THE ROLE OF DIGITALIZATION, ADAPTIVE COLLABORATION, AND SUSTAINABILITY PRACTICES IN STRENGTHENING MSME SUSTAINABLE SUPPLY CHAIN ACCOUNTABILITY: SYSTEMATIC LITERATURE REVIEW

Eka Siskawati[1]*, Sri Mangesti Rahayu[2], Yudi[2], Firman Surya[1], Halkadri Fitra[3]

1) Department of Accounting, Politeknik Negeri Padang, Padang, Indonesia
2) Department of Accounting, Universitas Jambi, Jambi, Indonesia
3) Department of Accounting, Universitas Negeri Padang, Padang, Indonesia

**Corresponding Author: ekasiskawati@gmail.com*
(ORCID ID https://orcid.org/0000-0003-1956-8803)

Highlight

MSMEs face persistent challenges in integrating accountability into sustainable supply chain management due to limited resources and market pressures. This study identifies that leveraging digitalization for transparency, fostering adaptive collaboration for resilience, and adopting rigorous sustainability practices are essential strategies for MSMEs to balance economic, social, and environmental goals effectively.

Abstract

Micro, Small, and Medium Enterprises (MSMEs) play a critical role in the global economy, yet they face persistent challenges in integrating sustainability into supply chain management. Limited resources, low awareness, and market pressures often hinder their ability to achieve accountability in balancing economic, social, and environmental goals. This study aims to synthesize the literature on the role of digitalization, adaptive collaboration, and sustainability practices in strengthening accountability within Sustainable Supply Chain Management (SSCM) for MSMEs. The research employs a Systematic Literature Review (SLR) guided by PRISMA methodology to ensure transparency and replicability. Data were collected from the Scopus database covering the years 2020–2025, yielding 232 initial studies. After a rigorous screening and eligibility process, 43 relevant articles were selected as the final sample. Articles were coded based on digitalization, collaboration, sustainability, and accountability indicators. A thematic synthesis was conducted to identify key patterns, interrelationships, and conceptual contributions. The results show that digital technologies enhance transparency and efficiency, adaptive collaboration fosters resilience and flexibility, and sustainability practices strengthen legitimacy through social and environmental reporting. These findings confirm that SSCM accountability is multidimensional. The study provides theoretical integration and practical insights to guide MSMEs toward more accountable and sustainable supply chain practices.

Keywords

Sustainable Supply Chain Management (SSCM), Digitalization, Adaptive Collaboration, Sustainability Practices, MSMEs Accountability.

Introduction

Sustainable Supply Chain Management (SSCM) has evolved from a buyer–supplier relationship focus into a multi-tier framework that emphasizes transparency, collaboration, and technology to strengthen socio-environmental legitimacy and the resilience of sustainable supply chains (Heldt & Beske-Janssen, 2023; Venkatarman & Rajkumar, 2024). This transformation positions SSCM as a strategic instrument for enhancing competitiveness, building market trust, and advancing the achievement of sustainable development goals. Micro, Small, and Medium Enterprises (MSMEs) are the backbone of the economy, key absorbers of labor, and drivers of local economic activity. However, within the context of sustainability, MSMEs face the challenge of operating their businesses without compromising environmental and social dimensions (Supriyono et al., 2024). Research indicates that MSMEs encounter systemic barriers in adopting sustainable practices (Gonçalves et al., 2024), such as limited resources, low awareness, and market pressures, which constrain their ability to build an environmentally friendly image (Rajapakse et al., 2022). These barriers explain the suboptimal implementation and accountability of sustainable supply chain management. Yet, SSCM practices enable MSMEs to utilize information more effectively to optimize supply chains, thereby creating added value while simultaneously enhancing their competitiveness in the market (Ikhwana & Maulana, 2023; Rohmasari & Fakhroni, 2023)(Reyna-Castillo et al., 2023).

Digital technology has emerged as a key catalyst accelerating business transformation toward sustainability by fostering innovation, operational efficiency, and the integration of socio-environmental dimensions (Correggi et al., 2024). While digitalization contributes positively to business transformation, a gap remains between digitalization and the internalization of accountability values such as collaboration, participation, and legitimacy (Anthonysamy et al., 2025). This gap creates a "black box" risk, wherein technology operates without generating positive impacts for stakeholders. Digitalization without the internalization of accountability undermines both organizational legitimacy and competitive advantage (Erhan et al., 2022). Competitive advantage cannot rely solely on technology, as technological adoption without strategic integration remains temporary in nature (Kraus et al., 2022).

Digitalization has been extensively examined as a driver of green innovation through sustainable supply chain collaboration (Cheng, Li, et al., 2024; Dong et al., 2023; M. Li et al., 2023; W. Yu et al., 2023), including digital integration (Cheng, Li, et al., 2024; M. Li et al., 2023), knowledge collaboration (Dong et al., 2023), and the role of suppliers and customers in fostering green innovation (W. Yu et al., 2023). These studies highlight the strong interlinkages between digitalization, GSC collaboration, and the attainment of environmental innovation performance. However, the existing body of research remains predominantly technocentric, emphasizing green innovation as the primary outcome, while the sociocentric dimension of accountability within the SSCM context—particularly in MSMEs—has been relatively underexplored. Thus, there is room for research to synthesize the literature on the role of digitalization, adaptive collaboration, and socio-environmental sustainability practices in strengthening SSCM accountability, thereby broadening both theoretical and practical contributions beyond green innovation alone.

Literature Review

(RBV) emphasizes that firm performance is determined by internal resources rather than solely by external market conditions (Arbelo et al., 2020). Resources that are Valuable, Rare, Inimitable, and Non-substitutable (VRIN) form the foundation of sustainable competitive advantage. RBV focuses on identifying and leveraging VRIN resources, including tangible assets, intangible assets, and organizational capabilities that create value (Kamasak, 2017). Prior studies highlight the importance of reputation, knowledge, and customer relationships; for example, in the port industry, customer and relational resources are critical determinants of service competitiveness (Pak et al., 2015).

In the context of SMEs, e-commerce adoption can enhance business performance. Although outcomes are influenced by technological readiness and adoption costs, entrepreneurial competence is consistently regarded as a vital internal resource (Hussain et al., 2022). RBV also shifts the paradigm from traditional financial indicators toward profit efficiency, defined as a firm's ability to use resources effectively to generate profits, where reputation emerges as a key factor in determining efficiency levels (Arbelo et al., 2020). However, the RBV has been criticized for its static nature and limited attention to environmental dynamics. Kamasak (2017) argues that the RBV's emphasis on capabilities and competencies provides only a limited contribution, as it is not accompanied by adaptive strategies. Similarly, Cosic, Shanks, and Maynard (2015) assert that technology, as a tangible asset, remains relatively easy to imitate, suggesting that sustainable competitive advantage more often derives from dynamic and complex analytical capabilities.

Dynamic capability refers to a higher-order organizational ability to sense environmental changes, seize emerging opportunities, and continuously transform resources to remain competitive (Konopik et al., 2022). The sensing, seizing, and transforming framework explains how organizations identify technological opportunities, mobilize resources, and reconfigure structures to sustain advantage. The central focus of this theory is the organizational learning process in orchestrating cross-functional capabilities to address market and technological uncertainties. In the sensing phase, organizations develop market intelligence, strengthen ecosystem connectivity, and explore both internal and external innovations. In the seizing phase, they design business models, establish decision-making protocols, and build partnerships. In the transforming phase, organizations reconfigure assets, adjust governance mechanisms, and manage knowledge for continuous renewal (Konopik et al., 2022). This theory underscores the importance of enhancing internal operations through capability development aligned with environmental dynamics.

The strength of dynamic capability lies in its ability to bridge strategy and execution through a step-by-step capability roadmap. It integrates technology, data, partnerships, culture, and leadership to reinforce organizational adaptation (S. Zhang et al., 2024). Partnerships are viewed as a strategic means to access new

resources, accelerate innovation, and strengthen reconfigurability, serving as instruments of organizational adaptation that enable firms to capture opportunities and reduce market uncertainty. The purpose of this study is to synthesize the literature on the role of digitalization, adaptive collaboration, and socio-environmental sustainability practices in strengthening SSCM accountability in MSMEs. Employing a systematic literature review approach, this research identifies patterns, gaps, and interrelationships among these dimensions, which serve as the foundation for developing a conceptual model of accountable SSCM.

Methodology

This study employs a Systematic Literature Review (SLR) design according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure that the processes of literature search, screening, and analysis are conducted in a transparent, structured, and replicable manner. The identification process was carried out using the Scopus database with the keywords "supply chain," "financial performance," "green supply chain," "digital," and "SME efficiency," yielding an initial 232 articles aligned with the research focus. During the selection stage, filtering was applied based on the publication period (2020–2025) and abstract availability, resulting in 132 articles for further examination. Following a rigorous screening process—including checks for duplication, thematic relevance, and contextual alignment—only 27 articles met the inclusion criteria, supplemented by 4 additional articles from relevant external sources verified manually.

Inclusion Criteria

1. Articles are empirical studies (original research) using qualitative, quantitative, or mixed methods approaches.
2. Articles are indexed in Scopus Database (Q1and Q2).
3. The article discusses topics relevant to Sustainable Supply Chain Management (SSCM) in the context of SMEs/MSMEs.

Exclusion Criteria

1. Studies that discuss supply chains in general without the dimensions of sustainability, digitalisation, or accountability.
2. Articles with abstracts are unavailable, or the full text cannot be accessed.

Quality Appraisal

Quality appraisal is a fundamental stage of this systematic review, as it serves to verify that the studies selected for inclusion demonstrate adequate methodological rigor, reliability, and relevance for evidence synthesis. Considering the wide variation in research designs commonly found in SSCM studies focusing on SMEs/MSMEs, this review applies the Mixed Methods Appraisal Tool (MMAT) version 2018 (Q. N. Hong et al., 2018). The reviewed articles were first grouped based on their methodological approach, distinguishing between quantitative studies (including descriptive, non-randomized, and randomized designs), qualitative investigations, and mixed-methods research. Subsequently, each study was evaluated and assigned a quality score in accordance with the criteria corresponding to its specific design category as outlined in the MMAT framework, where a score of 20% indicated the fulfilment of a single criterion and a score of 100% reflected full compliance with all criteria. The assessment was guided by five core MMAT criteria, namely representativeness, appropriateness of measurements, completeness of outcome data, consideration of confounding factors, and the extent to which the exposure or intervention was implemented as intended.

The research instrument consists of a literature coding guide encompassing the variables of digitalization, adaptive collaboration, social–environmental sustainability practices, and accountability indicators in SSCM. The data collection procedure was conducted through systematic extraction, which included recording the research objectives, methodologies, MSME contexts, and key findings of each article. The collected data were then analysed using a thematic approach by mapping relationships among variables and identifying patterns, gaps, and emerging theoretical contributions. This analysis followed the steps of literature synthesis, integrating empirical findings across contexts within the theoretical frameworks of the Resource-Based View, Dynamic Capability Theory, and Stakeholder Theory (X. Chen et al., 2024; Cheng, Wu, et al., 2024; Piprani et al., 2024; Rutainurwa et al., 2024; W. Yu et al., 2023). Through this approach, the study was able to develop a conceptual model that highlights how digitalization, adaptive collaboration, and social–environmental sustainability practices contribute to strengthening accountability in SSCM for MSMEs.

Results

This study initially identified 232 articles from the Scopus database, and analysed 31 articles that met the criteria. The selection process is visualized through the PRISMA diagram (Figure 1), which illustrates the flow of identification, screening, eligibility, and inclusion of articles.

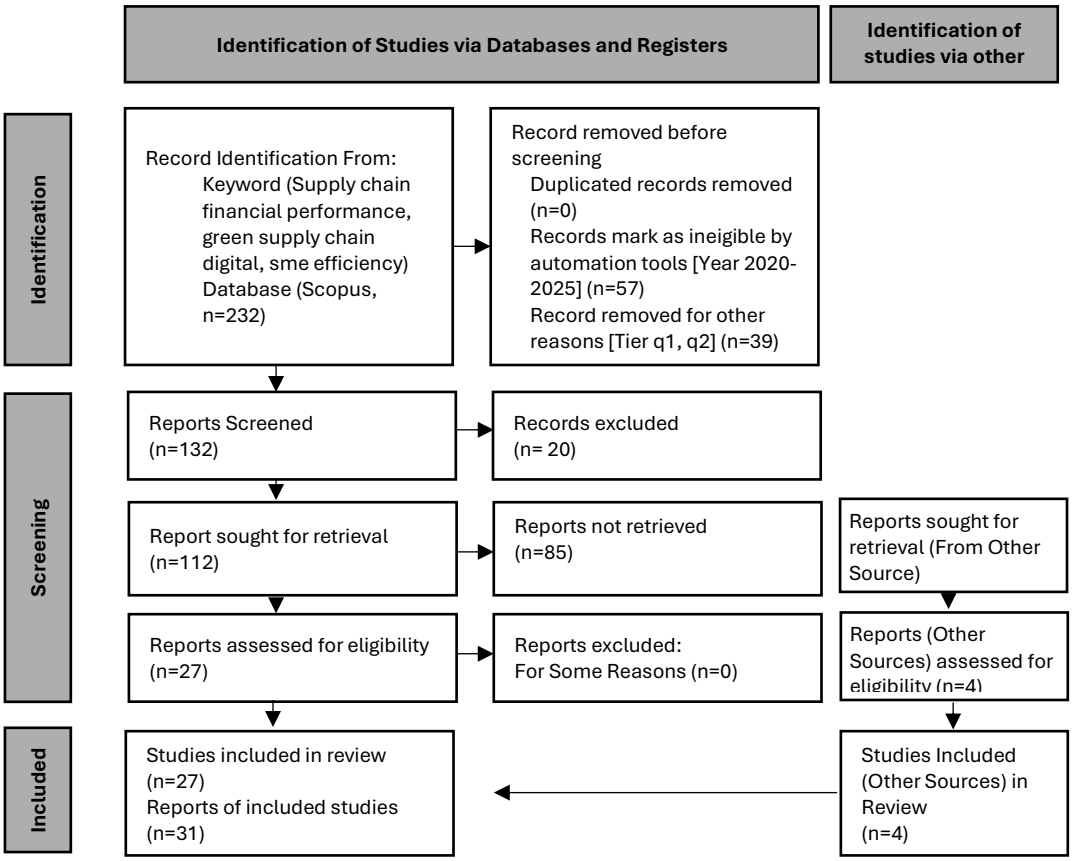

Figure 1. PRISMA Diagram

The publication trend illustrated in Figure 2 highlights a significant increase in research on SSCM, digitalization, collaboration, and sustainability during the period 2018–2025. The number of publications rose sharply from 10 articles in 2018 to a peak of 48 articles in 2024, while 33 articles were recorded in 2025 up to mid-year. This pattern indicates that research on SSCM—particularly with a focus on digitalization, adaptive collaboration, and social–environmental sustainability—has experienced rapid growth over the past six years.

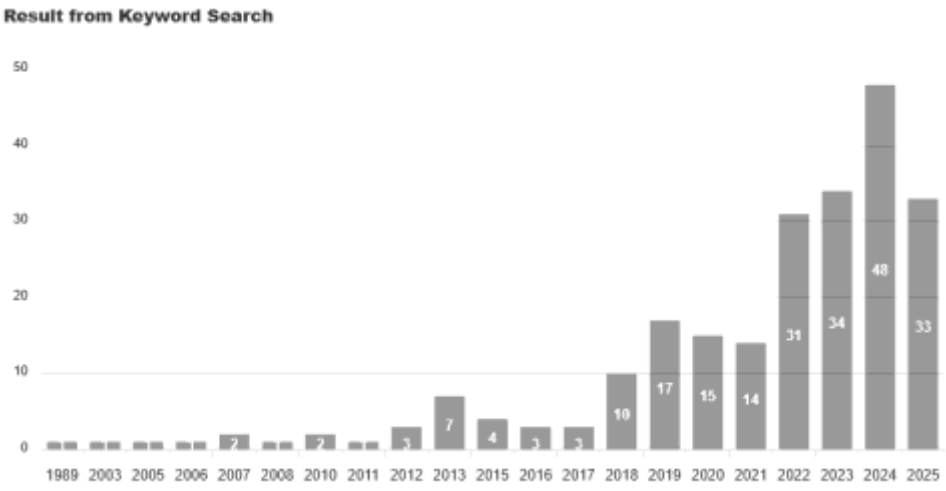

Figure 2. Publication trends of Sustainable supply chain management (SSCM) among SMEs (2018 – 2025)

Key Themes

From the 43 articles analysed, the study identifies three key themes: digitalization and transparency, collaboration and adaptive capabilities, and social–environmental accountability.

- The first theme, *digitalization and transparency*, covers 15 articles that highlight the role of ICT, ERP platforms, FinTech, and small-scale blockchain in enhancing accountability. These studies emphasize how digital tools improve transaction traceability, process efficiency, and reporting transparency (Abbasi et al., 2020; Lerman et al., 2022; Małys, 2022; Rutainurwa et al., 2024; H. Yu et al., 2025; Zeng et al., 2022; J. Zhao & Liu, 2024).
- The second theme, *collaboration and adaptive capabilities*, includes 13 articles that emphasize the importance of collaborative relationships among supply chain stakeholders to enhance competitiveness, resilience, and flexibility. The studies in this theme assert that capabilities such as agility and resilience serve as critical factors in responding to market dynamics and strengthening trust among business partners (Cheng, Wu, et al., 2024; Dong et al., 2023; Khan et al., 2024; Qiao et al., 2023; Tufan et al., 2024)
- The third theme, *sustainability and social–environmental accountability*, encompasses 15 articles that link green supply chain management (GSCM) practices with economic, social, and environmental performance. These studies affirm that practices such as green purchasing, eco-design, and reverse logistics positively influence profitability while also strengthening organizational legitimacy in the eyes of the public. Several articles further demonstrate that ESG indicators can function as evaluation instruments of sustainability that contribute to accountability in SSCM (Abbasi et al., 2021; D. Chen et al., 2024; Jum'a et al., 2021; Rehman et al., 2020; Zeng et al., 2022).

The systematic literature review identifies three dominant variables frequently investigated in relation to accountability in sustainable supply chain management (SSCM) among SMEs, namely Digitalisation, Adaptive Collaboration, and Socio-Environmental Sustainability. A total of 13 articles focus on digitalisation, emphasising ICT adoption, Industry 4.0 technologies, FinTech, ERP platforms, and blockchain as tools to enhance transparency, traceability, and efficiency. 9 articles highlight adaptive collaboration, concentrating on supply chain flexibility, resilience, agility, supplier–buyer relationships, and collaborative knowledge exchange as mechanisms to strengthen accountability through joint responsibility and information sharing. Meanwhile, 14 articles address socio-environmental sustainability, underlining green practices such as green purchasing, eco-design, reverse logistics, ESG-based reporting, and social–environmental disclosure to reinforce legitimacy and accountability. The cross-sectional analysis further shows that nine articles explicitly examine the linkage between digitalisation and accountability, seven studies connect adaptive collaboration with both environmental and financial performance, and eight papers emphasise the integration of socio-environmental sustainability with transparency and accountability, thereby confirming the multidimensional nature of SSCM accountability in SMEs.

Table 1. Themes Distribution in the Systematic Literature Investigated Relation to Accountability

Description	**Themes**	**No. of Articles**	**Articles**
Dominant Themes	**Digitalization**	18	(H. Yu et al., 2025);(Cheng, Li, et al., 2024);(D. Chen et al., 2024);(Rutainurwa et al., 2024);(Piprani et al., 2024);(Khan et al., 2024);(J. Zhao & Liu, 2024);(Cheng, Wu, et al., 2024);(Tufan et al., 2024); (Dharmayanti et al., 2023); (Juan & Li, 2023); (Munir & Bhutta, 2023); (Pan et al., 2023); (M. Li et al., 2023);(Qiao et al., 2023);(Dong et al., 2023);(Rodríguez-González et al., 2022);(Reza-Gharehbagh et al., 2023)
	Adaptive Collaboration	13	(Cheng, Li, et al., 2024); (Piprani et al., 2024); (Khan et al., 2024); (J. Zhao & Liu, 2024); (Tarnoto & Liu, 2024); (Juan & Li, 2023); (Wang et al., 2023); (D'Angelo & Belvedere, 2023); (W. Yu et al., 2023); (Qiao et al., 2023); (Rodríguez-González et al., 2022); (Ma et al., 2022); (S. Hong & Najmi, 2020)
	Social-Environmental Sustainability	15	(D. Chen et al., 2024); (Khan et al., 2024); (Cheng, Wu, et al., 2024); (Juan & Li, 2023); (Pan et al., 2023); (D'Angelo & Belvedere, 2023); (W. Yu et al., 2023); (W. Li et al., 2023); (Rodríguez-González et al., 2022); (Teirlinck & Khoshnevis, 2022); (Lerman et al., 2022); (Zeng et al., 2022); (Małys, 2022); (Eslami et al., 2024)

The Multidimensional Nature of SSCM Accountability.	**Digitalization & Accountability**	9	(H. Yu et al., 2025); (Cheng, Li, et al., 2024); (Rutainurwa et al., 2024); (Khan et al., 2024); (Dharmayanti et al., 2023) ; (Munir & Bhutta, 2023); (Juan & Li, 2023); (M. Li et al., 2023); (Rodríguez-González et al., 2022)
	Collaboration & Financial/Environmental Performance	7	(Piprani et al., 2024); (J. Zhao & Liu, 2024); (Tarnoto & Liu, 2024); (Wang et al., 2023); (W. Yu et al., 2023); (Qiao et al., 2023); (S. Hong & Najmi, 2020)
	Sustainability & Accountability	8	(D. Chen et al., 2024); (Piprani et al., 2024); (Cheng, Wu, et al., 2024); (Pan et al., 2023); (Teirlinck & Khoshnevis, 2022); (Rodríguez-González et al., 2022); (Lerman et al., 2022); (Eslami et al., 2024)

Overall, this study presents a comprehensive overview of the literature on SSCM in SMEs. The findings confirm that three main themes—digitalization, adaptive collaboration, and socio-environmental sustainability practices—consistently emerge in the literature as key drivers of sustainable supply chain accountability. Although the research contexts vary, a general pattern can be observed: digital technologies function as instruments of transparency, adaptive collaboration enhances flexibility and resilience, and sustainability practices strengthen organizational legitimacy through social and environmental reporting.

Quality Appraisal

Table 2 presents quality appraisal using the Mixed Methods Appraisal Tool (MMAT). It shows that all studies that passed the screening stage were quantitative, consisting of non-randomised quantitative and descriptive designs. The MMAT scores ranged from 40% to 100%, indicating significant methodological quality variation but still meeting the core criteria of MMAT, consisting of research design (C1), sampling quality (C2), measurement validity (C3), data analysis accuracy (C4), and method integration (C5). Several studies obtained a maximum score of 100%, reflecting strengths in research design, good sampling procedures, adequate measurement validity, and appropriate analytical approaches.

Table 2. Quality appraisal of studies

Article	**C1**	**C2**	**C3**	**C4**	**C5**	**Total**
MMAT Category: Quantitative Non-Randomized						
Chen et al., (2024)	x	√	x	x	√	40%
Yu et al., (2025)	√	√	√	x	√	80%
Yu et al., (2023)	√	√	√	x	√	80%
Munir & Bhutta,. (2023)	x	√	√	x	√	60%
Abbasi et al., (2021)	√	√	x	√	√	80%
Lerman et al., (2022)	√	√	√	√	√	100%
Ma et al., (2022)	x	√	√	x	√	60%
Eslami et al., (2024)	√	√	√	√	√	100%
Lee., (2021)	√	x	√	x	√	60%
Jum'a et al., (2021)	√	x	√	√	√	80%
Yu et al., (2021)	√	√	x	x	x	40%
Hong & Najmi (2020)	√	x	√	x	√	60%
Ariadi & Rohman (2021)	√	√	√	√	√	100%
Kalyar et al., (2019)	x	√	√	x	√	60%
MMAT Category: Quantitative Descriptive						
Li et al., (2023)	√	√	√	x	√	80%
Rodríguez-González et al., (2022)	√	√	√	x	√	80%
Rodríguez-González et al., (2022)	√	√	√	x	√	80%
Teirlinck & Khoshnevis., (2022)	√	√	√	x	√	80%
Zeng et al.,(2022)	√	√	x	x	√	60%
Małys (2022)	√	√	√	x	√	80%
Dharmayanti et al.,(2023)	√	x	√	x	√	60%
Juan & Li.,(2023)	√	x	√	√	√	80%
Cheng, Li, et al., (2024)	√	√	√	x	√	80%
Qiao et al., (2023)	√	√	√	√	x	80%
Dong et al., (2023)	√	√	√	√	√	100%
Rutainurwa et al.,(2024)	√	√	√	x	√	80%

Piprani et al., (2024)	√	x	√	x	√	60%
Khan et al., (2024)	√	x	√	√	√	80%
Zhao & Liu., (2024)	√	x	√	x	√	60%
Tarnoto & Liu., (2024)	√	x	√	√	√	80%
Tufan et al., (2024)	√	x	√	x	√	60%

Discussion

The Role of Digitalisation in Strengthening Accountability of Sustainable Supply Chain Management in SMEs

The findings of this systematic literature review indicate that digitalisation and transparency have become dominant themes in recent SSCM research, particularly due to their crucial role in enhancing information management and accountability. Several studies emphasise the transformative potential of digital technologies in improving supply chain integration, efficiency, and traceability. Zhao & Liu (2024) highlight that ICT capabilities strengthen digital integration in supply chains and significantly enhance firm competitiveness. Similarly, Yu et al. (2025) demonstrate that digitalisation improves green productivity and reduces environmental risks, while Rutainurwa et al. (2024) confirm that ICT-based supply chain integration positively influences the financial performance of SMEs. Moreover, Kumar et al. (2022) provide evidence that digital transformation, when combined with supplier collaboration and green innovation, leads to optimal environmental performance. Zeng et al., (2022). Further note that ESG indicators can be integrated with financial indicators to enhance accountability through data-driven transparency.

For SMEs, the adoption of digital technologies is particularly relevant because of their limited financial and infrastructural resources. Small-scale solutions such as simple ERP platforms or FinTech applications can be effective and affordable tools to strengthen accountability. These technologies allow SMEs to improve record-keeping, ensure transaction traceability, and present transparent reports to stakeholders, thereby reinforcing their legitimacy. As Piprani et al. (2024) suggest, Industry 4.0 tools also enable SMEs to develop lean, agile, resilient, and green supply chains, which directly support accountability and sustainable competitiveness. The literature shows that digitalisation not only enhances operational efficiency but also extends the scope of accountability to include social and environmental dimensions. This aligns with the growing global demand for SMEs to be more transparent and responsible in their supply chain practices. Empirical evidence across various contexts confirms that digital technologies support both financial and non-financial reporting, thereby strengthening trust among stakeholders. By adopting scalable digital tools, SMEs can overcome resource limitations and improve their accountability mechanisms, ensuring both operational efficiency and long-term sustainability (H. Yu et al., 2025; J. Zhao & Liu, 2024).

The Role of Adaptive Collaboration in Strengthening Accountability of Sustainable Supply Chain Management in SMEs

The review findings highlight adaptive collaboration as a critical theme in SSCM research, particularly in contexts characterised by limited resources and high uncertainty. Cheng et al. (2024)demonstrate that digital capabilities combined with managerial awareness reinforce green collaboration, which subsequently drives sustainable innovation. Supplier–buyer collaboration significantly improves operational and financial performance in SMEs. Khan et al. (2024)further underline that supply chain flexibility and technological support play essential roles in coping with market uncertainties, while Tufan et al. (2024) stress the importance of agility and resilience as fundamental capabilities to sustain financial performance.

The synthesis of these studies shows that adaptive collaboration is not merely a coordination mechanism but a foundation for collective accountability. By sharing responsibilities, exchanging information, and aligning practices across supply chain partners, transparency is enhanced, and accountability becomes embedded in the system. Zhang et al.(2023) confirm that cross-chain collaboration strengthens joint responsibility for environmental outcomes, illustrating how accountability extends beyond individual firms. For SMEs, which often face constraints in capital, expertise, and infrastructure, collaboration provides access to external resources and collective legitimacy, ensuring both survival and competitiveness in dynamic environments.

The Role of Sustainability Practices in Strengthening Accountability of Sustainable Supply Chain Management in SMEs

The literature review reveals that socio-environmental sustainability practices are strongly linked to SSCM accountability. Chen et al. (2024) demonstrate that environmental disclosure significantly affects market value. Similarly, Rehman et al., (2020) and Jum'a et al. (2021) highlight the mediating role of environmental performance

between GSCM practices and financial outcomes. These findings show that sustainability practices strengthen accountability by providing transparent evidence of firms' commitments to social and environmental responsibilities. Wu et al. (2022) emphasise ESG indicators as tools to measure sustainability-driven accountability, while Zhao et al., (2022) highlight blockchain's role in improving traceability and transparency. Additionally, government regulation and customer pressure as external drivers shaping sustainable accountability. Therefore, socio-environmental sustainability practices not only enhance legitimacy but also integrate financial, environmental, and social dimensions into SSCM accountability, making them indispensable for SMEs' long-term survival and stakeholder trust.

Figure 2. Conceptual Model of Accountability in SSCM for SME

This study unifies diverse findings that were previously fragmented across separate research streams. Earlier works examined technology, collaboration, or sustainability in isolation. This research brings these three pillars together into a single conceptual framework. It shows that accountability in SSCM should be understood as multidimensional. Digital technologies provide transparency, adaptive collaboration builds shared responsibility, and sustainability practices reinforce legitimacy. The study contributes by extending established theories, including Resource-Based View, Dynamic Capability Theory, and Stakeholder Theory. It demonstrates how these perspectives can be integrated to explain accountability in SMEs' sustainable supply chains.

1. Digitalization as a Catalyst for Adaptive Collaboration

Digitalization has fundamentally transformed how MSMEs coordinate with suppliers, customers, and external partners. The adoption of cloud-based applications, online marketplaces, and simplified ERP systems facilitates efficient data exchange, reduces information asymmetry, and lowers coordination costs. MSMEs that previously relied on manual communication can now track transactions and product flows in real time, enhancing responsiveness and decision-making across the supply chain. This transformation positions digitalization as a catalyst for adaptive collaboration, as it enables transparency, agility, and synchronization among supply chain actors. From a theoretical perspective, digitalization represents a valuable intangible resource under the Resource-Based View (RBV), generating efficiencies that are difficult to imitate when combined with managerial and relational capabilities (Arbelo et al., 2020; Kamasak, 2017). Dynamic Capability further suggests that digitalization strengthens sensing mechanisms through big data analytics and enhances seizing through collaborative decision-making (Konopik et al., 2022). In addition, Stakeholder Theory emphasizes that digitalization facilitates two-way communication with stakeholders, thereby legitimizing collaborative practices (Ashrafi et al., 2020). Thus, digitalization should be understood not merely as a supportive tool, but as a strategic foundation for establishing adaptive collaboration.

2. Adaptive Collaboration as a Driver of Social and Environmental Sustainability

Adaptive collaboration, in turn, becomes a powerful driver for embedding sustainability practices within MSMEs. Partnerships with environmentally conscious suppliers enable the use of sustainable raw materials, while collaboration with local communities enhances the social contributions of enterprises. Furthermore, the shared distribution of responsibilities in collaborative networks stimulates green innovation that would be challenging for firms to achieve individually. As such, sustainability practices emerge not simply as external pressures but as organic outcomes of adaptive relationships among supply chain actors. The RBV conceptualizes these collaborative relationships as intangible assets that generate trust, reputation, and shared knowledge, all of which are difficult for competitors to replicate (Pak et al., 2015). The Dynamic Capability framework underscores

collaboration as a transforming mechanism that reconfigures operational processes toward energy efficiency, waste reduction, and green innovation (Konopik et al., 2022). From the perspective of Stakeholder Theory, adaptive collaboration enhances social legitimacy by integrating stakeholders into the formulation of sustainability values (Hategan et al., 2018). In this sense, adaptive collaboration serves as a bridge linking business objectives with broader social and environmental responsibilities.

3. Sustainability Practices as a Pathway to Accountability in SSCM

The integration of sustainability practices directly contributes to greater accountability in Sustainable Supply Chain Management (SSCM). MSMEs that disclose their environmental impacts, uphold ethical standards in community relations, and implement recognized sustainability frameworks gain increased credibility with both investors and consumers. Such transparency signals accountability by demonstrating that firms are not solely profit-oriented but are also committed to their broader social and environmental responsibilities. This aligns with Stakeholder Theory, which argues that sustainability practices reinforce social legitimacy and serve as the basis for long-term accountability (Ashrafi et al., 2020). From an RBV perspective, sustainability constitutes a strategic capability that not only improves resource efficiency but also strengthens reputation as a rare and inimitable intangible asset (Arbelo et al., 2020). Meanwhile, the Dynamic Capability lens views sustainability practices as a form of transforming, whereby firms adapt their processes in response to regulatory pressures and market expectations (Konopik et al., 2022). Hence, sustainability should not be interpreted as a reactive or normative measure, but rather as a proactive strategy to institutionalize accountability in SSCM.

4. Accountability in SSCM acts both as a catalyst that accelerates digital adoption and as an enabler that sustains continuous digitalization in supply chain ecosystems.

MSMEs with strong accountability are more likely to gain access to financing, partnerships, and new markets. Transparent reporting and commitment to sustainability act as positive signals for investors and customers, fostering support in the form of capital, technology transfer, and strategic collaboration. This demonstrates that accountability catalyses advancing digitalization within supply chains. From the perspective of Stakeholder Theory, legitimacy derived from accountability strengthens external relationships and opens pathways to technological resources (Hategan et al., 2018). RBV highlights accountability as a unique intangible asset, enabling firms to secure digital opportunities and build competitive advantage (Arbelo et al., 2020). Meanwhile, Dynamic Capability emphasizes that accountable organizations have stronger seizing capacities, trusted to mobilize resources for adopting innovations (Konopik et al., 2022). Thus, accountability in SSCM is not only a foundation of social legitimacy but also an enabler of continuous digitalization, reinforcing innovation and competitiveness.

Conclusions

This study examines how digitalization, adaptive collaboration, and social–environmental sustainability practices collectively strengthen the accountability of Sustainable Supply Chain Management (SSCM) in micro, small, and medium enterprises (MSMEs). Using a systematic literature review of 43 relevant articles, the research demonstrates that accountability in MSMEs cannot be established through a single dimension but requires the simultaneous integration of technological, collaborative, and sustainability aspects. The findings indicate that digitalization acts as a strategic enabler of transparency, traceability, and efficiency within supply chains. Technologies such as ICT, simplified ERP systems, FinTech, and blockchain improve data accuracy and support more accountable reporting. Adaptive collaboration with suppliers, customers, and partners fosters trust, information exchange, and flexibility, while also enhancing competitiveness and shared responsibility for sustainable performance. Furthermore, social–environmental practices, including green purchasing, eco-design, reverse logistics, and ESG-based reporting, strengthen legitimacy among stakeholders. Together, these dimensions highlight that accountability in SSCM is multidimensional and integrative. The study contributes to theory by synthesizing fragmented literature and linking the Resource-Based View, Dynamic Capability, and Stakeholder Theory to MSME practices. Future research should empirically test this conceptual model using mixed methods and longitudinal designs, while exploring diverse geographical contexts to enhance validity, generalizability, and practical recommendations for MSMEs worldwide.

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