

Resilient and Governed: Enhancing Firm Performance in the Traditional Weaving SMEs Supply Chain – An Empirical Investigation

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ABSTRACT

Traditional weaving SMEs in Gorontalo province, Indonesia, known for producing Karawo textiles, play an important role in preserving cultural heritage but face persistent supply chain challenges, including fragmented collaborations, limited market access, and poor inventory coordination. These constraints hinder their ability to achieve sustainable firm performance, especially under conditions of uncertainty. Addressing these issues requires not only operational improvements but also the development of resilient and well-governed supply chains. This study is to evaluate, under consideration the mediating function of supply chain governance (SCG), how supply chain resilience (SCR) influences firm performance (FP) in Karawo SMEs. Based on the theory of constraint (TOC), this paper proposes a theoretical framework to investigate, using supply chain resilience, financial and non-financial performance. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), data gathered from 195 traditional weaving SMEs in Gorontalo province, Indonesia is evaluated in order to evaluate theoretical assumptions. According to the results, SCR does not immediately increase FP by means of agility, integration, and SCRE. Moreover, SCG plays a mediator in the link between SCR and FP. By means of supply chain governance, this study enables SMEs to raise their performance. This paper develops a theoretical framework connecting agility, integration, and SCRE with resilience as its basis, therefore exploring past research in the subject of SCM. Based on TOC, the work

clarifies how agility, integration, and SCRE affect SCG. Second, SCG mediates the effect of SCR on FP by operationalizing resilience capabilities into coordinated, performance-enhancing governance practices.

Keywords: *firm performance; supply chain resilience, supply chain governance, theory of constraint*

1. INTRODUCTION

Firm performance includes several elements: financial performance, operational performance, marketing performance, and supply chain performance. (Chowdhury *et al.*, 2019) Companies now compete as members of a supply chain (SC), not individually. (Munizu *et al.*, 2024). A well-managed SC is one of the long-lasting resources for enhancing a company's competitive strength, including for Small, and Medium Enterprises (SMEs). SMEs drive entrepreneurship and innovation that can be undertaken by all segments of society, from the grassroots level to the upper echelons (Imtiaz *et al.*, 2023). One example is the traditional weaving SMEs in Gorontalo province, Indonesia, which produce traditional Karawo textiles. Karawo is an important part of Gorontalo's cultural heritage and reflects traditional values and the beauty of local textile art (Mohungo *et al.*, 2022).

Karawo SMEs have been involved in supply chain activities, particularly in the downstream supply chain. This is certainly an advantage for Karawo SMEs, as the primary objective of SC is to improve performance (Liu *et al.*, 2018; Agyabeng-Mensah *et al.*, 2020). However, in reality, Karawo SMEs are weak in implementing supply chain processes, as the collaborations with business partners are

not very binding and lack continuity in the operations of Karawo SMEs. The role of Karawo artisans here is as suppliers who receive orders for Karawo textile crafts from stores and distributors that have partnered with the artisans, as they lack market knowledge, resulting in market information being withheld.

Supply chain practices in Karawo SMEs in Gorontalo province, Indonesia face many challenges from within and outside the SMEs, as demonstrated by the problems faced by Karawo craftsmen. Difficulties in managing inventory can lead to problems such as stock shortages or excess stock, which can impact operational efficiency and customer satisfaction due to a lack of knowledge about the developing market (Manhart *et al.*, 2020). This situation highlights the broader importance of supply chain management for SMEs, which plays a pivotal role in improving performance and competitiveness (Dzikriansyah *et al.*, 2023; El Baz & Ruel, 2021). Strong relationships between supply chain partners enhance information exchange, reduce operational costs, and enable risk and resource sharing throughout the supply chain (Chowdhury *et al.*, 2019). Establishing and preserving these ties will enable SMEs to solve supply chain problems and raise their general performance. Firm performance reflects an enterprise's ability to achieve strategic goals through efficient resource utilization and value creation across financial and non-financial domains (Daniliuc *et al.*, 2020; Ozdemir, 2020). Performance is described as the accomplishment of results or outputs generated by people, teams, or companies in performing tasks or work that have been decided in respect to the accomplishment of objectives (Johnstone, 2022).

Furthermore, the need for resilience adds another layer of complexity to supply chain management for SMEs. Building resilience would enable SMEs to minimize negative effects and guarantee continuity by better handling supply chain interruptions and uncertainty (Habib *et al.*, 2021; Hossan Chowdhury & Quaddus, 2021). Therefore, supply chains resilience (SCR) and company success are intimately correlated. It speaks to a company's capacity for survival, adaptation, and recovery from disturbances to keep business running, satisfy client demand, and reach performance goals. (Chowdhury *et al.*, 2019; Nartey, 2023). SCR cover agility, integration, and supply chain (re-)engineering (SCRE) (Abeysekara *et al.*, 2019; Liu *et al.*, 2018). Moreover, might be a competitive advantage since it preserves company performance and reputation (Y. Liu & Yin, 2020). Agility is the capacity of Karawo SMEs to react fast to unanticipated demand or supply fluctuations. Integration seeks to foster cooperation among all the players in the supply chain by means of seamless and effective movement of goods, knowledge, and services from suppliers to consumers. Concurrently, supply chain re-engineering is the process of SMEs optimizing their operations.

The Theory of Constraints (TOC) states that agility, integration, and SCRE handle and identify constraints differently. Still, studies on the interactions between agility, integration, and SCRE are somewhat rare. Abeysekara *et al.*, (2019) and C. L. Liu *et al.*, (2018) clarify that SCR, in which agility, integration, and SCRE have both good and negative effects on company performance, they did not, however, differentiate SCR from its measurement in SMEs to investigate its impact on FP. This work thus investigates, in

line with the above description of research, the effects of agility, integration, and SCRE on FP.

Firm performance is tightly correlated with supply chain governance (SCG). It refers to internal mechanisms including management oversight, independent internal audits, a board of directors with different levels of responsibility, separation of controls, and policy development (Gibbs *et al.*, 2015). These mechanisms aim to ensure that companies operate efficiently and effectively, as well as comply with applicable regulations and ethical standards (Blome *et al.*, 2013; Mahrani & Soewarno, 2018). This aligns with the research conducted by Anugerah *et al.*, (2023), which revealed that an organization's performance is closely related to its governance. However, research on whether SCR can address such constraints to develop SCG capabilities and thereby enhance FP remains limited. To address this gap, this study adopts the TOC perspective and argues that SCR provides opportunities for SMEs to address constraints, that SCG is a capability developed by SMEs in managing resources, and that FP is the utilization of SMEs' capabilities to create valuable outcomes.

Given these pressing challenges, it is critical to examine how Karawo SMEs can enhance their performance by improving resilience and governance capabilities within their supply chains. The Theory of Constraints (TOC) is especially relevant in this context, as it emphasizes the identification and resolution of operational bottlenecks, such as delays in production, mismatch between supply and demand, or lack of coordination among partners, that are commonly observed in Karawo's production and distribution system. By applying TOC, this study focuses on how Karawo SMEs can reconfigure their agility, integration, and supply chain (re-)engineering (SCRE) to address core limitations in their operations.

In parallel, Supply Chain Governance (SCG) is introduced to reflect the socio-cultural nature of business relationships in the Karawo ecosystem, where trust-based and informal agreements often replace formal contracts. Incorporating SCG into the model enables the analysis of how Karawo SMEs can strengthen relational coordination, ensure mutual accountability, and formalize decision-making in ways that align with local business norms. This dual focus on TOC and SCG allows the study to build a more nuanced understanding of how Karawo SMEs, despite being rooted in a traditional craft sector, can navigate contemporary supply chain challenges to enhance firm performance. As such, the research questions are not only theoretically grounded but also directly motivated by the operational and structural realities of Karawo SMEs. In summary, this study attempts to answer the following two questions:

1. How do agility, integration, and SCR each influence FP?
2. Does SCG play a mediating role in the relationship between SCR and FP?

By answering the above questions, this paper contributes to current research in the following ways: First, a new theoretical explanation for the influence of SCR on FP is provided using TOC. The drivers of FP based on TOC have been discussed in several studies (Pozo *et al.*, 2009), but few studies have focused directly on the relationship between SCR and FP, particularly the nuanced effects of

agility, integration, and SCRE on FP. To examine the individual effects of agility, integration, and SCRE, this paper enriches the existing theoretical framework based on the literature above. Second, from a management perspective, this study reveals the internal mechanisms between SCR and FP by viewing SCG as an intermediary process. This study examines how agility, integration, and SCRE impact FP and SCG. Based on these findings, SCG plays a mediating role between SCR and FP

2. THEORY AND HYPOTHESIS

This study develops the theoretical foundation for examining the relationships among supply chain resilience, supply chain governance, and firm performance in Karawo SMEs. Drawing on the Theory of Constraints (TOC), we first define the key constructs and then systematically develop hypotheses that explain how agility, integration, and supply chain re-engineering influence firm performance both directly and through the mediating role of supply chain governance.

2.1 Firm Performance

This study develops the theoretical foundation for examining the relationships among supply chain resilience, supply chain governance, and firm performance in Karawo SMEs. Drawing on the Theory of Constraints (TOC), we first define the key constructs and then systematically develop hypotheses that explain how agility, integration, and supply chain re-engineering influence firm performance both directly and through the mediating role of supply chain governance.

2.2 Theory of Constraints

Every company has at least one limitation, according to TOC, which holds that by methodically addressing one restriction, the system's general performance may be raised (Shashi, 2023). Applied in manufacturing, healthcare, supply chain management, and other industries, TOC shows its adaptability and efficiency in many operational situations (Bauer *et al.*, 2019; Puche *et al.*, 2016). By pointing up workflow bottlenecks, TOC can greatly enhance manufacturing processes. Focusing on these constraints helps companies to increase results without using more resources or expenses (Bauer *et al.*, 2019).

Some research show that combining TOC with other models, like feasible system models, results in thorough systemic analysis that finally improves supply chain performance and cooperation (Puche *et al.*, 2016). By means of a methodical approach to pinpoint areas of weakness or bottleneck in manufacturing or distribution systems, TOC helps companies create more flexible and adaptive governance systems to maximize material and information flow (Simatupang *et al.*, 2004; Rahman, 2002). By focusing managers on spotting and enhancing important supply chain bottlenecks, TOC significantly helps supply chain management policies to be developed and applied.

The integration of TOC principles into supply chain management also encourages closer collaboration among supply chain partners. For example, identifying constraints through the TOC approach not only helps reduce potential operational barriers but also opens opportunities to develop joint replenishment policies and performance measurements that support overall supply chain performance. This will

ensure that SMEs could manage challenges in their businesses when facing supply chain disruptions, thereby improving FP.

Therefore, based on the TOC perspective, this paper develops a “survival-capability-value” model. This model involves building a combination of agility, integration, and SCRE, combining these resources to form SCG capabilities, and using these capabilities to improve FP.

2.3 Supply Chain Resilience and Firm Performance

Abeyssekara *et al.*, (2019) investigated the extent to which companies in the apparel industry can practice Supply Chain Resilience and examined whether SCR practices affect the performance and competitive advantage of these companies. Korosteleva, (2020) argues that resilience cannot be engineered externally and requires local communities, who are aware of their strengths and capacities, to actualize their potential. The added value of this thinking is not only to clarify the concept of resilience itself and its practical operationalization; it is also about how companies can ensure that their current governance becomes more responsive and adaptable to the challenges of uncertainty, complexity, and reduced control (Liu *et al.*, 2018; Y. Liu & Yin, 2020). Li *et al.*, (2017) clarify that Supply Chain Resilience in supply chains is their capacity to adapt to change—formed by means of preparedness for future change, awareness of change, and agility in change response. Resilience as understood by SMEs can help them to perform better. This shows in how small businesses evaluate and handle supply chain problems. Greater attention is needed since identifying and fixing problems can improve SMEs' performance in the supply chain.

(Ourzik, 2023) shows that improving firm performance depends much on agility. In line with this, (Tse *et al.*, 2016) underline the need of supply chain agility and its major favorable consequences for company performance. Crucially for a firm to survive in a changing business environment (Deshati, 2023), strategic agility improves its responsiveness and flexibility to the market). Research from Caesari *et al.*, (2023), which shows the favorable link between strategic agility and organizational success including key performance metrics, strengthens this even further.

Studies by Omar *et al.*, (2024) underline how much supply chain integration increases operational efficiency and effectiveness, so improving general corporate performance. This is consistent with the results of (Germain & Iyer, 2006), who contend that performance measurements are much improved by both internal and downstream integration. By means of several channels, including better information flow and resource allocation, supply chain integration improves operational and business performance (Flynn *et al.*, 2010).

Refining procedures to remove inefficiencies and improve cooperation among stakeholders is the essence of supply chain re-engineering. Effective supply chain cooperation greatly increases collaborative advantage, according to Cao & Zhang, (2011), which increases firm performance at last. Moreover, studies by Parast & Subramanian, (2021), show that general company performance suffers when supply chains are disrupted process or supply interruptions. Thus, re-engineering efforts

that address these disruptions can foster a more resilient supply chain, thereby improving performance metrics.

When SMEs operate within a robust resilience framework, they have more opportunities to compete and survive threats that may arise at any time. In this context, collaboration with all partners within the supply chain is a critical aspect of surviving threats to enhance firm performance. Therefore, SCR can improve FP in the supply chain. Considering the above, this paper proposes the following hypothesis:

- H1. SCR has a positive effect on FP.
- H1a. Agility has a positive effect on FP.
- H1b. Integration has a positive effect on FP.
- H1c. SCRE has a positive effect on FP.

2.4 Supply chain resilience and Supply Chain Governance

The relationship between resilience and governance is conceptualized as a self-referential capacity-building process based on a sense of “good life” in society and articulated through self-governing mechanisms. This perspective views resilience not merely as the quality of systems or policy tools, but more broadly as a new analysis of governance (Korosteleva, 2020). Resilience is considered a better organizing principle today in responding to change. The relationship between resilience and governance is closely intertwined, where resilience is the capacity to learn, cope, adapt, and transform in the face of shocks and stresses, and good governance is identified as a decision-making process that is accountable, transparent, fair, responsive, and participatory (Anugerah *et al.*, 2023). Bedi *et al.*, (2014) explain that resilience is almost always found in good governance, as resilience facilitates the creation of broad and equitable development opportunities that can enhance the ability to survive and recover from adverse situations.

Agility, characterized by the capacity to respond quickly to market changes and customer demands, directly influences how supply chains are organized. Supply chain agility influences ambidexterity, which in turn strengthens supply chain governance by enabling organizations to effectively balance exploration and exploitation (Jamaludin *et al.*, 2023). Studies suggest that this implies that in fast changing surroundings, governance structures must remain effective and relevant by means of agility practices, hence their adoption is vital. This helps to create a more-strong supply chain structure that can resist shocks; this is especially crucial for small businesses who might lack the required resilience to handle extended interruptions. Coordinated contact between supply chain partners, that is, integration has demonstrated to have a major influence on governance systems. Effective use of internal and external resources made possible by supply chain integration helps businesses to match objectives across the supply chain, hence enhancing general governance (Huo *et al.*, 2014). Strong governance procedures, thereby promoting greater decision-making, responsibility, and risk management, are more likely to result from organizations that successfully combine their operations. Reengineering of supply chains mostly affects the facilitation of a stronger governance framework, which is essential for controlling complexity and raising supply chain openness. The COVID-19 epidemic's disruptions have underlined the requirement of strong supply

chains, which has forced businesses to change their governance systems (Jabbour & Jabbour, 2020). Therefore, efficient governance systems can be seen as the basis for executing reengineering initiatives that help businesses to react to disruptions more effectively by means of speedier and more efficient decision-making processes. Studies show that companies who effectively manage resilience are naturally more resilient since they may concentrate on fixing supply chain operations to raise performance (Bedi *et al.*, 2014). Resilience in the supply chain helps SMEs to adapt to changes and limits, so guaranteeing the continuation and sustainability of their working methods. Therefore, SCR can enhance SCG in the supply chain. Considering the above, this paper proposes the following hypothesis:

- H2. SCR has a positive effect on SCG.
- H2a. Agility has a positive effect on SCG.
- H2b. Integration has a positive effect on SCG.
- H2c. SCRE has a positive effect on SCG.

In practice, SCR can improve governance of unexpected disruptions. Based on TOC, efficiency, responsiveness, and sustainability serve as an important framework for optimizing supply chain governance by enabling companies to collaboratively identify and overcome constraints, thereby improving overall supply chain performance. SMEs with SCG can manage and regulate how SMEs operate in the supply chain in such a way that FP can be improved. Therefore, according to TOC, SCR can enable organizations to better adapt to rapid changes and complexities in their operational environment. SMEs develop certain capabilities through resilience, namely SCG, and ultimately use these capabilities to create value, namely improving FP.

The application of TOC in production analysis can help SMEs identify factors that prevent them from achieving optimal performance (García-Vidal *et al.*, 2019). By conducting constraint analysis, business owners can make better decisions to overcome these constraints, increase productivity, and ultimately increase profits. As a result, FP can improve significantly. Considering the above, the following hypothesis is proposed:

- H3. SCG acts as a mediator between SCR and FP.
- H3a. SCG acts as a mediator between agility and FP.
- H3b. SCG acts as a mediator between integration and FP.
- H3c. SCG acts as a mediator between SCRE and FP.

The conceptual framework based on previous research is outlined in Figure 1.

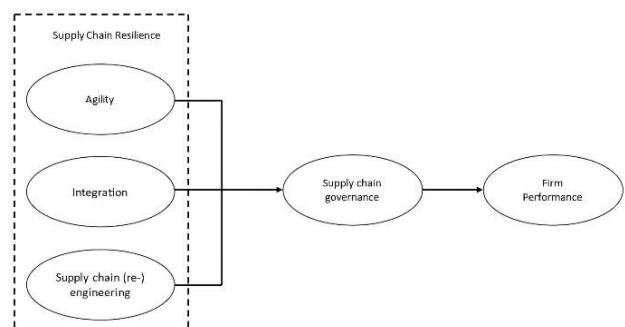


Figure 1 Theoretical Model

3. RESEARCH DESIGN AND METHODOLOGY

To contextualize the empirical model, the constructs included in Figure 1 are directly derived from the real-world challenges faced by Karawo SMEs in Gorontalo, Indonesia. These traditional weaving SMEs operate in fragmented supply chains with weak collaborative ties, inefficient inventory control, and limited strategic governance. The constructs of agility, integration, and supply chain re-engineering (SCRE) reflect essential resilience capabilities needed to address fluctuating demand, lengthy production cycles, and unpredictable market forces. Likewise, supply chain governance (SCG) is critical for transforming these capabilities into structured relationships that foster stability, mutual accountability, and value creation, especially in informal, trust-based business environments like those found in Karawo’s artisanal networks.

By modeling the interaction between SCR, SCG, and firm performance (FP), this study aims to deliver practical insights for enhancing SME competitiveness in creative industries. The expected outcome is not only to validate

theoretical relationships but also to demonstrate how traditional SMEs can reconfigure their supply chain practices through resilience and governance to overcome persistent operational bottlenecks. In particular, the model seeks to illustrate actionable pathways for SMEs to reduce inefficiencies, sustain collaborative partnerships, and improve performance outcomes amid uncertainty. Therefore, the measurement and structural model were designed not only to align with literature but also to reflect the socio economic dynamics unique to heritage-based SMEs in developing regions.

3.1 Sampling

The respondents in this study were karawo weaving SMEs in Gorontalo province, Indonesia. The total number of respondents was 195. The characteristics of the surveyed respondents primarily reflect the characteristics of karawo weaving SMEs according to age, length of business operation, gender, and education level. This paper utilized SPSS 29 and SmartPLS 4 software for data processing and analysis. The distribution of the SME sample is presented in Table 1.

Table 1 Respondent Characteristics

| Type Data | Personal Characteristics of Respondents | N=195 (Frequency) | Percentage (%) |
|--------------------|---|-------------------|----------------|
| Age | < 30 Years | 0 | 0 |
| | 30 to 40 Years | 30 | 15,4 |
| | 40 to 50 Years | 52 | 26,7 |
| | > 50 Years | 113 | 57,9 |
| Gender | Male | 22 | 11,3 |
| | Female | 173 | 88,7 |
| Length of business | < 1 Year | 0 | 0 |
| | 1 to 3 Years | 9 | 4,6 |
| | > 3 Years | 186 | 95,4 |
| Education | Not graduated from high school | | |
| | High school | 1 | 0,5 |
| | Diploma | 74 | 37,9 |
| | S1 | 10 | 5,1 |
| | S2 | 102 | 52,3 |
| | S3 | 8 | 4,1 |
| | | 0 | 0 |

3.2 Measures

All measures were adapted from instruments that had been validated in previous studies. This paper mobilizes five constructs: agility, integration, SCRE, SCG, and FP. To confirm the construct validity and content validity, measures from previous literature were adopted. To ensure construct validity and content validity, the indicators used in this study were derived from previous literature and subsequently adapted to fit the specific characteristics of small and medium-sized enterprises (SMEs) within the Karawo creative industry in Gorontalo Province, Indonesia. The Karawo industry possesses distinctive features as part of a creative economy rooted in local cultural heritage. Specifically, Karawo textiles are hand-embroidered using traditional techniques passed down through generations, requiring 2-4 weeks per piece depending on complexity. Its production processes remain largely manual, with artisans using traditional wooden looms and hand-stitching intricate geometric patterns that cannot be replicated by machines. This manual approach creates several supply chain challenges: first, production capacity is limited by the

number of skilled artisans available, creating bottlenecks during peak demand periods such as wedding seasons (June-August) and cultural festivals like Eid celebrations. Second, quality consistency varies between individual artisans, making standardization difficult for bulk orders from distributors.

Its working relationships are predominantly social and informal in nature, typically based on kinship ties and community connections rather than formal contracts. For example, most Karawo artisans receive orders through word-of-mouth recommendations from village leaders or through long-standing relationships with local textile shops, often without written agreements specifying delivery timelines, quality standards, or payment terms. This informality creates vulnerability when disputes arise, as artisans have limited recourse if buyers reject products or delay payments.

Market demand is influenced by seasonality, design trends, and cultural events. Specifically, demand peaks during religious holidays when traditional attire is required, dropping by 60-70% during off-peak months. Design preferences shift based on contemporary fashion trends,

forcing artisans to constantly adapt traditional patterns to modern aesthetics without formal market research capabilities. Cultural events such as local government ceremonies or traditional wedding customs directly impact order volumes, but artisans often receive insufficient advance notice to adjust production schedules accordingly.

These contextual factors directly impact supply chain resilience dimensions: agility becomes critical for responding to sudden order changes during festival seasons; integration is essential for coordinating between scattered artisan households and urban distributors; and supply chain re-engineering is necessary to optimize resource allocation during demand fluctuations while preserving traditional production methods.

These conditions necessitate modifications to conventional supply chain measurement approaches. Therefore, the constructs employed in this study were reinterpreted to better align with the downstream activities typical of creative SMEs, such as made-to-order production, collaboration without formal contracts, and risk management practices based on experience and interpersonal trust.

The SCR assessed in this study includes agility, integration, and SCRE, measured based on a scale developed by (Liu *et al.*, 2018). For agility, five items are used to measure, namely always seeing opportunities in the business environment, always seeing threats in the business environment, responding quickly to market changes, always providing stock in response to rapidly changing markets, and providing customized services to business consumers. Integration is measured through three items: always sharing information about operations with business consumers, entering into cooperation agreements with several business consumers to share revenue and risks, and being able to accept innovative ideas from business consumers to design new services. Meanwhile, SCRE is measured through four items: understanding potential risks, using risk as a key criterion in selecting business customers, ensuring that “extra” resources are not wasted but used as preparation for unexpected events, having ways to prevent potential risks, and allocating more resources to address risks within collaborations.

Meanwhile, the supply chain governance (SCG) construct was measured using a scale adapted from Um & Kim, (2019), which was then transformed to be relevant to the pattern of trust-based collaboration and long-term binding relationships among Karawo actors. The governance practices observed included informal coordination mechanisms, participatory decision-making, and contractual relationship management between actors. The last construct, firm performance (FP), was measured through a combination of financial and non-financial aspects including profit levels, customer satisfaction, ability to reach new markets, and perceptions of business reputation. This indicator was chosen to reflect the success of Karawo's business in maintaining its existence and growth amidst market challenges and resource constraints.

The final constructs and items are presented in the Appendix.

3.3 Validity and Reliability

Table 2 presents information regarding the reliability and construct validity of the five variables (agility,

integration, SCRE, SCG, and FP) measured using three statistical indicators: Cronbach's alpha, Composite Reliability (ρ_a), and Average Variance Extracted (AVE). Cronbach's alpha values indicate that each variable has a value above 0.7, which indicates that the values obtained are good, usually ranging from 0.7 to 0.9 (J. Hair *et al.*, 2014). Values below 0.7 can be considered poor, while values above 0.9 indicate very high consistency. The composite reliability value in Table 2 shows that the indicators used to measure the construct are reliable in reflecting the intended construct. The accepted value for ρ_a is higher than 0.7. The higher the value, the better the reliability (Hair *et al.*, 2019).

AVE is used to measure the proportion of variance explained by the construct in the model relative to the total variance in the indicators. AVE indicates how well the construct can explain the variance of its indicators. The value obtained is above 0.5. An AVE value greater than 0.5 indicates that the construct can explain more than half of the variance of its indicators, which means that the construct is sufficiently valid.

Table 2 presents the results of the measurement model assessment, including factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) for each construct. All items exhibit strong factor loadings above the recommended threshold of 0.70, confirming that each indicator meaningfully reflects its respective latent construct. The agility construct demonstrates excellent internal consistency, with all five items loading between 0.838 and 0.906. The Cronbach's alpha (0.922) and CR (0.923) exceed the 0.90 threshold, and the AVE value of 0.764 indicates strong convergent validity. This suggests that the agility dimension is well-defined and consistently perceived by respondents, particularly in how firms respond to dynamic market conditions and customer demands. Integration shows acceptable reliability with a Cronbach's alpha of 0.728 and a CR of 0.734, which are above the 0.70 minimum, though notably lower than the other constructs. Its AVE of 0.647 still meets the standard for convergent validity. This may reflect moderate heterogeneity in how collaboration and information sharing are practiced across SMEs in the Karawo industry, possibly due to informal governance and varying levels of digital integration. Supply Chain Re-engineering (SCRE) displays high internal consistency, with factor loadings ranging from 0.852 to 0.912, a Cronbach's alpha of 0.892, CR of 0.895, and AVE of 0.755. These results suggest that the construct effectively captures SMEs' efforts to redesign their supply chain processes in response to environmental uncertainty and resource constraints.

Supply Chain Governance (SCG) is the most comprehensive construct with seven items, all of which load strongly (ranging from 0.786 to 0.883). It exhibits high reliability ($\alpha = 0.925$, CR = 0.927) and an AVE of 0.692, indicating a consistent understanding of governance mechanisms such as coordination, trust-building, and collaborative arrangements among Karawo stakeholders. Finally, Firm Performance (FP) also demonstrates robust psychometric properties. The factor loadings range from 0.820 to 0.847, while its Cronbach's alpha and CR both reach 0.928, and the AVE is 0.697. This affirms that performance was consistently assessed across both financial and non-financial dimensions, including adaptability, customer

Table 2 Construct reliability and validity

| Constructs | Items | Factor loading | Cronbach's alpha | CR | AVE |
|-------------|-------|----------------|------------------|-------|-------|
| Agility | X11 | 0.905 | 0.922 | 0.923 | 0.764 |
| | X12 | 0.880 | | | |
| | X13 | 0.906 | | | |
| | X14 | 0.838 | | | |
| | X15 | 0.838 | | | |
| Integration | X21 | 0.830 | 0.728 | 0.734 | 0.647 |
| | X22 | 0.787 | | | |
| | X23 | 0.795 | | | |
| SCRE | X31 | 0.912 | 0.892 | 0.895 | 0.755 |
| | X32 | 0.855 | | | |
| | X33 | 0.852 | | | |
| | X34 | 0.856 | | | |
| SCG | Z1 | 0.835 | 0.925 | 0.927 | 0.692 |
| | Z2 | 0.857 | | | |
| | Z3 | 0.805 | | | |
| | Z4 | 0.786 | | | |
| | Z5 | 0.883 | | | |
| | Z6 | 0.813 | | | |
| | Z7 | 0.839 | | | |
| FP | Y1 | 0.847 | 0.928 | 0.928 | 0.697 |
| | Y2 | 0.840 | | | |
| | Y3 | 0.828 | | | |
| | Y4 | 0.843 | | | |
| | Y5 | 0.820 | | | |
| | Y6 | 0.831 | | | |
| | Y7 | 0.835 | | | |

satisfaction, and perceived competitiveness. In sum, the measurement model confirms that all constructs meet or exceed the recommended thresholds for reliability and convergent validity, supporting the robustness of the instrument in capturing key supply chain and performance dimensions within the creative industry context.

4. ANALYSIS AND RESULTS

This section presents the empirical findings from the PLS-SEM analysis conducted on data collected from 195 Karawo SMEs in Gorontalo province, Indonesia. The results are organized to systematically test the proposed hypotheses, beginning with the direct effects of supply chain resilience dimensions on firm performance, followed by their effects on supply chain governance, and concluding with the mediation analysis that examines the indirect pathways through which resilience capabilities enhance performance outcomes.

4.1 Effect of SCR on FP

As shown in Table 4, the results of H1a indicate that agility does not have a statistically significant direct effect on FP ($\beta = 0.207, p > 0.05$), suggesting that the data do not provide sufficient evidence to reject the null hypothesis. This

does not imply that agility has no effect, but rather that the effect could not be confirmed with the current sample size. A similar interpretation applies to H1b, where integration shows a small, non-significant effect on FP ($\beta = 0.018, p > 0.05$). This aligns with the caution advised in interpreting non-significant p-values as evidence of absence (Greenland *et al.*, 2016). Meanwhile, the results of H1c show that SCRE has a statistically significant positive effect on FP ($\beta = 0.214, p < 0.05$), supporting H1c.

4.2 Effect of SCR on SCG

The results of H2a indicate that agility has a significant positive effect on SCG ($\beta = 0.388, p < 0.05$), thus supporting H2a. The results of H2b indicate that integration has a significant positive effect on SCG ($\beta = 0.183, p < 0.05$), thus supporting H2b. The results of H2c indicate that SCRE has a significant positive effect on SCG ($\beta = 0.317, p < 0.05$), thus supporting H2c. Therefore, H2a, H2b, and H2c are accepted, thus supporting H2.

4.3 SCG Mediation Effects

To examine the mediating role of SCG between SCR and FP, this paper tests the mediating role of SCG according to the three-step mediation effect test introduced by Baron & Kenny, (1986). The results show that: (1) SCR does not

significantly affect FP; (2) SCR significantly affects SCG; and (3) SCR significantly affects FP after controlling for SCG.

The first two testing steps align with H1 and H2, respectively, and each has been validated. The third testing step is presented in Table 4. The results of H3a indicate that, after controlling the SCG variable, agility significantly influences the dependent variable FP ($\beta = 0.196, p < 0.05$). The results of H3b indicate that, after controlling for the SCG variable, the effect of integration on the dependent variable FP becomes significant ($\beta = 0.093, p < 0.05$). The results of H3c indicate that, after controlling for the SCG variable, the effect of SCRE on the dependent variable FP becomes significant ($\beta = 0.16, p < 0.05$). Therefore, SCG plays a full

mediating role between agility and FP, supporting H3a. SCG plays a full mediating role between integration and FP, supporting H3b. Additionally, SCG plays a partial mediating role between SCRE and FP, supporting H3c. Thus, SCG plays a mediating role between SCR and FP, supporting H3. Furthermore, a bootstrap sampling test for the mediation effect was conducted (sample size set at 5,000), and the results showed that the indirect effect of SCG between agility and FP is significant ($z = 3.604, p < 0.05, 95\% \text{ CI} = [0.087, 0.299]$), the indirect effect of SCG between integration and FP is also significant ($z = 3.469, p < 0.05, 95\% \text{ CI} = [0.043, 0.147]$), and the indirect effect of SCG between SCRE and FP is also significant ($z = 2.258, p < 0.05, 95\% \text{ CI} = [0.039, 0.314]$). Therefore, H3 is further supported.

Table 4 Direct effect and mediating effect test

| Path | β | T statistics | P values | Decision |
|--------------------------|---------|--------------|----------|----------|
| Agility -> FP | 0.207 | 1.672 | 0.095 | not sig. |
| Integration -> FP | 0.018 | 0.332 | 0.74 | not sig. |
| SCRE -> FP | 0.214 | 2.132 | 0.033 | sig. |
| Agility -> SCG | 0.388 | 3.716 | 0 | sig. |
| Integration -> SCG | 0.183 | 3.5 | 0 | sig. |
| SCRE -> SCG | 0.317 | 2.895 | 0.004 | sig. |
| SCG -> FP | 0.505 | 5.486 | 0 | sig. |
| Agility -> SCG -> FP | 0.196 | 3.604 | 0 | sig. |
| Integration -> SCG -> FP | 0.093 | 3.469 | 0.001 | sig. |
| SCRE -> SCG -> FP | 0.16 | 2.258 | 0.024 | sig. |

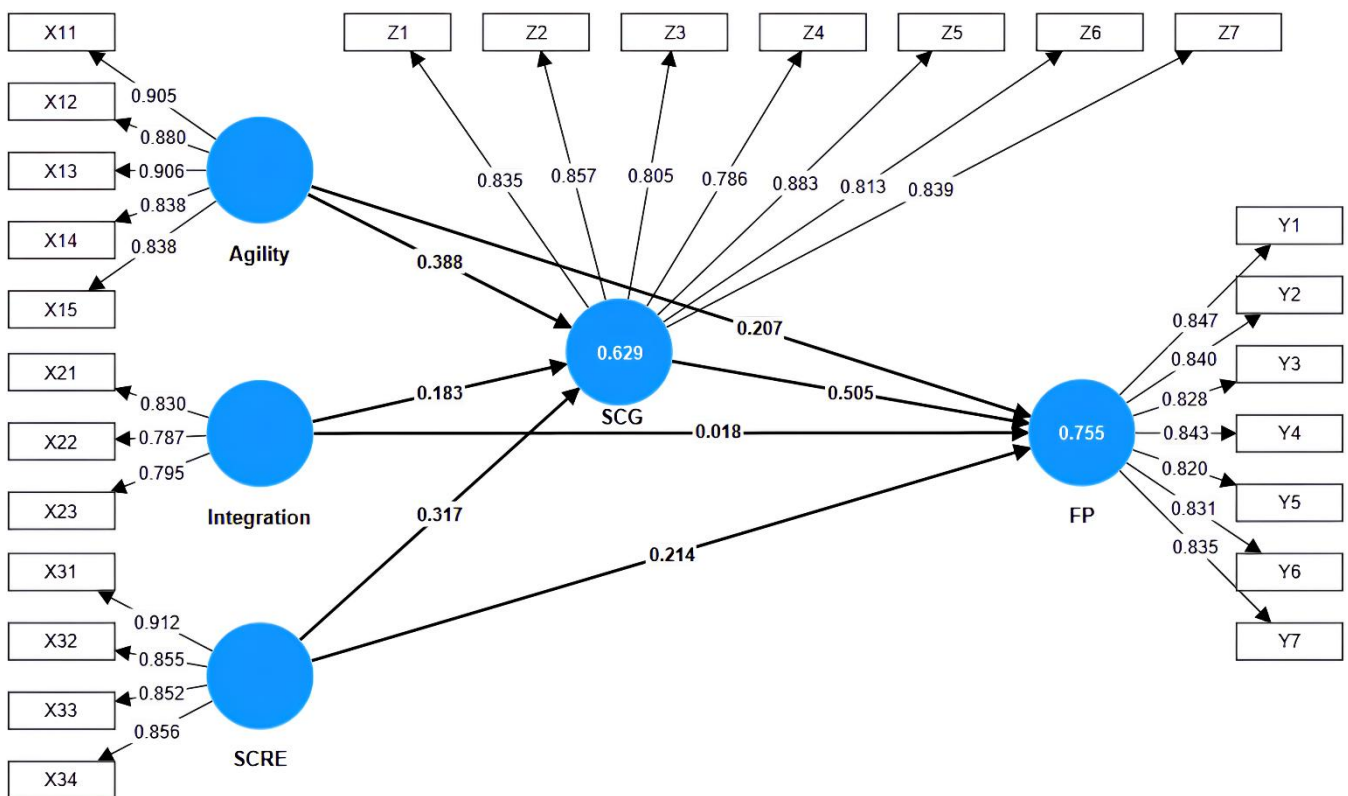


Figure 2. Estimated PLS-SEM

5. DISCUSSION

This study proposes a research model theoretically grounded in the Theory of Constraints (TOC) to investigate the relationships among agility, integration, SCRE, SCG, and FP. It is important to note, however, that the empirical results of this study are context-specific and reflect the operational realities of Karawo SMEs in Gorontalo, Indonesia. Therefore, the findings should not be generalized to other settings without careful consideration of contextual similarities. Karawo SMEs operate within a unique socio-economic and cultural environment, characterized by artisanal production methods, informal collaboration networks, and seasonal market patterns. As such, the insights drawn from this study represent a distinctive perspective on how traditional SMEs in emerging economies manage supply chain constraints.

Karawo SMEs' reliance on artisanal, hand-embroidered production methods directly influences their ability to respond to market fluctuations. For example, during the Eid season or Gorontalo cultural festivals, order volumes can surge by up to 70%, yet production is constrained by the limited availability of skilled artisans who each require 2–4 weeks to complete a single piece. This constraint reduces agility in meeting sudden demand spikes and can result in missed sales opportunities or customer dissatisfaction. The informal collaboration networks often based on kinship or community ties rather than formal contracts also shape supply chain governance. While these trust-based relationships facilitate flexible, low-cost coordination, they create vulnerabilities such as inconsistent quality control, delayed payments, and lack of enforceable delivery schedules. Such governance weaknesses can reduce the integration benefits observed in more formalized supply chains, where roles, responsibilities, and risk-sharing mechanisms are clearly defined. Seasonal market patterns further complicate performance outcomes. In off-peak months, demand drops sharply, leading to underutilization of labor and resources. Without mechanisms for product diversification or market expansion, SMEs struggle to maintain consistent revenue streams, which in turn limits reinvestment into process improvements or capacity upgrades. These cyclical patterns reinforce the importance of resilience capabilities, particularly supply chain re-engineering to optimize resource allocation, balance production loads across seasons, and develop new market channels. At the supply chain level, these socio-economic and cultural characteristics mean that the performance of individual Karawo SMEs cannot be separated from the collective performance of their artisan networks and distributors. A delay by one artisan can disrupt a distributor's ability to fulfill bulk orders, affecting the reputation of the entire Karawo supply chain. Conversely, well-coordinated governance structures, even if informal, can amplify positive spillovers such as knowledge sharing on new designs across the network, leading to performance gains that extend beyond any single SME.

Rather than presenting universal conclusions, this study aims to highlight locally embedded supply chain dynamics and governance challenges that are not only specific to Karawo SMEs in Gorontalo but also resonate with other heritage-based SME sectors in emerging economies. For instance, the seasonal production surges experienced by Karawo artisans during Eid and local cultural festivals mirror

similar demand spikes faced by handwoven silk producers in Cambodia, batik cooperatives in Central Java, and kente cloth weavers in Ghana, where production capacity is similarly constrained by artisanal skills and lengthy production cycles. Likewise, the reliance on kinship-based and trust-driven governance structures in Karawo reflects patterns seen in Moroccan rug-making clusters and Peruvian alpaca textile networks, where informal agreements enable flexibility but pose challenges in enforcing quality standards and delivery timelines. These parallels suggest that the governance and resilience mechanisms observed in the Karawo context, such as rapid adaptation to shifting design trends, collaborative resource pooling during peak seasons, and incremental process re-engineering without compromising cultural authenticity, represent valuable strategies for other SMEs in informal, tradition-based supply chains. By framing these contextual characteristics as distinctive strengths rather than limitations, this study contributes to a deeper understanding of how heritage-based SMEs in developing regions can leverage embedded social capital and adaptive resilience to achieve sustainable performance improvements despite structural constraints.

5.1 Theoretical Contribution

First and foremost, this paper provides specific knowledge about the elements of FP improvement. Supply chain management and related fields provide little information about the precursors of FP from both financial and non-financial perspectives (Shou *et al.*, 2018). This study contributes to existing research on SCR by explaining and analyzing several aspects of SCR, thereby enhancing managerial insights into resilience within supply chains. Results from other studies indicate that improved organizational performance is also driven by how organizations withstand disruptions and quickly recover to their original state while maintaining their performance (Li *et al.*, 2017). Liu & Yin, (2020) investigated the relationship between SCR and FP in their study. The study found a positive relationship between SCR and FP. Based on TOC, it was found that SCR and SCG together can enhance FP. To further clarify the relationship between SCR and FP, this paper divides SCR into agility, integration, and SCRE, and uses data from Karawo SMEs, which are SMEs operating in the textile weaving industry in Gorontalo Province, Indonesia, as the research sample to explore how agility, integration, and SCRE influence FP from the perspective of constraints. Specifically, SCR can influence constraints and help SMEs minimize risks from both internal and external sources. This will help SMEs to solve problems and raise FP standards. Moreover, SCR has been demonstrated to improve FP by means of constraint management. There are vary ways in which agility, integration, and SCRE handle constraints.

Moreover, by means of an intermediary step, this study offers understanding of the link between SCR and FP. This work suggests that SCR improves SCG. Including SCG as a mediator in the SCR and FP research paradigm helps this study deepen the knowledge of the link between SCR and FP. From the TOC standpoint, the results support and enhance already available empirical data. There are rather few empirical research examining how SCG affects FP in SMEs. (Dwianika *et al.*, 2020; Guluma, 2021) show that organizational performance development can be much

influenced by competent government. Adoption of supply chain governance is a crucial approach able to solve supply chain issues and improve supply chain integration, so directly affecting firm performance (Zhou *et al.*, 2024). This study implies that businesses can lower risks including "free riding" and data leakage by building suitable governance systems, therefore fostering a more stable and unified operational environment. Therefore, both formal and relational systems of governance complement one other in helping corporate performance. From a TOC vantage point, this paper offers fresh understanding of the link between SCR and SCG. By emphasizing the management of important constraints, the inclusion of TOC into supply chain resilience offers further benefit. This not only improves internal process efficiency but also strengthens collaboration and communication among strategic partners within the supply chain. Thus, the implementation of TOC as a strategic initiative in the context of supply chain resilience can lead to enhanced operational performance and sustainable competitiveness, particularly in increasingly dynamic and uncertain business environments.

5.2 Managerial Implications

First, to improve FP, SMEs must pay attention to the active role of agility, integration, and SCORE, as well as the role they play in managing constraints in SCR. SMEs in the supply chain must perform well in terms of agility, which is based on how SMEs respond and adapt to changes; integration, which is based on coordination and synergy between supply chain partners and the reorganization of processes and structures; and improving synergy among supply chain partners related to SCORE. On the one hand, SMEs need to pay attention to the construction of agility and integration. The emphasis on agility significantly supports resilience and business performance sustainability, indicating that the ability to move quickly and adapt is a strategic advantage in conditions of market uncertainty. Meanwhile, integration plays a major role in creating effective collaboration and real-time information exchange, which are essential for improving supply chain resilience. Such integration minimizes miscommunication and optimizes operational processes, enabling SMEs to allocate resources more efficiently and ensure operational continuity in the face of disruptions. TOC instills a focus on constraint management, improving operational flow by overcoming limitations, and further improving SME FP. On the other hand, SMEs cannot overlook the construction of SCORE. As a tool for redesigning the structure of SMEs' operational activities, SCORE enables SMEs to respond to and overhaul processes within the supply chain to achieve better outcomes. Essentially, SCORE facilitates how activities within the supply chain are improved, thereby increasing FP levels.

Finally, SMEs must pay attention to the role played by SCG in transforming SCR into better FP. On the one hand, SMEs must strive to adapt to changes and coordination between upstream and downstream business partners in the supply chain, as well as to increase agility and integration levels. Supply chain management does not only function as a tool for managing constraints, but also as a driver for managing cooperation between partners so that the cooperation is not only beneficial to one party. In addition,

SMEs can promote resilience in the supply chain by building relationships and carrying out collaborative agility and integration functions in the supply chain. Karawo is known for its intricate traditional embroidery work, facing several challenges such as fluctuating market demand, time-consuming production processes, unprofitable collaborations, and unpredictable prices. Supply chain management is an effort that must be undertaken to create conditions where SMEs can develop SCG capabilities. On the other hand, SMEs must manage all production processes and adapt them to the constraints faced to enhance SCORE levels. SMEs within the supply chain network must strengthen their SCORE, ensuring they can optimize their SCR capabilities to withstand disruptions by redesigning processes within the supply chain to align with their own needs. These steps will help SMEs prevent obstacles that could lead to losses, as SMEs are positioned as the weakest link in the supply chain.

5.3 Limitations and Further Research

Although this study is empirically grounded in the context of Karawo SMEs in Gorontalo province, Indonesia, the findings and the proposed conceptual model may offer insights for other settings with similar characteristics. The Karawo industry exemplifies traditional SMEs in developing countries that rely on manual production processes, have limited market access, operate through socially embedded relationships, and face seasonal demand fluctuations. These features are commonly found in creative economy sectors across other developing countries, such as traditional textile crafts, weaving cooperatives, or local artisan networks operating within informal supply chain structures.

Nevertheless, the generalizability of the results should be approached with caution. The external validity of this study is likely stronger when applied to sectors or regions that share similar supply chain configurations, particularly those dominated by micro-actors, informal collaborations, and governance-related constraints. Therefore, the applicability of this model is more relevant to community based creative industries than to large-scale manufacturing or digitized supply chains. To strengthen external validity, future research should examine diverse sectors and regional contexts, allowing for further empirical validation of the SCR–SCG–FP framework under varying socio economic conditions.

Furthermore, this paper innovatively introduces SCG as a mediating mechanism to explore the relationship between SCR and FP based on TOC. However, other types of capabilities, such as collaboration capabilities and value chains, can be shaped by constraint theory. These types can be used as mediating mechanisms in future research to enhance and expand the current research framework. Additionally, this study uses TOC to explain the relationship between SCR, SCG, and FP from the perspective of information and goods flow, and future research can utilize other theories, such as resource theory, to uncover the internal mechanisms between SCR and FP from a resource perspective.

Moreover, the findings of this study offer practical insights into how the proposed PLS–SEM model can help address the specific challenges faced by Karawo SMEs.

First, the inclusion of agility in the model enables SMEs to better cope with fluctuating market demand, as agility reflects the firm's ability to respond quickly to market changes and customize products accordingly. This is particularly important for Karawo artisans who often deal with unpredictable consumer trends and seasonal demand. Second, integration facilitates better coordination and information flow across supply chain partners, which can reduce redundancies and inefficiencies in the traditionally time-consuming production process. By improving supply chain integration, Karawo SMEs can streamline production timelines and avoid misalignment in scheduling and order fulfillment.

Third, the mediating role of supply chain governance (SCG) addresses the issue of unprofitable collaborations by promoting more structured and accountable relationships among supply chain actors. The development of trust-based governance mechanisms ensures fairer value distribution and encourages long-term partnerships, rather than ad-hoc transactional relationships that often disadvantage artisans. Finally, supply chain re-engineering (SCRE) supports SMEs in redesigning their supply chain processes to be more responsive and adaptive to pricing instability. By reallocating resources and reconfiguring operations, Karawo SMEs can increase their flexibility in negotiating prices, managing cost structures, and absorbing price shocks more effectively. Collectively, these mechanisms demonstrate that the PLS-SEM model not only has theoretical merit but also offers actionable pathways for overcoming real-world operational constraints in traditional creative industries.

6. CONCLUSION

This study examined the relationships among supply chain resilience (SCR), supply chain governance (SCG), and firm performance (FP) in traditional weaving SMEs producing Karawo textiles in Gorontalo province, Indonesia, using the Theory of Constraints (TOC) as the theoretical foundation. Based on data from 195 SMEs analyzed through PLS-SEM, the findings reveal that while agility and integration do not directly enhance firm performance, supply chain re-engineering (SCRE) has a significant positive direct effect on performance outcomes. Importantly, all three dimensions of supply chain resilience: agility, integration, and SCRE, significantly influence supply chain governance, which in turn acts as a crucial mediator that transforms resilience capabilities into improved firm performance. The study's key theoretical contribution lies in demonstrating how TOC can explain the constraint-management mechanisms through which SMEs develop governance capabilities that ultimately enhance performance, while the practical implications suggest that traditional SMEs in emerging economies should prioritize building structured governance mechanisms to fully capitalize on their resilience investments. These findings advance our understanding of supply chain management in heritage-based industries and provide actionable insights for SMEs operating in informal, trust-based business environments where governance serves as the critical bridge between operational capabilities and sustainable performance outcomes.

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Appendix A. Discriminant Validity Fornel-Larcker

| | Agility | FP | Integration | SCG | SCORE |
|-------------|---------|-------|-------------|-------|-------|
| Agility | 0.874 | | | | |
| FP | 0.778 | 0.835 | | | |
| Integration | 0.516 | 0.518 | 0.805 | | |
| SCG | 0.753 | 0.83 | 0.553 | 0.832 | |
| SCORE | 0.853 | 0.776 | 0.535 | 0.746 | 0.869 |

Appendix B. Items used in developing the scales

Please indicate the extent of your agreement or disagreement. (from 1 “strongly disagree” to 5 “strongly agree”).

Part 1: Supply Chain Resilience

Agility

- X11. MSEs always see opportunities in the business environment.
- X12. MSEs always see threats in the business environment.
- X13. MSEs can quickly respond to market changes.
- X14. MSEs always have stock in response to rapidly changing markets.
- X15. MSEs can provide customized services to business customers (such as shipping companies).

Integration

- X21. MSEs always share information about their operations with business consumers.
- X22. MSEs have entered into cooperation agreements with some business consumers to share revenues and risks together.
- X23. MSEs can accept innovative ideas from business consumers to design new services.

Supply chain (re-)engineering

- X31. MSEs consider the ability to understand the risks that will occur as an important criterion in selecting business customers.
- X32. MSEs believe that some "extra" resources (such as manpower and equipment) are not wasted, but rather are a preparation for sudden events.
- X33. MSEs have ways to prevent risks from occurring.
- X34. MSEs have allocated more resources to deal with risks in cooperation.

Part 2: Supply Chain Governance

- Z1. MSEs trust in business consumers.
- Z2. Even though circumstances change, MSEs are confident that business consumers will be ready and willing to provide assistance and support.
- Z3. When making important decisions, so that business consumers pay attention to the welfare or interests of MSEs.
- Z4. MSEs are confident that future decisions and actions of business consumers will not have a negative impact on MSEs.
- Z5. MSEs have specific and clear agreements with business customers.
- Z6. MSEs have specific agreements that detail the obligations of both parties.
- Z7. MSE contracts clearly state what will happen if an unforeseen event occurs.

Part 3: Firm Performance

- Y1. Cooperation can help MSEs increase profits on business development.
- Y2. Cooperation can help MSEs increase profits on assets (fabric materials, looms, computers, etc.).
- Y3. Cooperation can help MSEs increase sales growth.
- Y4. Collaboration can help MSEs meet business consumer needs
- Y5. Collaboration can help MSEs meet market changes
- Y6. Collaboration can help MSEs meet new product development
- Y7. Collaboration can help MSEs improve on-time product delivery

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