	10
Chemical and allied products	13	24
Coffee and tea processing	37	11
Building and construction materials	35	10
Plastics and rubber	33	12
Total	*213*	*100*
Work experience		
1–5	48	23
6–10	68	32
11–15	41	19
Over 5	56	26
Total	*213*	*100*
Job qualifications		
CEO/Owner/President	41	20
Manager	100	48
Assistant manager	53	26
Others	19	9
Total	*213*	*100*
Source(s): Authors' own work		

was employed to verify the absence of response bias by comparing the completion and return times of the questionnaire using the initial responses (Pallant, 2016). The two-sample *t*-tests did not reveal any significant difference between the two groups. The chi-square test was used to assess the firms' size and ownership demographics. Table 2 below presents the main demographics of the sample.

Since the analysis shows no statistically significant difference between the two groups, nonresponse bias issues are not present in this study. The questionnaire was deemed suitable for prospective CMV screening.

4. Study findings
4.1 Cronbach's α for validity and reliability
EFA was employed for each variable within the conceptual model (see Figure 1) to identify the non-directly observable variables (Pallant, 2016). This approach was deemed most suitable for the study as it allows for the identification of underlying factors in the data without making prior assumptions about their nature, unlike other methods. A more manageable set of components was identified to illustrate the relationships between the independent variables: strategic partnership, stakeholder trust, and information sharing for SC collaboration. The dependent variable is SC performance, explained by increased market share, customer satisfaction, reduced lead time, and increased profit. Cronbach's Alpha was used to evaluate

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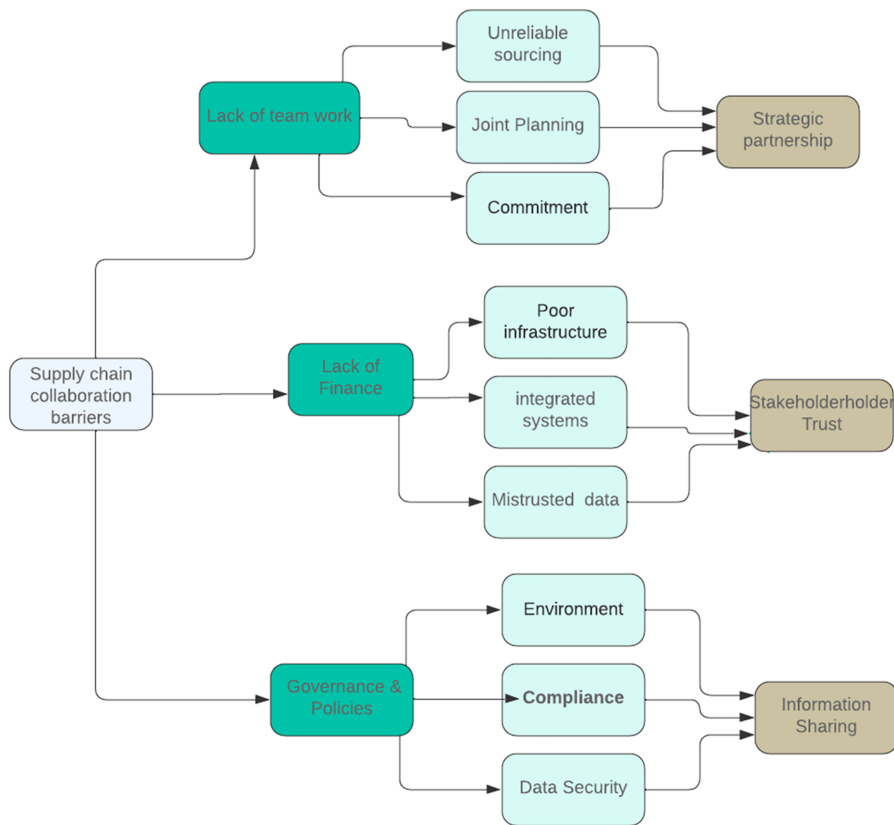
Source(s): Authors' own work

Figure 2. Supply chain collaboration barriers themes

the reliability of the constructs (0.085, 0.857, and 0.769 < 1). For an explanatory study, the reliability should be equal to or greater than 0.60 (Taherdoost and Group, 2017). In this study, for all variables, the values range from 0 to 1, with values closer to one denoting increased reliability.

Table 3 presents the results, indicating that all constructs are reliable, with scores exceeding the commonly used cutoff value of 0.70. Scale validity and reliability were measured using EFA (Watkins, 2018). The factor analysis application was validated using the Kaiser-Meyer-Olkin sample adequacy metric and the Bartlett Test of Sphericity, which examines the null hypothesis that the correlation matrix is an identity matrix. Factor loadings were extracted using SPSS version 26, and the t-values were greater than 0.5. The Average Value Extracted (AVE) and Composite Reliability (CR) values are higher than 0.50 and 0.80, respectively. Table 3 below indicates Cronbach's alpha, AVE, CR, and Collinearity Tests used in this study. The study employed the AVE to establish content validity, using indicators with outer loading scores ranging from 0.40 to 0.70. The AVE for strategic partnership was 0.634, while stakeholders' trust and information sharing scored 0.613 and 0.542, respectively. Based on these results, the methodology used in the study is considered effective in generating valuable outcomes.

All of the above outcomes confirm the uni-dimensionality of the measurement scale. Convergent Validity is established when each t-value at $p < 0.01$ is greater than 0.05.

Table 2. Main demographics of the sample

Segment	Items	Samples	Percentage (%)
Ownership	Private firms	85	39.90
	State owned firms	43	20.19
	Cooperative firms	26	12.20
	Foreign owned firms	24	11.27
	Joint ventures firms	35	16.43
Industry	Food and beverage	49	23
	Textile and garments	36	16.90
	Metal and allied	10	46.94
	Chemical and allied products	13	6.10
	Coffee and tea processing	37	17.37
	Building and construction materials	35	16.43
	Plastics and rubber	33	15.49
Firm size	Less than 300	54	25.35
	300–600	56	26.29
	600–1,200	33	15.49
	More than 1,200	37	17.37
Source(s): Authors' own work			

Table 3. Cronbach's alpha, AVE, CRs, and collinearity tests

Const-ructs	Mean	Standard deviations	ANOVA	Cronbach's alpha	Composite reliability	Average value extracted	Collinearity statistics tolerance	VIFs
SP	4.2128	0.40930	0.002	0.835	0.869	0.634	0.136	7.289
ST	4.1675	0.35478	0.000	0.857	0.878	0.613	0.132	7.623
I S	4.0731	0.47823	0.003	0.769	0.769	0.542	1.122	8.254
Source(s): Authors' own work								

Additionally, Discriminant Validity is confirmed for each construct as its square root of the AVE is higher than its corresponding correlation with each of the other components (Pallant, 2016). Collinearity tests are used to evaluate the degree of correlation between predictor variables in a regression model (Pallant, 2016). Collinearity may lead to unstable or erroneous estimations of the predictor effects and complicate model interpretation. Researchers can address collinearity by detecting it before conducting any research. Each component in this study was assessed for multicollinearity using the Variance Inflation Factor (VIF). Table 3 indicates the value of every VIF to be 7.289, 7.623, and 8.254 < 10. Moreover, the overall model summary in Table 4 demonstrates that stakeholder trust, strategic partnership, and information sharing account for 73.9% of the variance in the SC performance of manufacturing firms. This suggests that variables not considered in this analysis may explain the remaining 26.1% of the variation in manufacturing companies' performance.

4.2 Descriptive statistics

Table 3 provides mean von Likert scale values of 4.2128, 4.1675, and 4.0731, which correspond to the average scores of Strategic Partnership, Stakeholder Trust, and Information Sharing, respectively. When using a five-point rating scale to measure agreement with statements, a mean score of 4.123 suggests a moderate to high degree of agreement among respondents. This quantitative measure summarizes the group's overall sentiment or opinion. These results support H1, H2, and H3, indicating that these factors are critical for successful

Table 4. Regression analysis

		SC Performance	Strategic partnership	Stakeholder trust	Information sharing
Supply chain performance	Pearson correlation	1			
	Sig. (2-tailed)				
	N	213			
Strategic partnership	Pearson correlation	0.765**	1		
	Sig. (2-tailed)	0.000			
	N	213	213		
Stakeholder trust	Pearson correlation	0.718**	0.595**	1	
	Sig. (2-tailed)	0.000	0.000		
	N	213	213	213	
Information sharing	Pearson correlation	0.681**	0.31	0.350**	1
	Sig. (2-tailed)	0.00	0.002	0.000	
	N	213	213	213	213

Note(s): **Correlation is significant at the 0.01 level (2-tailed); Correlation is significant at the 0.05 level (2-tailed)
Source(s): Authors' own work

SCC in Manufacturing SMEs in Rwanda. This implies that by focusing on these factors, SMEs can establish strong and sustainable relationships with their suppliers, customers, and other stakeholders, leading to improved collaboration, better performance, and ultimately, business performance. As previously discussed, analysis indicates that different manufacturing SMEs perceive different drivers or incentives influencing their adoption of SCC from various sources. Analysis of Variance (ANOVA) provides evidence to support this, as covered in section 4.3.

4.3 ANOVA
The ANOVA results in Table 3 demonstrate that strategic interaction with evaluated suppliers and consumers regarding collaboration integration influences Rwandan manufacturing SMEs, with information sharing scoring 0.003. The values (Sig.) for strategic partnership and stakeholders' trust are 0.022 and 0.000, respectively. This indicates no significant difference in the pressure on SMEs in different industrial sectors to adopt SCC. The data support H1, H2, and H3 as the main conclusion. Rwanda's industrial sectors exhibit varying internal and external pressures to adopt supply collaborative integration, with variance in the pressures from suppliers, consumers, and other regulators.

4.4 Regression analysis
Correlation measures the relationship between two continuous variables, including the strength of the relationship and its direction (Pallant, 2016). The correlation coefficient "*r*" is a value between −1 and +1, where +1 represents a strong positive correlation, 0.00 indicates no association, and −1 indicates a strong negative correlation among the variables being tested. Table 4 indicates a significant positive relationship between Strategic Partnership and SC Performance, as evidenced by the correlation coefficient of 0.76 and *p*-value< 0.05. This suggests that as the level of strategic relations increases, performance is likely to improve. The results also show a moderate positive relationship between stakeholder trust and SC Performance, as demonstrated by the *p*-value and the correlation coefficient ($r = 0.595$,

$p < 0.05$). This can be interpreted as an increase in Stakeholder Trust leading to a 59.5% increase in SC performance. The remaining 41.5% can be attributed to factors not covered in this study. Table 4 below presents the regression analysis results.

The results indicate a significant positive correlation between Information Sharing and the SC Performance of manufacturing firms ($r = 0.350$, $p < 0.05$). This moderate relationship between Information Sharing and SC Performance is demonstrated by the correlation coefficient ($r = 0.350$, $p < 0.05$), indicating a positive correlation. The correlation coefficient between Information Sharing and SC Performance is statistically significant. While the relationship is not strong, SC Performance increases as Information Sharing increases, with a moderate correlation value of $r = 0.350$, $p < 0.05$.

Information-sharing-based solutions, such as CPFR and VMI, are crucial for sharing information through shared platforms. Sharing secure, accurate, and timely information can potentially improve performance. The empirical findings of this study support the notion that Effective Communication is key to fostering collaboration. It implies that each partner company must ensure the security of its data exchange systems to protect confidential company information. These findings align with scholars (Dubey *et al.*, 2020; Panahifar *et al.*, 2018) who argue that accurate, timely, and secure information sharing improves trust, enhances SC Performance, and creates loyalty among SC Partners.

5. Discussion

The findings of this study contribute significantly to the theoretical development of SCC by exploring the model that links collaboration enablers to effective collaboration and the performance of manufacturing SMEs. Additionally, this study identifies the most crucial characteristics of information sharing.

The research model consists of three subsections that provide in-depth analysis. The first part (H1) aims to examine the relationship between strategic alignment with partners, while the second part (H2) investigates the impact of trust on effective collaboration. Finally, the third part (H3) explores the influence of information in strengthening SCC.

The results demonstrate that strategic partnership positively and significantly influences the performance of manufacturing SMEs in Rwanda. The findings of this study suggest that strategic partnerships lead to cost savings as partners can jointly negotiate better prices and terms with suppliers, thereby reducing costs and improving profitability. This is evidenced by the beta coefficient of 0.765, which indicates a strong positive relationship between strategic partnership and SCC. These findings contradict Rezaei *et al*. (2015), who argue that firms benefit from collaboration only in research and development, while Mofokeng and Chinomona (2019) and Shin *et al*. (2019) contradict this by arguing that partnership commitment to collaboration and the firm's performance varies by collaborative structure. On the other hand, Nguyen Thi and Nguyen Thi Thu (2022) and Linze Li *et al*. (2024) confirmed that strategic partnerships can provide benefits such as lowering inventory costs, a more effective supply chain, and competitive pricing. These results also align with Sudusinghe and Seuring (2022), who asserted that strategic partnership fosters a sense of teamwork and shared responsibility, leading to increased efficiency and effectiveness. These findings help confirm hypothesis 1 (H1) that strategic partnership influences SCC and the performance of manufacturing SMEs in Rwanda.

The findings of the present study support the second hypothesis (H2) that posits stakeholder trust as a significant factor influencing SC performance, as evidenced by the beta coefficient of 0.595 (see Table 4). Specifically, the lack of trust among shareholders hinders the ability of manufacturing SMEs to adapt to market changes and ensure environmental sustainability. This, in turn, leads to costly conflicts and, sometimes even termination of partnerships between SC partners. Collaborative SC practices, however, enhance stakeholder responsiveness and satisfaction, leading to improved trust levels. The lack of trust, as evidenced by the findings, is often rooted in the provision of inaccurate and

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untimely information between SC partners. Additionally, the lack of integrated systems, lack of teamwork, and trust among stakeholders emerged as significant challenges. These findings corroborate the views of Kauppi *et al*. (2023), who further emphasise the negative impact of trust deficits on information asymmetry, delays, and misattributed supply failures. Wamba similarly highlights the need for collaborative efforts in supply chains to improve responsiveness to stakeholder needs and guarantee satisfaction, loyalty, and trust. Ultimately, Sentama (2014) argued that "Imihigo" (performance contracts) promote the mutual trust that emerges from such collaborative efforts and benefits all individuals involved in the SC operations.

The present study supports hypothesis 3 (H3) that information sharing improves collaboration and SC performance, as evidenced by the beta coefficient of 0.350. While a correlation coefficient of 0.350 may seem low, it is important to note that the correlation coefficient reflects the strength of the relationship between two variables. In this case, the correlation between information sharing and SCC may not be as strong as the other correlations in Table 4, but it is still statistically significant, meaning it is unlikely to have occurred by chance. Information sharing in this study is explained in terms of data accuracy, shared platforms, and integration of information systems. However, it has been found that in the context of manufacturing SMEs in Rwanda, the primary challenges to sharing information pertain to a lack of technological infrastructure, unreliable communication channels, and limited access to technology. This state of affairs negatively impacts the relationship and trust between SMEs and their suppliers and customers, consequently hindering their ability to respond to market changes (Ogutu *et al*., 2023). These findings align with those of Song *et al*. (2024), who suggested that modern technology is instrumental in fostering accurate data sharing, visibility, and data reliability, thereby enhancing performance. However, Mora-Contreras *et al*. have cautioned that the adoption of information sharing does not necessarily lead to improved performance, and Kauppi *et al*. (2023) have contended that information asymmetry does not necessarily stem from the behaviour of SC partners but from inadequate communication behaviour. Despite the significance of traditional values in promoting collaboration and partnership within SC, empirical studies examining their role in this regard remain scarce. In Rwanda, cultural norms intersect with contemporary governance structures and development strategies to provide avenues for effective collaboration and trust-building. The values of "Ubumuntu" (humanity) and "Umuganda" (community work) promote empathy, solidarity, and collective responsibility, contributing to the accumulation of social capital and facilitating information sharing and trust-building. These findings highlight the potential of traditional values in shaping collaboration and partnership in contemporary contexts.

5.1 Theoretical implications

The study provides valuable insights into the benefits of collaboration among SMEs in the manufacturing sector, highlighting the importance of firms sharing resources, knowledge, and expertise to improve their overall performance. This research can serve as a foundation for further studies on collaboration among SMEs in other industries and regions.

The RBV and RV theories emphasise the need for collaborative efforts to acquire resources that will ensure SCs perform better. Specifically, for manufacturing firms to connect effectively and efficiently requires visibility, which upgrades collaborative efforts between SC partners and other stakeholders. Extending the theoretical implications even further reveals that some firms, as highlighted by the RBV and RV theories, are highly focused on their SC processes to achieve a competitive advantage. Thus, based on these theories, organisations can set targets and monitor progress, using "Imihigo" (performance contracts) to help align the efforts of different partners towards a common goal, which in turn improves collaboration and stakeholder trust. This approach can serve as a valuable lesson for other developing countries seeking to improve their SC performance and strengthen stakeholder trust.

5.2 Practical implications

In terms of practice, the findings of the study can help SMEs in the manufacturing sector in Rwanda to adopt collaboration strategies that can enhance their performance. The study highlights the importance of trust, communication, and mutual benefits in successful collaborations. SMEs can use these insights to form partnerships and collaborations with other firms in their industry to improve their competitiveness and increase their chances of success.

Finally, from a societal perspective, the study shows how collaboration among SMEs can contribute to the economic development of a country. By working together, SMEs can create more job opportunities, increase productivity, and contribute to the overall growth of the manufacturing sector in Rwanda. This can lead to increased income and a better standard of living for people in the country.

6. Conclusions

This study focuses on the impact of SCC on the performance of manufacturing SMEs in Rwanda. It highlights the importance of strategic partnership, stakeholder trust, and information sharing. The results show that information sharing is the most constrained variable due to low technology and limited internet connectivity. To overcome these challenges, SMEs in Rwanda must invest in modern technology, language training, market research, and infrastructure development. The study suggests integrating customers into production processes to build sustainable business relationships.

Traditional Rwandan values such as "Ubumuntu" (humanity), "Umuganda" (community works), and "Imihigo" (performance contracts) can improve SC trust-building tactics. This approach can serve as a valuable lesson for other developing countries seeking to improve their SC performance and strengthen stakeholder trust.

The study conducted on Rwandan manufacturing enterprises reveals a significant correlation between collaboration and SC performance. However, further research in the public or commercial domains is required to fully comprehend the relationship between SCC and the performance of manufacturing SMEs. The study recommends incorporating more respondents like finance managers, operations managers, Third-party logistics, and suppliers to supplement the findings. The study suggests that a range of conclusions can be drawn if people with different backgrounds, objectives, and skill levels are encouraged to interact.

The data collected from one informant may have a bias, and comparative analysis using data from other regional countries and employing other research approaches in future studies can help determine whether the outcomes could differ. Overall, the findings of this study can be debated, supported, or contradicted by further investigations, and it is essential to conduct more research to understand the impact of collaboration on the performance of manufacturing SMEs.

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Corresponding author
Alexis Uwamahoro can be contacted at: a.uwamahoro2@ur.ac.rw