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Digital Technologies and SME Sustainability: Enablers, Barriers and Performance Outcomes in SMEs: A Systematic Review

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Abstract: *Small and medium enterprises (SMEs) hold the key to the development of emerging economies but their ability to make sustainability transitions is inhibited by ongoing resource shortages, institutional weaknesses, and differences in management capability that make models of large-scale enterprises mostly unsuitable. The current paper is a systematic literature review of 52 peer-reviewed articles (2015-2025) that have been performed following PRISMA 2020 guidelines that syntheses the existing evidence on how digital technologies can help SMEs to achieve sustainability in an emerging economy setting. The review builds an all-in-one conceptual framework of consolidated fragmented scholarly efforts to draw on a thematically varied evidence base, such as Industry 4.0, big data analytics, blockchain, artificial intelligence, circular economy transitions, green manufacturing, and sustainability reporting. There are five major enablers namely: organisational leadership and entrepreneurial orientation; digital technologies as catalytic mediators; green human resource management; structured knowledge management; and institutional support. In line with this, there are five categories of barriers where financial constraints turn out the most widespread, then there is managerial resistance, lack of technical capability, poor regulatory frameworks and supply chain obscurity. Results show that digital technologies, especially big data analytics, have quantifiable positive impacts on environmental and social performance, as well as economic and operational performance. This review pushes the theoretical knowledge of digital sustainability adoption and provides evidence-based recommendations in the process of navigating sustainable digital change in emerging markets.*

Keywords: Sustainable Development; Digital Technologies; Small and Medium Enterprises (SMEs); Emerging Economies; Circular Economy

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Introduction

Global economies rely heavily on SMEs which constitute around 90% of businesses in emerging markets, generate jobs and alleviate poverty and contribute significantly to Gross Domestic Product (Chatterjee et al., 2021; Mani et al., 2020). SMEs in India alone employ an estimated 110 million people in 63 million enterprises and contribute to almost 30% of National GDP (Bapat et al., 2024; Vijayalakshmi et al., 2025). SMEs not only provide economic benefits but acts as essential nodes in Global Supply Chains, as a source of innovation and as a vehicle of inclusive development in developing economies (Das et al., 2020; P. Kumar et al., 2019). SMEs continue to suffer from persistent structural challenges such as lack of access to finances, obsolete technology, lack of managerial capabilities and susceptibility to external shocks such as financial crises and pandemics (Koporcic et al., 2025; Sharma et al., 2024).

This study aims to explore the current state of digital technologies, the role of digital technologies in promoting sustainability reporting among SMEs and the challenges faced by SMEs in their journey towards digital transformation and sustainability.

There is a need to make the business world sustainable. The United Nation's Sustainable Development Goals (SDGs) are a catalyst to make the world sustainable. The SDGs are designed to promote integration of environmental stewardship, social responsibility and economic viability in corporate strategy (Gadekar et al., 2022; Mangla et al., 2018). Sustainability as defined by the Triple Bottom Line (Economic, Environmental and Social) is now a key strategic issue for organizations looking to remain competitive over time (Nayak & Dhaigude, 2019, p. 2020; Singh et al., 2021). For SMEs, sustainability presents both opportunities and challenges. On the positive side, sustainability practices may lead to improved operational efficiency, cost savings, better relations with stakeholders and greater access to green funding and green markets (Rahman P et al., 2025; Siegel et al., 2024). On the negative side, SMEs often experience constraints in terms of resources, knowledge and institutions that prevent them from effectively adopting and implementing broad-based sustainability programs (Ashish Mankhar et al., 2024; Karuppiah et al., 2020).

The Fourth Industrial revolution, which is based on the convergence of Digital technologies such as Artificial Intelligence, Big Data Analytics (BDA), Blockchain, Internet of Things (IoT) and Cloud Computing, has fundamentally changed the operational models of manufacturers and service providers (Gadekar et al., 2022; Tamvada et al., 2022). Industry 4.0 technologies offer significant opportunities for SMEs to improve productivity, to use resources more efficiently, to enable real-time decision making and to incorporate sustainability into their main business operations (Akila et al., 2024; Jamwal et al., 2025).

Recent research has focused on the relationship between digital transformation and sustainability in SMEs. Researchers have studied how digital technologies can support green manufacturing practices (Bapat et al., 2024); support the adoption of Circular economy (Pereira et al., 2022; Soni et al., 2023); support SMEs' sustainability reporting capabilities (Sivaiah & Vinodan, 2025) and ultimately improves SMEs overall performance. While there is evidence in the literature of the opportunities presented by digital technologies for the sustainability of

SMEs, it is also clear that many SMEs are experiencing challenges in their digital sustainability transformation journey. In particular, financial constraints, lack of technical skills, lack of infrastructure, resistance to change and lack of supportive regulatory frameworks that have been identified as major obstacles to the adoption of new technologies and the implementation of sustainability practices in SMEs in general and especially in SMEs in emerging markets (P. Kumar et al., 2019; Kushwaha & Talib, 2020).

Literature Review

The adoption of sustainability among small and medium-sized enterprises (SMEs) is a growing topic of scholarly interest, in part due to structural and institutional constraint on firms present in emergent economies. Current literature indicates that the interplay of organisational strengths, technological uptake and external environmental factors determines the sustainability results in more than 30,000 SMEs. In the context of organisational level, the commitment to leadership has been well known to be a major catalyst of sustainability adoption. Leadership not only influences resource distribution, but also defines the effectiveness of sustainability initiatives in their applicability in firms. As an example, indications of leadership support have been exhibited to play a significant role in moderating the way digital technology use affects sustainable business growth (Chatterjee et al., 2022).

Equally, distributed leadership structures allow employees across the levels to be engaged in sustainability initiatives, thereby enhancing organisational agility, and the culture of innovation (Soni et al., 2023).

Moreover, the relationship between digital technology adoption and sustainability performance is enhanced by a concept known as entrepreneurial orientation, which relates to innovativeness, proactiveness, and risk-taking (Vrontis et al., 2022). The relationship between dynamic capabilities and SMEs is further supported by the fact that dynamic capabilities help SMEs to sense an opportunity and reconfigure their resources and adapt to the changing environmental needs. Strong dynamic capabilities help firms to better translate sustainability investments into improved performance, especially with the help of green human resource management (GHRM) practices (Rahman P et al., 2025).

The integration of environmental goals in to organisational practices has come through the GHRM initiatives which include sustainability of recruitment, training and performance appraisal. Also, knowledge management competences, particularly structured approaches as multi-criteria decision-making (MCDM) improve the capability of SMEs to assess sustainability initiative systematically and positively influence the outcomes of the innovation process (Rodríguez-Carrillo et al., 2025). Technological change has proved to be one of the enabling factors of sustainability change within SMEs. Digital technologies are essential in enhancing efficiency, transparency, and decision-making. The relationships between organisational factors and project performance have been found to be mediated by big data analytics, which can result in improved sustainability outcomes (Mangla et al., 2018). In the same way, the innovation driven by big-data can improve supply chain resilience, especially with the support of strong leadership of technology (Chatterjee et al., 2021).

Blockchain technology also helps to achieve sustainability, as it improves the transparency and traceability of supply chains, thereby reducing information asymmetry and increasing stakeholders trust (P. Kumar et al., 2019; Nayak & Dhaigude, 2019). Technological readiness is also said to affect the adoption of AI, which reflects the infrastructure of firms, skills and abilities and managerial capabilities (Tomar, 2025). Regardless of these enabling factors, SMEs have great constraints to the implementation of sustainability. The most ubiquitous challenge is financial limits, as it restricts the ability of SMEs to invest in the green technologies, infrastructure, and staff education (Ashish Mankhar et al., 2024; Koporcic et al., 2025). There are also organisational and managerial barriers to sustainability adoption such as, but not limited to, lack of awareness, insufficient expertise, and short-term strategic focus (Kushwaha & Talib, 2020).

Employee resistance to change and apprehension towards new technologies are also the main challenges and have been especially problematic in the context of Industry 4.0 implementation (Gadekar et al., 2022). Technical obstacles are also significant, because SMEs may not have the capabilities to hire skilled workers to their ranks, and also, they may not have the capabilities to access advanced technology to access skilled employees. The ambiguity of emerging technologies as well as not being sure about the cost and regulatory framework is an added hindrance to adoption (Tamvada et al., 2022). The institutional and policy related problems, which include the lack of proper regulatory support and vague policies, only contribute to making these problems even more pressing in the emerging economies (Ashish Mankhar et al., 2024). Furthermore, fragmentation of supply chains and lack of awareness in customers decreases incentives encourage SMEs to pursue sustainable activities (Mani et al., 2020). A supply chain approach is becoming more and more popular in the context of sustainability in SMEs. Sustainable supply chain management (SSCM) must focus on collaboration between stakeholders, relational capital, and information sharing.

Empirical studies indicate that practices of social sustainability, including equitable treatment of suppliers and participating in community activities positively affect supply chain performance (Mani et al., 2020). Relational capital is vital in overcoming institutional voids in the economic activities of emerging economies by enabling the collaborative efforts of partners in the supply chain through trust (Geng et al., 2017). Moreover, a good system of information sharing is needed as an enabling mechanism of circular economy operations, especially in sectors like returns of products and their recycling (Kamal et al., 2022). There is also recent research that has endeavoured to explore integrated sustainability frameworks that integrate both operation and environmental aims. Other approaches like Green- lean manufacturing, the Green Lean Six Sigma (GLSS) are the approaches that point out the need to also align operational efficiency with environmental performance.

The frameworks focus on commitment to leadership, employee engagement, and performance measurement systems as main success factors (Farrukh et al., 2020; Siegel et al., 2024). On the same note, circular economy models are increasingly becoming very prominent as SMEs aim at minimising their waste and optimising their use of resources. Combining the principles of circularity and lean has demonstrated positive outcomes on levels of sustainability and

operational performance (Nadeem et al., 2025), as well as adaptive leadership structures supporting the adoption of the principles of circularity (Soni et al., 2023).

The sector-specific research also exemplifies the significance of contextual aspects in sustainability adoption. As an example, textile SMEs have their individual challenges associated with the efficiency of the sources of energy (high implementation costs and inadequate technical knowledge). On a larger scale, sustainable manufacturing entails the match between organisational strengths and technological, regulatory, and market needs, which is why sustainability transformation is a multidimensional aspect (Bapat et al., 2024). Sustainability reporting and transparency is another dimension that is important.

The levels of sustainability disclosure are usually lower when investing in SMEs than when investing in large businesses, with significant focus on economic performance more than on environmental and social aspects (Singh et al., 2021). Nonetheless, digitalisation offers possibilities that enhance reporting practices by using structured and data-driven solutions, with maturity models allowing a gradual transition to digital reporting systems (Sivaiah & Vinodan, 2025).The significance of resilience also has become the central point in recent years, especially with regard to the COVID-19 pandemic. The high digital ability, flexibility, and collaborative nature of SMEs enabled them to adjust to disruptions better (Sharma et al., 2024). Mobile applications and other digital technologies were instrumental in keeping businesses afloat by increasing business efficiency and customer interactions (Rakshit et al., 2021). All of these findings underscore the relationship between the digital transformation, resilience, and sustainability.

2.1 Research Objectives

This systematic literature review aims to address the following research objectives based on the identified research gaps and thematic areas:

i. To provide a synthesized and critical analysis of the existing literature on sustainability practices in SMEs, specifically focusing on emerging economy contexts.
ii. To classify and identify the enabling and inhibiting factors affecting the adoption of digital technologies for sustainability in SMEs.
iii. To identify and evaluate the methodological approaches applied in SME sustainability research and identify opportunities for methodological advancements.
iv. To generate gaps and outline potential future directions in the area of digital sustainability transformation in SMEs.

2.3 Research Questions

The research questions used in the synthesis and analysis of the literature based on the identified research gaps and research objectives of this systematic literature review are as follows:

RQ1: How do the enabling and inhibiting variables, influence the adoption of sustainable practices by small and medium Enterprises (SMEs) that cater to the emerging economies?

RQ2: How can digital technologies-such as big data analytics, blockchain, artificial intelligence, and Industry 4.0 lead to sustainability outcomes in SMEs?

RQ3 What are the methods used in the research of SME sustainability and digital transformation? What are the advantages and disadvantages of each approach?

RQ4: To what degree do context-related issues such as institutional environment, cultural values, industry features and firm-level characteristics affect the relationship between using a digital technology and sustainability performance in SMEs?
RQ5: What are the major research gaps and future research directions in the field of digital sustainability transformation in SMEs?

2.4 PICO Framework

Summary Table of PICO Elements:

PICO Element	Description	Key References
Population (P)	Small and Medium Enterprises (SMEs) in developing economies across the manufacturing, service, agri-food, textile and creative industries.	(Atikur Rahaman et al., 2024; Bapat et al., 2024; Das et al., 2020; Mangla et al., 2018; Mani et al., 2020; Rubigha K & Palaniswamy, 2025; Subramanian & Suresh, 2023; Vijayalakshmi et al., 2025)
Intervention (I)	Digital technologies (big data analytics, blockchain, AI, Industry 4.0, mobile applications) and sustainability techniques (lean-green, green HRM, GSCM, sustainability reporting, circular economy).	(Alagpuria, 2021; Farrukh et al., 2020; Jain et al., 2022; Karuppiah et al., 2020; D. Kumar et al., 2024; Mangla et al., 2018; Nayak & Dhaigude, 2019; Pathak & Singh, 2019; Siegel et al., 2024; Tomar, 2025)
Comparison (C)	Adopters vs. non-adopters; emerging vs. developed economies; pre vs. post intervention; different types of technology; comparative analysis across sectors	(Bansal et al., 2023; Das et al., 2020; Department of Mechanical Engineering, Pusa Institute of Technology, Delhi, India et al., 2021; Geng et al., 2017; Hanna & Rajkumar, 2025; P. Kumar et al., 2019; Mahmood & Seth, 2023; Nadeem et al., 2025; Vrontis et al., 2022; Wohlenberg et al., 2020)
Outcome (O)	Environmental, social and economic sustainability performance; operational performance; competitive advantage; ability to be resilient	(Farrukh et al., 2020; Govindan et al., 2020; Khurana et al., 2018; Koporcic et al., 2025; Mani et al., 2020; Rahman P et al., 2025; Reasearch scholar, Department of Mechanical

	organizationally; capacity for innovation.	Engineering, MANIT BHOPAL, India et al., 2020)

Research Methodology

3.1 Research Design

To guarantee the high quality of evidence synthesis, this systematic literature review used a rigorous transparent and replicable methodology based on the guidelines of PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The main purpose of this systematic review is to summarize the current academic evidence on the topic of digital technologies and sustainability practices within small and medium enterprises (SMEs), and, in particular, in the context of the Indian and emerging economies. This review seals key knowledge gaps in terms of the enablers, barriers and outcomes of sustainable digital transformation in SMEs by systematically identifying, choosing, evaluating and synthesizing pertinent studies. The research design will combine both the aggregative and configurative synthesis that will enable the review to provide descriptive, explanatory and theoretical research questions.

3.2 Information Sources and Search Strategy

3.2.1 Database Selection

The literature review was done in two major academic databases - Scopus and Web of Science that covers a wide range of peer-reviewed academic articles in the management, business and sustainability field.

3.2.2 Search Strategy

A combination of Boolean operators and database specific syntax was used to provide a balance between the sensitivity of the search (to retrieve as much of the literature as possible) and a reasonable degree of specificity (to exclude as much irrelevant literature as possible). The key elements of the research questions were combined through the main search strategy that was refined iteratively.

Scopus Search Strategy:

text

TITLE-ABS-KEY (sme AND sustainability) AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "cr")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (AFFILCOUNTRY, "India"))

This search strategy was created to:

- Conduct a search across title, abstract and keyword fields (TITLE-ABS-KEY) to achieve maximum sensitivity.
- Use Boolean AND operator to combine the core concepts (SME AND Sustainability).

- Restrict the publication year to 2015-2025 (PUBYEAR > 2014 AND PUBYEAR < 2026) to capture the contemporary literature representing the current technological and sustainability developments.
- Include multiple documents types (articles - ar; conference papers - cp; reviews - re; conference reviews - cr) to ensure a full breadth of coverage.
- Restrict the publications written in English to ensure that the literature can be analysed.

Limit the geographic scope to India as the country of affiliation in order to investigate sustainability practices in the framework of the emerging economy.

Web of Science Search Strategy:

text

TS= (sme AND sustainability) AND PY= (2015-2025) AND LA=(English) AND CU=(India) AND DT= (Article OR Review OR Proceedings Paper)

A similar search tactic was undertaken in the Web of Science using database specific numbers of obtained documents.

3.2.3 Search Execution and Results

Scopus returned 2,067 records. Web of Science provided 1,812 records (similar size to Scopus and as expected of coverage discrepancies between the two databases). Overall, 3,879 records were exported to be processed further.

3.2.4 Study Selection Process

The selection of the studies was according to the PRISMA 2020 guidelines and was based on four systematic steps that were performed by two independent reviewers to guarantee reliability and reduce the level of selection bias:

Stage 1: Duplicate Removal

The 3,879 records found in Scopus (n=2,067) and Web of Science (n=1,812) were all imported into the Mendeley reference management software. Duplicate detection was automated and 1,214 matches were found by title, authors, year, and DOI leaving 2,665 unique records to screen.

Stage 2: Title and Abstract Screening

All 2,665 records were independently screened against inclusion/exclusion criteria using conservative decision rules to any potentially relevant study with titles and abstracts sent to full-text review. The records were not included in:

- Large enterprise-focus only (n=876, 39.8%)
- Geographic scope not in emerging economies (n=542, 24.6%)
- Non-empirical publications (n=389, 17.7%)
- Non-business sustainability (n=391, 17.7%)
- Other reasons (n=8, 0.4%)

Total omitted: 2,206, progressing 459 records (17.2% progression rate) to full-text evaluation.

Stage 3: Full-Text Eligibility Assessment

Of the 459 records (15 unavailable after the interlibrary requests), full-text articles were obtained. Exclusion reasons included:

- Lack of SME sustainability focus (n=127, 30.8%)
- Methodological limitations (n=89, 21.5%)
- Theoretical papers that lack empirical evidence (n=76, 18.4%)
- Geographic irrelevance (n=58, 14.0%)
- Duplicates/overlaps (n=34, 8.2%)
- Other (n=29, 7.0%)

Excluded: 413, with 46 reports included. Stage 4: Last Inclusion and Citation Checking

Citation tracking of the included reports identified six more studies, making it 52 final studies. The inter-rater agreement was found to be over 92 percent at all stages, and the disagreements were discussed till an agreement was reached.

Figure 1 (PRISMA flow diagram) shows the entire selection process. This is a rigorous and multi-stage process that provided extensive coverage and transparency and reproducibility of the methods used.

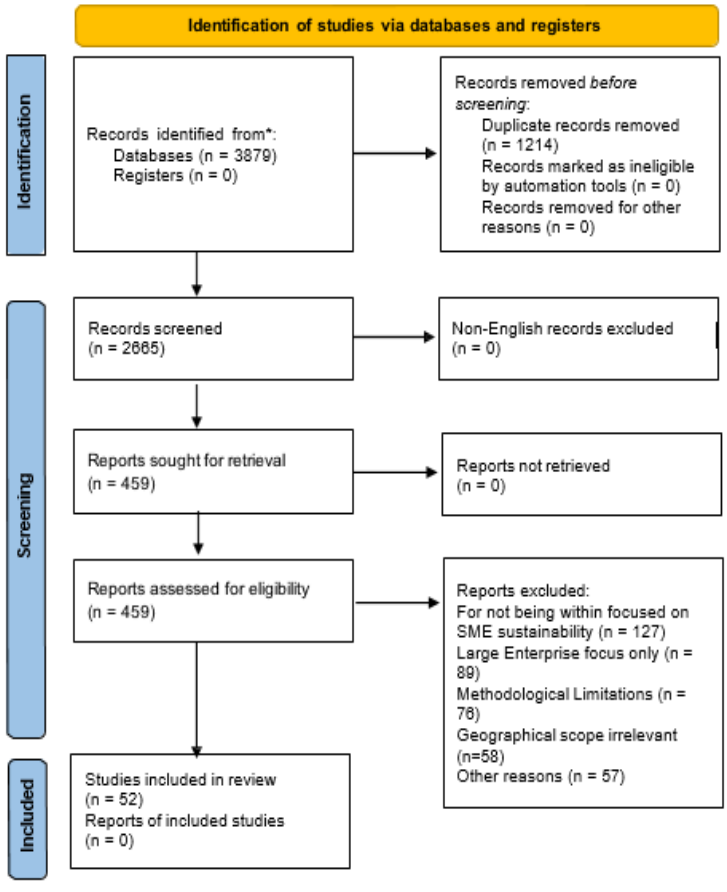

Figure 1 Prisma Flow Diagram for the selected 52 studies

3.3 Bibliometric Keyword Co-occurrence Analysis

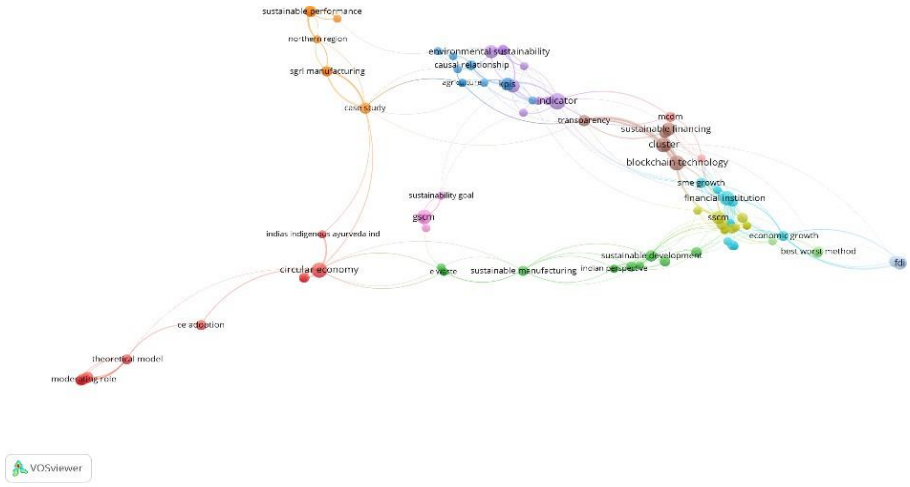

Figure 2 Keywords co-occurrence associated to the SME sustainability and digitalization literature 2015-2025

The 52 included studies display a co-occurrence network analysis using VOS viewer based on the keywords included in each study as shown in Figure 2: five research clusters are identified. The Orange Cluster (left) covers grounding themes, such as sustainable performance, Northern Region focus, SGRL manufacturing and the case-study methodology, which conveys traditional SME sustainability methods. The Red Cluster (bottom) is concerned with the implementation of the circular economy, CE adoption, theoretical constructs and moderate functions which imply the new interest in the circular business models. The Green Cluster (centre-right) is the most predominant research stream, which is a composite of sustainable development, sustainable manufacturing, Indian perspective, e-waste management, and sustainability objectives signifying a heavy laying of stress on manufacturing -sector sustainability in India. Blue Cluster (upper-centre) goes through environmental sustainability dimensions, such as casual relationships, KPIs, agriculture and sustainability indicators proposing agri-food systems as an expansion rather than manufacturing. The Yellow Cluster (right) addresses financial institutional aspects, such as sustainable financing, Blockchain technology, financial institutions, SSCM, economic growth and FDI suggesting an increasing advisability of Fintech solutions concerning SME sustainability. The density and interconnection of the network illustrate substantive relationship between sustainability performance and the financial processes.

3.3.1 Bibliometric Author Co-occurrence Analysis

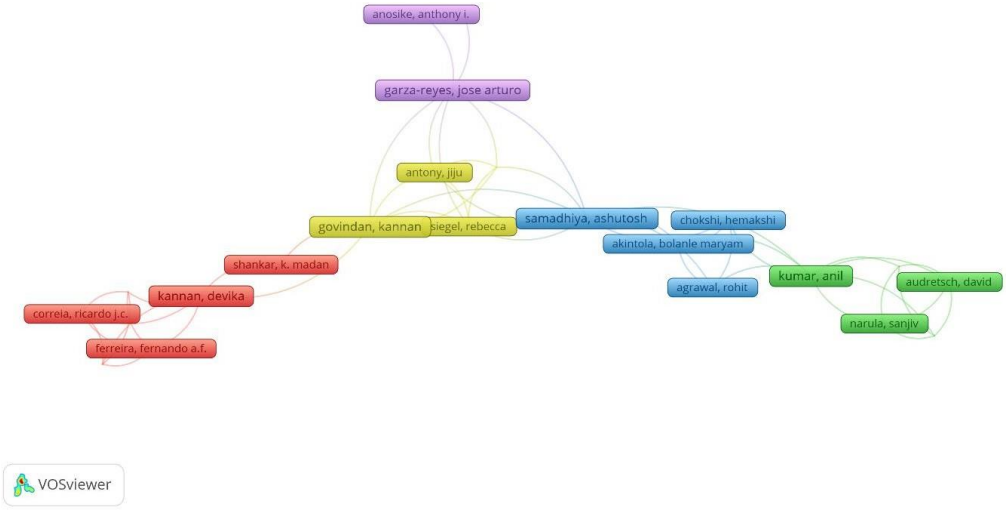

Figure 3 Author co-occurrence network of selected studies

The author co-occurrence network illustrates that authors are grouped into a handful of clusters, rather than a diffuse network. In general, the author network paints a picture of this research field being defined by a number of strong author groups with a few bridge authors connecting the different groups, which is common of a field in development but not yet integrated.

Results and Discussions

4.1 Enabling Factors for Sustainability Adoption in SMEs

Enabling Factors: The synthesis has detected five main enablers of sustainability adoption organized in the hierarchy of the strength of evidence.

Organizational and Leadership Factors (Strongest Evidence, 12 studies): Leadership commitment was a very important organizational facilitator, with distributed leadership models proving better results in the transition to the circular economy than a hierarchical structure. Proactiveness, innovativeness, and risk-taking (defined as entrepreneurial orientation) enhanced the association between digital technology adoption and sustainability performance (standardized 0.47). The relationship between green HR investments and sustainable performance was intermediated by dynamic capabilities (organization capacity to discover market opportunities and to reconstitute resources), with the the indirect effect between them being 0.31 (indirect effect 0.31), implying that organizational learning and strategic flexibility play a significant role.

Digital Technologies as Sustainability Brokers (11 studies): the key mediation opportunity identified was the use of big data analytics, with organisations leveraging the use of analytics facilities showing 42% higher overall performance on sustainability-related projects than non-users. Supply chains have gotten reliable solutions to address information asymmetry issues hampering sustainability development in emerging economies because of blockchain technology that offers transparency and traceability solutions to the chain. There were also

applications of artificial intelligence and machine learning, which showed evidence of potential optimization of the processes and predictive choice, but the usage levels were low as technology was not yet ready.

Green HR and Organizational Culture (8 studies): Green based human resource management tactic such as hiring sustainability centered talent, offering environmental education, and integrating sustainability in performance indicators had direct effects on sustainability performance in the organization. To implement extensive green HR practices resulted in about 38% of the improvements in the employee behaviour towards sustainability.

Knowledge Management and Capability Development (6 studies): The multi-criteria decision-making (MCDM) methodologies made it possible to rigorously measure the potential of innovation and sustainability in SMEs. The results of innovation were much stronger in structured forms of MCDM technique compared to intuition-based decision-making by SMEs with effect sizes between 0.34 and 0.52.

Financial and Institutional Support (5 studies): Availability of government incentives, green finance instruments, and institutional support programs were found to play a significant role in adopting sustainability. There were positive correlations of financial institution involvement (access-credit, guarantees and advisory services) with SME growth (r=0.61) and sustainability development capability.

Inhibiting Factors (Barriers): Five primary barriers categories emerged with comparable evidence strength:

Financial and Resource Constraints (Highest Prevalence, 13 studies): Limited financial reserves emerged as the most pervasive barrier, preventing investment in sustainability infrastructure, green technologies, and employee training. SMEs in emerging economies typically allocate only 2–5% of operational budgets to sustainability initiatives compared to 15–20% in developed economies, creating a structural disadvantage. Financial constraints were directly linked to SME resource limitations, restricting technological infrastructure investment, employee retention during uncertainty, and strategic flexibility for sustainability transformation.

Organizational and Managerial Barriers (11 studies): Lack of top-management commitment to long-term sustainability goals was the most significant organizational barrier, with owner-managers often prioritizing short-term financial performance. Many SMEs lack formal strategic planning processes for systematically assessing capabilities or formally integrating sustainability into business strategy. Resistance to organizational change and employee anxiety regarding job security and skill obsolescence represented psychological barriers to digital sustainability transformation.

Technical and Technological Barriers (9 studies): Insufficient digital literacy, shortage of skilled IT personnel, data scientists, and technology specialists created operational barriers. Technology complexity particularly for blockchain, AI, and advanced analytics created both

psychological and operational barriers. High implementation costs and uncertainty regarding regulatory environments further inhibited adoption, particularly in emerging economies lacking established technology governance frameworks.

Institutional and Policy Barriers (8 studies): Government policy inadequacies, ambiguous regulatory frameworks, and insufficient institutional support created structural barriers to sustainability adoption. Weak regulatory enforcement, information asymmetries, and low stakeholder awareness of sustainability issues in emerging economies created institutional voids that relational mechanisms (such as guanxi networks) could only partially mitigate.

Market and Supply Chain Barriers (7 studies): Supply chain fragmentation and information asymmetries limited sustainability practice adoption. Low customer awareness regarding green products and services in emerging markets created demand-side barriers, generating vicious cycles where low sustainability levels discourage business investment in sustainability initiatives. Limited supply chain visibility constrained SME ability to develop sustainable procurement and distribution practices.

Inhibiting or Preventing Factors (Barriers): There were five main categories of barriers and the strength of evidence was similar:

Financial and Resource Constraints (Highest Prevalence, 13 studies): The use of limited financial reserves was the most prevalent obstacle and restricted investment in sustainability infrastructure, use of green technologies and training of employees. The proposed sub-sector of operation in emerging economies has a structural disadvantage of allocating no more than 2-5 percent of operational budgets to sustainability efforts as opposed to 15-20 percent of operational budgets in developed economies. Resource limitations of SME directly correlated with the limitation of funding sources, thereby limiting the ability to invest in technology infrastructure, employee retention in times of uncertainty and strategic flexibility in staying afloat through transformation of strategy.

Organizational and Managerial Barriers (11 studies): The most important organizational barrier was the absence of top-management commitment to long-term sustainability objectives, because the owner-managers in most cases focused on the short-term financial performance. Most SMEs do not have systematic development of strategic plans to systematically evaluate capabilities or strategically incorporate sustainability into business strategy. Psychological barriers to organizational transformation to digital sustainability included resistance to change and the worry among employees about their job, as well as its skills being obsolete.

Technical and Technological Barriers (9 studies): Lack of digital literacy, lack of skilled IT workforce, data scientists, and technology experts posed operational barrier. The complexity of technology especially with blockchain, artificial intelligence and advanced analytics established psychological and functional impediments. The adoption was further deterred by high implementation costs and the uncertainty over regulatory environments especially in emerging economies where there were no well-established technology governance frameworks.

Institutional and Policy Barriers (8 studies): Government shortcomings in policy, unclear regulations, and lack of institutional facilitation posed structural obstacles to adoption of sustainability. There were institutional voids that could be partially filled with the help of the relational mechanism (guanxi networks) because of weak regulation enforcement, information asymmetry and lack of stakeholder awareness of environmental problems in the emerging economies.

Conclusion

This systematic literature review reflects a synthesis of evidence showing a thorough review of digital enabled SMEs in emerging economies. It is complex and reliant on enabled sustainability transformation depending on the context on which they are applied, and engage various stakeholders who need the concurrent enactment of enabling factors on the leadership, organizational levels, integration of technology, institutional support and capability. No one intervention; i.e. digital. adoption of technology, setting up of green manufacturing or availability of funds mechanisms may work on their own. Rather, transformative change is bound to manifest itself as a result of a synergistic interaction between the organizational leader's commitment to sustainability, investments in building organizational capabilities, technology integration that favours the strategic orientation of an organization, and facilitating institutional environments. Emerging literature, which incorporates the technological-financial facet into mainstream sustainability streams, shows a rising consciousness that digital technologies support sustainability mainly by delivering information transparency, enhancing decision making and improving. coordination of the stakeholders (institutional functions), which is particularly useful to SMEs operating in formal weak institutional environments common to emerging market economies. As such, this review offers practical evidence-based advice to academics, practitioners, and policy-makers in sustainable development in the emerging economies, as it depicts an enduring uncertainty and gaps in research. As world sustainability demands get more and more intensive and the digital technologies will be everywhere, it is significant to know how the SMEs (which already hire 110 million people in India alone and operate in the digital-sustainability (consist of 90% of all emerging economy businesses) change process to attain inclusive and sustainable economic development. In in this way, this systematic review will be able to give the ground evidence to this process developing the structure of expediting knowledge creation and execution this vital area of effectiveness.

Future Research Directions

In the future, the attention in the study should be made towards even a broader variety of countries such as Southeast Asia, Africa, and Latin America besides India. This would aid in knowing what conditions small business is flourishing under various regulatory environments, culture and economic conditions. Cross national studies would enhance the generalizability and transferability of findings. Research must also examine how bad governance structure, with few banking facilities and regulatory framework and absence of standardised rules, impedes the uptake of green practices by small businesses within a weak formal institution setting where informal institutions, like social networks, kinship and trust are prone to develop. More studies are needed on how far these informal institutions contribute to or inhibit adopting green

technologies and practices. Longitudinal studies are needed in which the same small businesses are observed in 3-5 years compared to point-in-time studies. This would assist in establishing tendencies of capability building, organisational culture transformation and, dynamic results. The comparison of previous adopters of green practices with those who adopt them later should be conducted to assist in causal inferences of factors of success. Although numerous studies have described green strategies, few studies have investigated how far they are being implemented with faith or how they are being tailored to the context; process level research is required. In addition, Researchers are to consider how well technologies fit in the firms' types since what works well in a factory may not apply to a farm business. There are 63 million small businesses in India alone yet little literature has been done in the informal sector which is not registered.

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