

Institutional Conditions and Practical Constraints in Circular Economy Transitions Among Small and Medium Enterprises

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ABSTRACT

This study explores how small and medium enterprises engage with circular economy practices by examining enablers, barriers, and implementation patterns in the scholarly literature. Through a structured review of peer-reviewed sources, key conditions that support or hinder circular adoption in SMEs are identified. Organizational flexibility, local embeddedness, and entrepreneurial orientation appear as strategic assets, while financial constraints, regulatory fragmentation, and technical capacity gaps limit advancement. The research also highlights the critical role of managerial values, supply chain cooperation, and access to digital infrastructure. Sectoral diversity and geographical location further influence the degree of circular integration, indicating the need for differentiated approaches. Current frameworks often overlook these contextual variables, reducing the visibility of incremental and informal innovations occurring within smaller firms. To address these issues, the paper recommends deeper theoretical engagement with the SME context, improved measurement tools, and stronger support mechanisms through cross-sectoral partnerships. These recommendations aim to inform both policy development and scholarly inquiry by framing circular economy transitions in ways that reflect the realities of the most prevalent business segment globally. The study provides a comprehensive synthesis to guide future research and strategy formulation in sustainable enterprise development.

INTRODUCTION

As sustainability transitions reshape global economic thinking, traditional production and consumption models face increasing scrutiny. The linear paradigm of extraction, manufacturing, use, and disposal has proven incompatible with long-term environmental stability and resource efficiency. In response, the concept of a circular economy has emerged as a viable alternative that seeks to decouple economic growth from material depletion by emphasizing reuse, regeneration, and systemic value retention. Within this framework, production systems are reimaged to preserve utility and eliminate waste across product life cycles (Silva, 2019).

While multinational corporations have received considerable attention for their ability to experiment with circular practices, small and medium enterprises (SMEs) represent the vast majority of businesses globally and serve as critical stakeholders in any shift toward sustainable operations (Dey et al., 2022). SMEs often operate with limited resources yet exhibit agility and

adaptability that allow for creative responses to sustainability challenges. Their collective potential to support the diffusion of circular principles across industries is considerable, yet under-examined in scholarly discourse (Gani et al., 2021). The visibility of these businesses in policy agendas has increased, but knowledge on how circularity is operationalized at the SME level remains fragmented (Sharma et al., 2021).

Studies on the application of circular economy within SMEs frequently identify both opportunity and constraint. On the one hand, SMEs can engage in product redesign, service-based models, and local resource loops that enhance economic resilience (Salvioni et al., 2021). On the other hand, barriers such as inadequate funding, limited technical expertise, and the absence of supportive regulatory environments inhibit deeper adoption. These factors interact with organizational culture, sectoral differences, and market expectations, resulting in highly variable outcomes across firms (Ghenta & Matei, 2018).

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Given these complexities, academic inquiry must assess the nature and extent of circular economy implementation in SMEs. This includes identifying the enabling conditions that promote adoption, the operational practices that reflect circular thinking, and the institutional or structural limitations that persist. Such assessment requires rigorous and focused examination of existing research to clarify how circular economy principles are translated from theory into action within this crucial economic segment (Takacs et al., 2022).

Despite the increasing recognition of circular economy as a sustainability model, the empirical evidence on its adoption by SMEs remains uneven. According to Gibb (2000), many small firms lack formalized strategies and operate based on reactive decision-making, which complicates the alignment with long-term ecological objectives. Similarly, Storey (1994) notes that SMEs are characterized by informal management structures, making coordinated change processes difficult to implement. These characteristics limit the capacity for systemic transformation and inhibit sustained engagement with circular models (Arifin & Darmawan, 2022).

The knowledge gap is further compounded by methodological inconsistencies in how circular economy practices are measured and evaluated within SMEs. Schaper (2002) argues that sustainability initiatives in smaller firms are often overlooked due to research frameworks that favor scale and formality. As a result, valuable practices embedded in daily operations remain undocumented, and the broader potential of SMEs to support regenerative economies is underestimated. These omissions reduce the reliability of policy instruments and hinder cross-sectoral learning.

Another pressing issue concerns the scalability of circular economy practices across heterogeneous SME environments (Fogarassy & Finger, 2020). While some firms demonstrate high levels of innovation and integration, others struggle with regulatory ambiguity, fragmented supply chains, and consumer resistance (Abdullah et al., 2021). According to Tilley (1999), structural asymmetries across firm sizes and sectors influence environmental engagement patterns. Without tailored support, circular economy efforts may remain isolated or symbolic, rather than transformative (Darmawan, 2024).

The application of circular principles in SMEs reflects not only a technical adaptation but a broader redefinition of value, risk, and growth (Unal et al., 2019). As global systems confront ecological limits, the role of SMEs in creating

distributed, adaptive, and restorative business models becomes increasingly vital. Evaluating how these businesses respond to circular imperatives offers a window into both the challenges and the emergent possibilities of sustainable enterprise at scale.

This study aims to examine the current literature addressing how circular economy principles are adopted and operationalized by small and medium enterprises. By identifying recurring challenges, institutional enablers, and context-specific practices, this research contributes to a clearer understanding of how circular transitions are pursued within the SME landscape. The findings are intended to provide conceptual refinement and practical reference for scholars, business leaders, and sustainability advocates alike.

RESEARCH METHOD

This research employs a qualitative literature review approach to investigate how small and medium enterprises implement circular economy principles and to identify both enablers and constraints documented in scholarly sources. The methodology follows an interpretive design aimed at synthesizing conceptual insights and empirical findings from multidisciplinary academic publications. Hart (1998) emphasizes that literature-based inquiry provides a systematic foundation for mapping knowledge structures and identifying theoretical inconsistencies. The choice of this method is particularly relevant given the complexity and variance in how SMEs respond to sustainability transitions. Unlike quantitative meta-analysis, the interpretive review permits flexible engagement with diverse forms of evidence, including case studies, theoretical frameworks, and practitioner-based evaluations.

Sources were collected through targeted searches in established academic databases including Scopus, Web of Science, and ScienceDirect. Key terms such as "circular economy in SMEs," "resource efficiency," "sustainable small business practices," and "barriers to green innovation" were used to refine the selection process. Inclusion criteria were based on scholarly rigor, relevance to the SME sector, and publication within peer-reviewed outlets. The analytic procedure follows the guidance of Tranfield et al. (2003), who advocate for structured reviews that promote transparency and replicability while enabling thematic interpretation. Data were coded to identify repeated concepts, theoretical convergences, and empirical divergences. The

resulting synthesis provides a coherent narrative that illuminates how circular economy principles are being explored, adopted, and challenged within small and medium enterprises.

RESULT AND DISCUSSION

In recent years, environmental degradation and resource scarcity have forced a rethinking of conventional economic models (Scheel et al., 2020). The linear model, characterized by extraction, consumption, and disposal, is increasingly regarded as unsustainable in light of ecological constraints and mounting waste volumes. In response to these challenges, circular economy thinking has emerged as a transformative framework that reimagines production systems to retain material value and eliminate unnecessary throughput (Fogarassy & Finger, 2020).

Among various actors in the economic system, small and medium enterprises have garnered attention for their unique structural traits and their collective impact on local and regional economies (Autio et al., 2018). Though often overshadowed by larger corporations in sustainability discourse, SMEs contribute significantly to employment and innovation, especially in manufacturing and service sectors (Ishaq et al., 2021; Mardikaningsih & Arifin, 2021). Their responsiveness to change and their close ties to local markets position them well for adopting resource-regenerative business models (Caldera et al., 2019).

One of the distinguishing characteristics of SMEs is their internal agility. Unlike large organizations burdened with complex bureaucracy, smaller firms typically function with compact teams and fluid communication channels (Priyono et al., 2020). This enables faster response times and more direct experimentation with novel processes. In the context of sustainability, this can translate into proactive efforts to redesign products, implement reuse systems, and explore nontraditional forms of value creation (Chatzakis, 2015).

Flexible organizational structures also allow SMEs to engage in iterative learning processes, where insights gained from practice can be quickly integrated into operational strategy. This feedback-rich environment supports the pursuit of circular practices even in the absence of formal sustainability departments. It also allows firms to adapt their offerings based on customer input, regulatory shifts, and supply chain evolution (Aghelie, 2017).

Despite this adaptive potential, the landscape of circular economy adoption in SMEs remains uneven. Structural vulnerabilities such as limited access to capital, fragmented regulatory frameworks, and

underdeveloped technical capacity continue to restrict broader uptake. These limitations, while not unique to small firms, often manifest more acutely due to scale, resource constraints, and limited institutional support (Caldera et al., 2019).

Understanding this duality—the simultaneous presence of opportunity and constraint—is critical for any comprehensive assessment of circular economy transitions in small-scale enterprises (Mottet et al., 2020). The nuances embedded in their operations, relationships, and innovation pathways demand careful exploration. Without such analysis, assumptions about capacity and readiness may lead to misaligned interventions and missed opportunities for system-wide transformation.

The application of circular economy principles in small and medium enterprises (SMEs) reveals a landscape shaped by both systemic enablers and persistent limitations (Howard et al., 2022). One of the most cited enabling conditions is organizational flexibility. Kirchherr et al. (2018) observe that SMEs benefit from flat hierarchies that allow quicker adaptation. This agility facilitates experimentation with circular practices such as product redesign, resource loops, and alternative service delivery.

Local networks and proximity to customers further strengthen the position of SMEs in adopting circular approaches. Rizos et al. (2016) found that firms embedded in community-level partnerships often engage in resource sharing, repair initiatives, and co-innovation, reducing transaction costs and enabling knowledge exchange. The feedback loop from close client relationships supports iterative improvement aligned with sustainability values.

Despite the conceptual promise of circular economy models, the persistent and multifaceted nature of financial constraints remains one of the most entrenched impediments to their realization within the SME sector (Hofsetter et al., 2012). While theoretical frameworks emphasize innovation, regeneration, and long-term value creation, small firms often operate within fiscal ecosystems that are incompatible with these ideals (Darmawan, 2013). De Jesus & Mendonça (2018) underscore that the capital intensity associated with redesigning processes, investing in closed-loop technologies, and reconfiguring supply chains is frequently prohibitive for businesses with limited liquidity and unstable revenue streams. These constraints are compounded by institutional biases in financial systems, where risk-averse lending practices and rigid collateral requirements systematically marginalize smaller firms, regardless of their environmental ambitions.

Moreover, as Aghelie (2017) points out, the landscape of green financing remains fragmented and opaque, with many SMEs unaware of or excluded from specialized instruments designed to fund sustainable transitions. Even when such mechanisms exist, they are often misaligned with the operational timelines and absorptive capacities of SMEs, resulting in underutilization or administrative fatigue. The inability to access affordable and timely capital not only stalls experimentation but also erodes strategic commitment, as resource-strapped entrepreneurs are forced to prioritize short-term survival over long-term transformation. This structural exclusion from sustainability finance highlights a fundamental contradiction: while SMEs are crucial to systemic economic change, the architecture of financial support continues to reinforce linear thinking, leaving circular aspirations unfulfilled and innovation unevenly distributed (Chakravarty, 2022).

Technical capability also proves insufficient across much of the SME sector. Geng et al. (2012) reported that circular innovation demands competencies in areas such as materials assessment, system design, and reverse logistics. Without training access, many SMEs operate below the threshold required for circular maturity. Another inhibiting factor involves regulatory environments. Ranta et al. (2018) emphasize that policies supporting circular economy tend to favor large firms with compliance departments. SMEs frequently report confusion about regulatory expectations and lack guidance for implementation, which weakens motivation to invest in circular models.

Managerial commitment significantly influences outcomes. Ormazabal et al. (2016) showed that firms led by environmentally minded owners were more likely to adopt circular strategies. Where leadership prioritizes profit over sustainability, initiatives are often symbolic and limited in scope, reducing the effectiveness of adoption efforts (Fogarassy & Finger, 2020). Informality in operational procedures contributes further complexity. Revell and Blackburn (2007) indicated that many SMEs lack structured environmental management systems, resulting in fragmented or inconsistent application of sustainability measures. This absence of formal routines inhibits tracking, evaluation, and optimization of circular processes.

Market uncertainty compounds these internal issues (Negara et al., 2021). Bocken et al. (2016) found that consumer demand for sustainable or remanufactured products is still evolving. Without

consistent willingness to pay for environmentally responsible options, SMEs face pressure to compromise on circular commitments to remain commercially viable (Alamin et al., 2021). In supply chains, SMEs often lack influence. Ghisellini et al. (2016) argued that small firms dependent on upstream suppliers or downstream distributors are vulnerable to the priorities of larger players. Where partners do not share circular goals, attempts to redesign materials, logistics, or packaging are easily derailed (Caldera et al., 2019). As a result, the successful implementation of circular strategies among SMEs often hinges not only on internal capabilities.

While digital innovation is frequently heralded as a catalyst for accelerating circular economy practices, its actual integration within small and medium enterprises remains uneven and often superficial, hindered by disparities in technological readiness and resource availability. Kristoffersen et al. (2021) emphasize that smart technologies—ranging from real-time monitoring systems and predictive analytics to digital platforms for material reuse—possess the capacity to enhance transparency, optimize resource efficiency, and enable closed-loop operations. However, such potential is contingent upon foundational capabilities that many SMEs currently lack (Miocevic & Morgan, 2018). Digital literacy varies widely across firms, with some equipped to experiment with data-driven decision-making while others struggle with basic infrastructure.

The absence of internal expertise, coupled with the high cost of digital tools, reinforces an asymmetry in innovation diffusion where benefits disproportionately favor technologically mature firms (Darmawan et al., 2020). Moreover, the absence of tailored digital ecosystems for SMEs often results in tools that are either too complex, too costly, or too disconnected from operational realities (Mittal et al., 2018). This disconnect perpetuates a two-tiered innovation system, where firms on the margins are excluded from the informational and operational gains that digital circularity affords. The issue is not merely one of access but of design and adaptability without digital architectures that are scalable and context-responsive, the vision of a technologically empowered circular transition risks becoming a narrative reserved for the few, rather than a shared infrastructure for sustainable transformation across the business landscape.

Sectoral variation also affects feasibility. Lieder and Rashid (2016) observed that manufacturing firms often have greater capacity for material recovery than service-oriented businesses. These

differences require customized approaches that take into account product characteristics, process integration, and customer interfaces (Chatzakis, 2015).

Geographic location determines access to infrastructure. Stahel (2010) emphasized that urban SMEs typically benefit from proximity to recycling hubs and logistics networks, while rural or remote firms face logistical challenges that restrict participation in circular ecosystems. Knowledge dissemination remains sporadic. The European Commission (2015) reported that many SMEs are unaware of available tools, guidance documents, or successful models. This information asymmetry stifles innovation, as firms duplicate mistakes or miss viable entry points into circular practice.

Peer networks can influence action positively. Su et al. (2013) documented that SMEs often emulate successful industry examples, particularly when they observe reputational or commercial benefits. However, without critical reflection, this mimicry can result in superficial implementation lacking strategic depth. Measurement challenges complete the set of obstacles. Geissdoerfer et al. (2017) argued that most circular economy metrics are designed for large firms and fail to capture incremental or customized practices found in SMEs. This gap in evaluation tools makes it harder to assess progress, communicate achievements, or attract support.

Reliable assessment tools are fundamental for navigating transitions toward sustainability. In the absence of evaluative clarity, even the most committed initiatives may falter due to uncertainty about their outcomes (Niet et al., 2022). For SMEs, which often rely on informal strategies and context-specific innovations, the lack of proportionate indicators creates a disconnect between operational practice and external validation (Caldera et al., 2019). This misalignment undermines not only internal decision-making but also visibility in broader sustainability frameworks (Gold & Heikkurinen, 2018).

Achievements that might otherwise inspire replication or attract collaboration remain isolated due to their inability to align with dominant reporting standards. This invisibility is particularly problematic in ecosystems where funding, partnerships depend on demonstrable results (Nath, 2020). Metrics that privilege scale and uniformity tend to overlook the complexity and creativity embedded in small-firm approaches. Innovations that arise from necessity or community interaction are difficult to translate into

conventional performance dashboards. As a result, evaluative instruments unintentionally reinforce structural inequalities by favoring actors that already possess the resources to comply with external measurement demands (Kamulegeya et al., 2019).

Moreover, the lack of nuanced indicators hampers communication across stakeholder groups. Policymakers and supply chain partners depend on data to allocate resources, shape policy instruments, or evaluate risk. When SMEs are unable to articulate their progress in formats that resonate with these audiences, their legitimacy as sustainability actors becomes diluted (Haack & Rasche, 2021). This communication gap not only undermines trust but also limits SMEs' access to critical support mechanisms such as green financing.

This disjuncture has consequences beyond reporting. It reflects a deeper epistemological issue: whose knowledge counts, and what types of practice are considered valuable. By centering assessment tools around standardized templates, the ecosystem risks marginalizing the very ingenuity that makes SMEs critical to adaptive sustainability. Addressing this requires more than technical adjustment. It calls for an intentional rethinking of how progress is conceptualized, recorded, and rewarded. Until measurement systems evolve to accommodate scale-sensitive innovation and locally grounded practice, the full potential of SMEs within the circular economy will remain untapped and underappreciated.

CONCLUSION

The literature reveals that while small and medium enterprises demonstrate clear potential to advance circular economy practices, their progress remains uneven due to structural, financial, and informational constraints. Flexibility, localized networks, and entrepreneurial initiative enable experimentation and responsiveness, yet these are often counterbalanced by weak institutional support, limited access to knowledge, and regulatory ambiguity. A deeper understanding of this duality is essential to guide future research and policy formation. The diversity of approaches across sectors, regions, and leadership models shows that one-size-fits-all recommendations are unlikely to succeed.

The findings emphasize the importance of designing tailored frameworks that account for the operational characteristics and capacities of small enterprises. Circular economy transition efforts must align with firm-level realities such as informal

decision-making, supply chain dependency, and customer orientation. Future evaluations should integrate qualitative dimensions such as leadership commitment and local embeddedness to enrich standard models based on technological or financial metrics. Knowledge transfer, peer benchmarking, and collaborative innovation ecosystems can serve as critical accelerators if adequately resourced. Stakeholders should prioritize multidirectional engagement strategies that incorporate SMEs into regulatory consultations, provide sector-specific training, and ensure equitable access to digital and financial tools. Emphasis should also be placed on developing appropriate measurement indicators for circular efforts in smaller firms. Academic and policy communities must continue to highlight the specific barriers these businesses face, while amplifying models of practice that reflect their unique advantages.

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