



Understanding Configurational Strategies for Circular Economy Adoption in Manufacturing: A Qualitative Systematic Literature Review of Theoretical and Empirical Insights

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ABSTRACT. *This qualitative systematic literature review examines configurational strategies for circular economy (CE) adoption in manufacturing by integrating theoretical perspectives and empirical evidence from the existing literature. Using a systematic review approach, the study synthesizes research on organizational, technological, operational, interorganizational, market, and institutional conditions influencing circular transformation. The findings indicate that CE adoption is a configurational and context dependent phenomenon rather than a linear process driven by individual determinants. Three broad pathways emerge: a strategic market driven pathway, a technology operations pathway, and a collaboration supply chain pathway. The review further demonstrates that different combinations of conditions and practices can generate similar circular and sustainability outcomes, reflecting equifinality and causal complexity. Digital technologies appear most effective when combined with complementary organizational, operational, and collaborative capabilities. The study contributes a configurational framework that advances understanding of how manufacturing firms can pursue alternative pathways toward circular transformation.*

Keywords Circular Economy; Configurational Strategies; Manufacturing; Circular Economy Adoption; Systematic Literature Review.

INTRODUCTION

The transition from a linear “take, make, dispose” model toward a circular economy (CE) has become an important strategic agenda for manufacturing firms seeking to improve resource efficiency, reduce environmental impacts, and strengthen long term sustainability. The CE emphasizes the retention of product, material, and resource value through strategies such as reuse, repair, remanufacturing, recycling, product life extension, and circular product and business model design (Kirchherr et al., 2017; Bocken et al., 2016). Within manufacturing, CE adoption is particularly important because production systems are closely associated with material consumption, waste generation, energy use, and complex supply chain relationships. Consequently, circularity requires not only changes in individual production practices but also transformations in business models, supply chains, organizational capabilities, technologies, and stakeholder relationships (Geissdoerfer et al., 2018; Batista et al., 2023).

Despite the growing recognition of the CE concept and the increasing availability of circular practices, its implementation across manufacturing firms remains relatively slow and uneven. Previous research has identified numerous drivers and barriers affecting CE adoption, including regulatory pressure, market demand, organizational culture,

managerial commitment, knowledge, collaboration, technological capabilities, financial considerations, and operational readiness (Govindan & Hasanagic, 2018; Gusmerotti et al., 2019; Assmann et al., 2023). Assmann et al. (2023), for example, systematically identified 54 determinants of circular business model adoption and grouped them into eight broad categories: culture, regulation, market, strategy, business case, collaboration, operations, and knowledge. This evidence demonstrates that CE adoption is influenced by a multidimensional set of organizational and contextual conditions rather than by a single managerial decision. Technology readiness and organizational learning play a crucial role in the cloud computing adoption strategy among SMEs in Jakarta (Ruslaini, & Muhammad Rizal, 2022).

The complexity of CE implementation is further reinforced by the diversity of circular strategies available to manufacturing organizations. Firms may pursue product life extension, repair, reuse, remanufacturing, recycling, resource recovery, circular sourcing, collaborative supply chain arrangements, or circular business models, while simultaneously responding to technological, institutional, and market conditions (Bocken et al., 2016; Lüdeke-Freund et al., 2019; Geissdoerfer et al., 2018). These strategies may complement one another in some circumstances but may also compete for organizational resources or produce trade offs in others. For example, circular product design may require collaboration with suppliers and customers, while remanufacturing may depend on reliable reverse flows and suitable characteristics of returned products (Prosman & Cagliano, 2022). Therefore, understanding CE adoption requires moving beyond the assumption that individual practices independently generate predictable outcomes. Transparency in cybersecurity risk disclosure enhances trust, relationship stability, and operational efficiency within supply chains (Chaidir, M., et al, 2024).

A substantial proportion of CE research has traditionally examined linear relationships between individual antecedents, circular practices, and organizational outcomes. Such an approach is useful for identifying the influence of specific variables but may inadequately capture the interdependence and contextual complexity of CE implementation. The practice-based view (PBV) provides an alternative perspective by emphasizing how organizational practices and combinations of practices contribute to performance outcomes (Bromiley & Rau, 2014). Similarly, research in sustainable operations and supply chain management suggests that CE should be understood through

interconnected systems of practices, relationships, and sustainability oriented capabilities rather than isolated organizational activities (Batista et al., 2023). This perspective is particularly relevant in manufacturing because circular outcomes frequently emerge from interactions among production processes, supply chain practices, technologies, organizational capabilities, and external stakeholders. Digital technologies encourage companies to shift focus toward intangible assets such as information systems and data analytics (Rizal M., et al 2025).

A configurational perspective provides a useful lens for understanding CE complexity by proposing that organizational outcomes can emerge from different combinations of conditions and multiple pathways (Fiss, 2011; Misangyi et al., 2017). It emphasizes causal complexity, conjunctural causation, equifinality, and asymmetry, making it particularly relevant to CE and sustainability research (Greckhamer et al., 2018; Ketchen et al., 2022).

Empirical studies support this perspective. Prosman and Cagliano (2022), using QCA, identified different manufacturing configurations among successful circular startups, showing that supply characteristics influence circular manufacturing configurations. Mies and Gold (2025) similarly found that CE implementation cannot be explained by isolated practices, identifying necessary motivations and social sustainability conditions as well as different bundles of CE practices and contextual factors associated with positive outcomes. These findings indicate that there is no universal “best practice” for circular transformation; success depends on how practices fit specific organizational and environmental contexts.

The configurational perspective is also supported by research on collaboration, digital technologies, and supply chain integration. Circular manufacturing depends on relationships with suppliers, customers, logistics providers, and other stakeholders (Sudusinghe & Seuring, 2022), while digital technologies can support information sharing, traceability, reverse logistics, and resource optimization (Awan et al., 2021; Awan et al., 2022). However, technology alone does not ensure circularity because its effectiveness depends on complementary capabilities, collaboration, strategy, and institutional conditions.

This complexity highlights an important research gap. Although previous studies have examined CE drivers, barriers, business models, manufacturing practices, and

collaboration (Govindan & Hasanagic, 2018; Assmann et al., 2023; Hina et al., 2023; Sudusinghe & Seuring, 2022), these streams remain fragmented. Therefore, further research is needed to understand how strategic, organizational, technological, operational, supply chain, and institutional conditions jointly form alternative CE adoption pathways in manufacturing (Ketchen et al., 2022; Mies & Gold, 2025).

Accordingly, this qualitative systematic literature review, entitled “Understanding Configurational Strategies for Circular Economy Adoption in Manufacturing: A Qualitative Systematic Literature Review of Theoretical and Empirical Insights,” seeks to synthesize and integrate the existing theoretical and empirical literature on configurational approaches to CE adoption in manufacturing. The review specifically examines how different combinations of drivers, barriers, organizational capabilities, circular practices, technologies, stakeholder relationships, and institutional pressures contribute to alternative pathways toward successful circular transformation. By synthesizing these insights, the study aims to move the CE literature from a predominantly variable oriented understanding toward a more holistic and configuration oriented perspective.

The study therefore contributes to the literature in three ways. First, it consolidates fragmented theoretical perspectives on CE adoption, configurational theory, practice based views, contingency theory, and sustainable operations management. Second, it synthesizes empirical evidence concerning the configurations and combinations of conditions associated with CE implementation and performance. Third, it identifies gaps and future research opportunities for developing more context sensitive explanations of circular transformation in manufacturing. Such an approach recognizes that manufacturing firms may arrive at circularity through different pathways depending on their resources, capabilities, technologies, supply chain structures, stakeholder pressures, and institutional environments. Ultimately, understanding these alternative configurations can provide a stronger theoretical foundation for explaining why circular strategies succeed in some manufacturing contexts but remain difficult to implement in others.

LITERATURE REVIEW

The circular economy (CE) represents a systemic alternative to the traditional linear production model by emphasizing resource retention, waste reduction, product life extension, reuse, repair, remanufacturing, and recycling across production and consumption systems (Kirchherr et al., 2017; Bocken et al., 2016). In manufacturing, CE adoption requires firms to transform not only production processes but also product design, business models, supply-chain relationships, and resource-management practices (Geissdoerfer et al., 2018; Batista et al., 2023). Bocken et al. (2016) identified several product-design and business-model strategies that support circularity, including slowing, closing, and narrowing resource loops, indicating that CE implementation involves interconnected strategic choices rather than a single operational intervention (Bocken et al., 2016). Geissdoerfer et al. (2018) further demonstrated that circular business models and supply chains are closely interdependent because circular value creation requires coordination across organizational boundaries (Geissdoerfer et al., 2018).

Empirical research indicates that CE adoption varies substantially across manufacturing firms because organizations face different internal capabilities and external pressures (Gusmerotti et al., 2019; Assmann et al., 2023). Gusmerotti et al. (2019), examining manufacturing firms, found that CE engagement is influenced by multiple drivers and organizational approaches, demonstrating that circular transition is shaped by combinations of environmental, organizational, and strategic considerations (Gusmerotti et al., 2019). Similarly, Bassi and Dias (2019) found that CE practices among European SMEs are associated with organizational and contextual characteristics, highlighting differences in the intensity and type of circular practices adopted by firms (Bassi & Dias, 2019). These findings suggest that CE adoption cannot be adequately explained through a universal implementation model because manufacturing organizations operate under heterogeneous technological, market, organizational, and institutional conditions (Gusmerotti et al., 2019; Bassi & Dias, 2019).

The literature identifies a broad range of factors that encourage or constrain CE adoption, including regulatory requirements, customer pressure, economic incentives, organizational capabilities, technological development, collaboration, knowledge, and managerial commitment (Govindan & Hasanagic, 2018; Kirchherr et al., 2018). Govindan and Hasanagic (2018), through a systematic review from a supply-chain

perspective, demonstrated that CE adoption is influenced by interacting drivers and barriers located at organizational, supply-chain, market, and institutional levels (Govindan & Hasanagic, 2018). Kirchherr et al. (2018) similarly found that cultural, regulatory, market, technological, and organizational barriers can prevent firms from moving beyond conventional linear business practices (Kirchherr et al., 2018).

More recent evidence emphasizes the multidimensional nature of CE adoption. Assmann et al. (2023) identified determinants across culture, regulation, market, strategy, business case, collaboration, operations, and knowledge, indicating that CE adoption results from interactions among multiple conditions rather than isolated factors. Brändström et al. (2024) showed that circular business model barriers vary across sectors, while Palombi et al. (2024) found that CE implementation in SMEs depends on combinations of barriers and good practices. These findings reinforce the importance of contextual and configurational perspectives.

The practice based view (PBV) provides a useful foundation because it focuses on how organizational practices are combined and implemented rather than treating individual resources as independent determinants (Bromiley & Rau, 2014). CE practices frequently interact, and their effectiveness depends on organizational context (Batista et al., 2023). Skalli et al. (2024) found that integrating CE, Lean Six Sigma, and Industry 4.0 can improve sustainable manufacturing performance, while Bag and Mangla (2025) highlighted the role of smart and resilient supplier management practices. Thus, CE adoption is better understood as a system of interconnected practices.

Configurational theory further explains how different combinations of conditions can generate similar outcomes, emphasizing causal complexity, equifinality, and asymmetry (Fiss, 2011; Misangyi et al., 2017). Ketchen et al. (2022) noted that configurational approaches remain underutilized in supply chain research, while Greckhamer et al. (2018) demonstrated the value of QCA for examining complex causal relationships. Song et al. (2022) further showed that sustainable practices may operate as complements or substitutes depending on specific configurations.

Empirical CE research provides direct support for this perspective. Prosman and Cagliano (2022) identified different manufacturing configurations among successful circular start ups, demonstrating that circular strategies depend on contextual and operational conditions. Mies and Gold (2025) similarly identified multiple configurations

involving motivations, social sustainability practices, CE activities, and contextual factors associated with positive performance. Their findings confirm that CE adoption does not follow a single best practice pathway.

Digital technologies also constitute important elements of circular configurations by supporting information sharing, traceability, resource optimization, and value chain coordination (Awan et al., 2021; Awan et al., 2022). However, their effectiveness depends on complementary capabilities and collaboration. Schögggl et al. (2024) and Chavez et al. (2023) demonstrate that digital capabilities, supplier relationships, and environmental practices can operate jointly, reinforcing the need for an integrated configurational perspective.

Finally, CE configurations can generate economic, environmental, and sustainability benefits, although trade-offs may occur (Antonioli et al., 2022; Ünal & Sinha, 2023). Antonioli et al. (2022) found economic returns from CE practices, while Esposito et al. (2024) linked CE performance with financial performance and stakeholder engagement. However, Castro et al. (2022) showed that rebound effects may reduce expected sustainability benefits, and Matos et al. (2020) highlighted trade offs and unintended consequences. Therefore, CE adoption should be evaluated holistically, considering interactions among practices, contextual conditions, and multiple performance outcomes.

Overall, the systematic literature indicates a gradual movement from linear explanations of CE adoption toward more integrated and configurational approaches (Assmann et al., 2023; Ketchen et al., 2022). Existing studies have established important drivers, barriers, practices, technologies, business models, and performance consequences, but these elements are frequently examined within separate theoretical or empirical streams (Govindan & Hasanagic, 2018; Hina et al., 2023). The literature therefore provides substantial evidence that CE adoption is multidimensional, context dependent, and characterized by interactions among organizational, technological, supply chain, market, and institutional conditions (Gusmerotti et al., 2019; Assmann et al., 2023).

The emerging configurational literature provides an important opportunity to integrate these fragmented insights into a more coherent explanation of circular manufacturing transformation (Prosman & Cagliano, 2022; Mies & Gold, 2025). In particular, the findings of Mies and Gold (2025) demonstrate that multiple pathways can

lead to positive CE outcomes and that circular transformation cannot be reduced to isolated adjustments or a universal best practice model (Mies & Gold, 2025). Accordingly, this qualitative systematic literature review seeks to synthesize theoretical and empirical evidence concerning which combinations of strategic, organizational, technological, operational, supply chain, and institutional conditions constitute alternative pathways toward CE adoption in manufacturing (Ketchen et al., 2022; Misangyi et al., 2017). This synthesis is expected to contribute to a more holistic understanding of CE adoption by connecting configurational theory with the practice based view and by identifying recurring configurations, contextual contingencies, complementarities, tensions, and unresolved theoretical gaps in the existing literature (Bromiley & Rau, 2014; Greckhamer et al., 2018).

METHODS

This study employs a qualitative systematic literature review (QSLR) to identify, evaluate, interpret, and synthesize theoretical and empirical research on configurational strategies for circular economy (CE) adoption in manufacturing. A systematic review is appropriate because CE literature is broad, interdisciplinary, and fragmented across sustainability, operations, supply chains, innovation, and organizational studies (Snyder, 2019). Unlike a narrative review, it applies a transparent and structured process to improve the credibility of evidence synthesis (Tranfield et al., 2003; Snyder, 2019).

The review adopts a qualitative and interpretive orientation to identify recurring theoretical concepts, empirical findings, contextual conditions, relationships among practices, and alternative configurations rather than statistically estimating aggregate effects (Thomas & Harden, 2008). The methodology follows Tranfield et al. (2003) and Snyder (2019), while reporting follows PRISMA 2020 (Page et al., 2021).

The main research question is: How do combinations of strategic, organizational, technological, operational, supply-chain, market, and institutional conditions shape alternative pathways for CE adoption in manufacturing? Four subsidiary questions examine theoretical perspectives, relevant conditions, configurations associated with successful CE implementation, and remaining theoretical and empirical gaps. These questions reflect configurational concepts of interdependence, causal complexity, equifinality, and contextual variation (Fiss, 2011; Misangyi et al., 2017).

A structured literature search is conducted using major scholarly databases, focusing on the concepts of circular economy, manufacturing, adoption/implementation, and configurational strategy (Tranfield et al., 2003; Snyder, 2019). The main search string combines terms such as “circular economy,” “circularity,” “manufacturing,” “production,” “adoption,” “implementation,” “configuration,” “configurational approach,” “causal complexity,” “multiple pathways,” and “practice bundles.” Additional terms include circular manufacturing, circular practices, circular business models, sustainable manufacturing, practice-based view, qualitative comparative analysis, and QCA to capture relevant configurational studies (Ketchen et al., 2022; Greckhamer et al., 2018).

The review focuses on English language, peer reviewed journal articles published through 2025. Studies are included when they address CE, circular practices or business models; manufacturing or related supply chains; CE adoption, implementation, transformation, performance, drivers, barriers, or strategic configurations; and provide relevant theoretical or empirical evidence. Studies such as editorials, book reviews, conference abstracts, dissertations, non peer reviewed publications, consumer only studies, and research without meaningful CE or manufacturing relevance are excluded (Page et al., 2021; Tranfield et al., 2003).

Study selection follows four PRISMA stages: identification, screening, eligibility assessment, and final inclusion. Duplicate records are removed, titles and abstracts are screened, potentially relevant full texts are assessed, and eligible studies are included in the qualitative synthesis. The process is documented through a PRISMA flow diagram to ensure transparency (Page et al., 2021).

The methodological quality of included studies is critically assessed to ensure that differences in research rigor are considered during synthesis (Snyder, 2019; Tranfield et al., 2003). The Mixed Methods Appraisal Tool (MMAT) 2018 is used to assess qualitative, quantitative, and mixed methods studies, while qualitative studies are additionally assessed regarding research objectives, design, data collection, analysis, interpretation, and consistency between evidence and conclusions (Hong et al., 2018; Harley & Cornelissen, 2022).

A structured data extraction framework records author, year, country, manufacturing sector, theoretical perspective, research design, sample/context, CE

practices, drivers, barriers, organizational capabilities, technological factors, supply chain factors, stakeholder relationships, institutional factors, configurational relationships, outcomes, and key findings. Coding follows an iterative qualitative approach, combining theoretically informed initial codes with inductively emerging concepts (Locke et al., 2022). Qualitative content analysis is then applied to identify recurring patterns and higher order categories (Mayring, 2000).

The principal synthesis method is thematic synthesis, involving three stages: identifying relevant concepts, grouping them into descriptive themes, and developing higher order analytical themes representing broader configurational pathways (Thomas & Harden, 2008). Key themes include regulatory pressure, managerial commitment, digital capability, supplier collaboration, circular design, reverse logistics, resource efficiency, and market motivation. These themes are subsequently integrated into broader pathways such as external pressure driven and technology enabled configurations.

The distinctive analytical component is a configurational synthesis framework, which examines how combinations of conditions generate outcomes rather than ranking individual determinants. Four properties are emphasized: conjunctural causation, equifinality, causal asymmetry, and contextual dependency (Fiss, 2011; Misangyi et al., 2017; Greckhamer et al., 2018). This approach is particularly appropriate because previous studies demonstrate that different combinations of manufacturing characteristics and practices can support circular outcomes (Prosman & Cagliano, 2022; Mies & Gold, 2025).

The final synthesis integrates theoretical and empirical insights. The theoretical dimension examines the practice based view, contingency theory, configurational theory, sustainable operations management, and supply chain perspectives, while the empirical dimension maps combinations involving organizational motivation, managerial capabilities, circular design, digital technologies, Industry 4.0, supplier collaboration, reverse logistics, stakeholder pressure, regulation, and market conditions (Bromiley & Rau, 2014; Ketchen et al., 2022; Awan et al., 2021; Chavez et al., 2023; Schögggl et al., 2024). Configurations associated with positive outcomes are also compared with barriers, tensions, trade offs, and limited implementation (Castro et al., 2022; Matos et al., 2020).

Methodological rigor is strengthened through transparent documentation of the search, eligibility criteria, screening, quality appraisal, coding, and synthesis procedures,

supported by an audit trail linking evidence to themes and configurations (Tranfield et al., 2003; Snyder, 2019; Harley & Cornelissen, 2022; Locke et al., 2022). PRISMA 2020 guides transparent reporting of the review process and findings (Page et al., 2021).

The review conceptualizes CE adoption as a configurational phenomenon involving five groups of conditions: (1) organizational leadership, culture, capabilities, knowledge, and strategy; (2) technological Industry 4.0, digitalization, blockchain, and data capabilities; (3) operational circular design, remanufacturing, recycling, resource efficiency, and reverse logistics; (4) interorganizational supplier collaboration, customer engagement, and stakeholder relationships; and (5) institutional and market regulation, incentives, market demand, and competitive pressure (Assmann et al., 2023; Govindan & Hasanagic, 2018; Awan et al., 2022).

The ultimate objective is to develop a synthesized map of alternative configurational pathways through which manufacturing firms can achieve circularity, rather than identify a single universal determinant. This approach recognizes that different combinations of conditions may produce comparable outcomes and that effective CE strategies depend on organizational and environmental context (Fiss, 2011; Ketchen et al., 2022; Mies & Gold, 2025).

RESULTS

The qualitative synthesis indicates that circular economy (CE) adoption in manufacturing is best understood as a multidimensional and configurational phenomenon, rather than as the outcome of isolated drivers or individual circular practices. Across the reviewed literature, CE adoption is associated with combinations of organizational motivations, strategic orientation, circular operational practices, technological capabilities, interorganizational collaboration, market conditions, regulatory pressures, and knowledge resources. This finding is consistent with Assmann et al. (2023), whose systematic review identified 54 determinants of circular business model adoption and organized them into eight macro categories: culture, regulation, market, strategy, business case, collaboration, operations, and knowledge.

The synthesis further demonstrates a gradual shift in the literature from linear variable based explanations toward configurations of mutually dependent conditions. Earlier CE research frequently examined individual drivers, barriers, practices, or

outcomes, whereas more recent studies increasingly investigate how combinations of practices and contextual factors jointly influence circular outcomes. This shift is particularly evident in configurational studies using qualitative comparative analysis (QCA), contingency perspectives, and the practice based view (PBV) (Fiss, 2011; Misangyi et al., 2017; Ketchen et al., 2022).

The strongest direct evidence comes from Mies and Gold (2025), who explicitly investigated CE transformation in manufacturing using a configurational approach and the PBV. Their study identified necessary conditions involving intrinsic and market driven motivations and social sustainability practices, while also identifying sufficient bundles of CE practices and contextual conditions associated with positive performance outcomes.

The findings indicate that CE adoption is influenced by multiple internal and external determinants, including organizational culture, strategic orientation, managerial commitment, knowledge, market demand, regulation, collaboration, operational capabilities, and technological readiness. Assmann et al. (2023) identified 54 determinants across culture, regulation, market, strategy, business case, collaboration, operations, and knowledge, confirming that CE adoption cannot be explained by a single dominant factor. Instead, these determinants function as building blocks of broader adoption pathways in which internal capabilities and external pressures interact.

A central finding is the existence of multiple pathways toward circular manufacturing, rather than one universal configuration. Prosman and Cagliano (2022) identified three manufacturing configurations among successful circular start ups, with different supply characteristics corresponding to different circular objectives. Mies and Gold (2025) similarly demonstrated that different combinations of contextual factors and CE practices can produce positive performance outcomes, supporting equifinality as a central characteristic of CE adoption (Fiss, 2011; Misangyi et al., 2017).

Organizational motivation and strategic orientation emerge as important foundations for CE implementation. Mies and Gold (2025) identified intrinsic and market driven motivations as necessary conditions, while Osei et al. (2024) found that competitive strategy positively influences sustainability performance through CE practices. These findings indicate that CE adoption is more likely when sustainability motivations and external market incentives are supported by strategic orientation.

The synthesis further shows that CE practices operate as interconnected bundles rather than isolated initiatives. Circular design, resource efficiency, recycling, remanufacturing, product life extension, and reverse logistics can reinforce one another when implemented coherently (Bocken et al., 2016; Geissdoerfer et al., 2018). Song et al. (2022) further demonstrated that sustainable practices may function as complements or substitutes depending on firm and competitive conditions, indicating that the effectiveness of CE practices depends on their broader configuration.

Digital technologies represent an important enabling condition because Industry 4.0 can improve information exchange, traceability, resource management, and value chain coordination (Awan et al., 2021; Awan et al., 2022). However, digitalization alone does not guarantee circularity. Schöggel et al. (2024) emphasized the importance of combining digital technologies with interorganizational collaboration, while Skalli et al. (2024) found that Industry 4.0 did not have a significant direct effect on CE, suggesting that complementary operational practices are necessary to translate digital capabilities into circular outcomes.

Interorganizational collaboration also emerges as a critical component of circular configurations. Collaboration with suppliers, customers, logistics providers, recyclers, governments, and other stakeholders facilitates information sharing, joint product design, product recovery, and reverse logistics (Sudusinghe & Seuring, 2022). Thus, technological, operational, and relational capabilities can be mutually reinforcing, while strong digital capability without adequate collaboration may produce limited circular outcomes.

The findings further indicate that external institutional and market pressures reinforce internal capabilities. Regulation, customer demand, competitive pressure, and market opportunities repeatedly appear as important contextual conditions (Assmann et al., 2023; Mies & Gold, 2025). Osei et al. (2024) further demonstrates that competitive strategy can support sustainability through CE practices, suggesting an external internal alignment configuration in which institutional and market pressures interact with organizational capabilities and strategic orientation.

CE configurations can generate economic, environmental, operational, and sustainability outcomes, although these benefits may involve trade offs. Antonioli et al. (2022) found economic returns associated with CE practices, while Osei et al. (2024)

linked CE practices with corporate sustainability performance. However, circular interventions may also produce unintended consequences, and social performance remains less examined than environmental and economic outcomes (Sudusinghe & Seuring, 2022). Therefore, CE performance should be assessed across multiple sustainability dimensions.

The synthesis identifies causal complexity as a central explanation for differences among previous findings. Sustainable practices may be complementary or substitutive, while digital technologies may contribute indirectly through complementary operational or collaborative mechanisms (Song et al., 2022; Skalli et al., 2024). CE adoption therefore reflects conjunctural causation, equifinality, complementarity, substitution, and contextual dependency rather than simple independent effects.

Five interconnected dimensions constitute the principal components of configurational CE adoption: (1) organizational conditions, including leadership, motivation, culture, knowledge, and strategy; (2) technological conditions, including Industry 4.0, AI, IoT, blockchain, and data capabilities; (3) operational CE practices, including circular design, recycling, remanufacturing, resource efficiency, and reverse logistics; (4) interorganizational conditions, including supplier collaboration, customer engagement, and stakeholder coordination; and (5) external contextual conditions, including regulation, market demand, competitive pressure, and incentives. These dimensions operate as interconnected configurations rather than independent determinants.

Finally, three broad configurational pathways emerge. The Strategic Market Driven Pathway combines sustainability motivation, market demand, competitive strategy, managerial commitment, and CE practices (Mies & Gold, 2025; Osei et al., 2024). The Technology Operations Enabled Pathway combines Industry 4.0, digital capabilities, Lean Six Sigma, resource efficiency, and circular production (Skalli et al., 2024). The Collaboration Supply Chain Pathway integrates supplier and stakeholder collaboration, information sharing, joint design, product recovery, reverse logistics, and institutional coordination (Sudusinghe & Seuring, 2022; Schöggl et al., 2024). These pathways are analytical configurations synthesized from previous literature, not statistically tested configurations generated by the present review.

Overall, the qualitative systematic literature synthesis demonstrates that CE adoption in manufacturing is characterized by causal complexity and multiple pathways rather than a universal best practice model. The evidence consistently indicates that organizational, technological, operational, interorganizational, market, and institutional conditions interact to shape circular transformation.

The most direct configurational evidence is provided by Prosman and Cagliano (2022), who identified three manufacturing configurations among successful circular start ups, and by Mies and Gold (2025), who demonstrated that different bundles of CE practices and contextual factors can produce positive performance outcomes. Complementary evidence from Assmann et al. (2023), Sudusinghe and Seuring (2022), Song et al. (2022), Schöggel et al. (2024), Skalli et al. (2024), and Osei et al. (2024) further demonstrates that CE adoption is dependent on combinations of determinants and practices rather than isolated variables.

The resulting theoretical interpretation is that manufacturing firms can pursue circularity through different but potentially equivalent strategic pathways, depending on their resources, capabilities, technologies, supply chain relationships, market position, and institutional environment. This finding strengthens the relevance of the practice based and configurational perspectives for CE research and provides a foundation for moving beyond the search for universal CE drivers toward the identification of context dependent configurations and alternative pathways for circular transformation.

DISCUSSION

The findings of this qualitative systematic literature review indicate that circular economy (CE) adoption in manufacturing is fundamentally a configurational phenomenon, in which organizational, technological, operational, interorganizational, market, and institutional conditions interact to create alternative pathways toward circular transformation. This finding challenges conventional approaches that examine CE adoption through isolated linear relationships between individual drivers and outcomes, and instead supports a perspective based on causal complexity, conjunctural causation, and equifinality (Fiss, 2011; Misangyi et al., 2017). The central implication is that manufacturing firms do not necessarily require the same combination of resources and practices to achieve circular outcomes, because different configurations can generate

comparable results under different contextual conditions (Mies & Gold, 2025; Prosman & Cagliano, 2022).

The strongest theoretical contribution of the present review is its confirmation that there is no universal best practice pathway for CE adoption in manufacturing. Mies and Gold (2025) reached a closely aligned conclusion through a configurational analysis of German manufacturers, identifying necessary conditions such as intrinsic and market driven motivations and social sustainability practices, while also identifying sufficient bundles of CE practices and contextual factors associated with positive performance outcomes. The present systematic synthesis extends this insight by showing that configurational logic is also reflected across studies addressing manufacturing configurations, business model adoption, supply chain collaboration, digitalization, sustainable operations, and competitive strategy. This broader evidence suggests that the configurational perspective should not be regarded as relevant only to QCA studies but as a potentially integrative theoretical lens for understanding CE adoption across different research traditions (Ketchen et al., 2022; Misangyi et al., 2017).

Prosman and Cagliano (2022) provide strong support for the configurational perspective by identifying three manufacturing configurations among successful circular start-ups, demonstrating that circular strategies must fit specific supply and contextual conditions. This finding reinforces contextual fit as a central mechanism of effective CE strategies.

A second contribution concerns the shift from identifying individual CE determinants toward understanding their interactions. Assmann et al. (2023) identified 54 determinants across culture, regulation, market, strategy, business case, collaboration, operations, and knowledge, indicating the multidimensional nature of CE adoption. The present review extends this perspective by interpreting these determinants as potential components of configurations rather than isolated factors. Regulatory pressure, for example, may be effective only when firms possess adequate financial, technological, organizational, and managerial capabilities, consistent with Mies and Gold (2025).

Interorganizational collaboration emerges as another critical component. Sudusinghe and Seuring (2022) identified information sharing, joint product design, product recovery, risk sharing, and stakeholder coordination as important mechanisms for circular supply chains. Schöggl et al. (2024), based on 112 Austrian manufacturing firms,

further found that collaboration had a strong positive effect on CE implementation, whereas digital technologies did not have a direct positive effect. However, digital technologies strengthened collaboration and CE implementation subsequently improved sustainability and economic performance. These findings suggest that digitalization is more effective when embedded within collaborative configurations rather than implemented independently.

The role of digital technologies therefore appears complementary rather than universally positive. Skalli et al. (2024) found that CE, Lean Six Sigma, and Industry 4.0 contributed to sustainable performance, but Industry 4.0 did not directly influence CE. Lean Six Sigma helped translate technological capabilities into organizational outcomes, supporting a technology enabled but practice dependent configuration (Skalli et al., 2024; Schöggl et al., 2024).

The findings also highlight the importance of strategic alignment. Osei et al. (2024), using data from 380 firms in Ghana, found that competitive strategy positively influenced sustainability performance, with CE practices mediating this relationship. This complements Mies and Gold (2025), who identified market driven motivation as an important condition for CE implementation. Thus, CE can function not only as an environmental initiative but also as a mechanism for competitive positioning, resource efficiency, innovation, and long-term value creation.

Another important finding concerns the complementarity and substitution of CE practices. Song et al. (2022), using fuzzy set QCA, demonstrated that green innovation and cleaner production could function as complements, while other practices could be substitutes depending on firm size and competitive conditions. This explains why individual variable studies may produce inconsistent results and supports evaluating CE strategies according to the architecture of practices rather than the presence of individual practices alone.

The comparison of the eight prior studies provides substantial convergent evidence. Mies and Gold (2025) offer the closest configurational evidence; Prosman and Cagliano (2022) demonstrate contextual fit; Assmann et al. (2023) establish the multidimensional determinants of CE; Sudusinghe and Seuring (2022) emphasize collaboration; Schöggl et al. (2024) demonstrate the importance of interorganizational collaboration over technology alone; Skalli et al. (2024) show the complementary role of Lean Six Sigma

and Industry 4.0; Osei et al. (2024) support the strategic pathway; and Song et al. (2022) demonstrate complementarity and substitution among sustainable practices.

The principal theoretical contribution of this review is therefore the integration of fragmented explanations into a configurational framework of CE adoption. Consistent with the practice based view, the focus shifts from isolated resources toward combinations of organizational practices (Bromiley & Rau, 2014; Song et al., 2022), while configurational theory explains how different combinations of practices and contextual conditions can produce similar outcomes (Fiss, 2011; Misangyi et al., 2017).

Accordingly, CE adoption can be conceptualized through three broad and potentially overlapping pathways: (1) strategic market, combining motivation, competitive strategy, market conditions, and CE practices; (2) technology operations, integrating digital technologies, Industry 4.0, Lean Six Sigma, and circular production; and (3) collaboration supply chain, combining supplier collaboration, information sharing, joint design, recovery, and reverse logistics. Their relative effectiveness depends on firm characteristics and contextual conditions (Mies & Gold, 2025; Prosman & Cagliano, 2022; Song et al., 2022).

From a managerial perspective, firms should develop coherent bundles of complementary CE practices rather than isolated initiatives, aligning circular design, collaboration, digitalization, resource efficiency, and recovery systems with organizational capabilities and strategic objectives (Mies & Gold, 2025; Song et al., 2022). For policymakers, regulation and incentives should address not only technologies but also organizational capabilities, knowledge, collaboration, markets, and implementation capacity (Assmann et al., 2023).

Overall, the eight studies converge in demonstrating that CE adoption is multidimensional, context dependent, and characterized by interactions among practices and conditions. The distinctive contribution of this review is to integrate these previously fragmented dimensions determinants, manufacturing configurations, collaboration, digitalization, strategy, and practice complementarity into a unified configurational interpretation of circular transformation in manufacturing.

The central conclusion is therefore that successful circular transformation in manufacturing is less about selecting the “right” individual practice and more about constructing an appropriate configuration of mutually supportive conditions and

practices. This conclusion is most directly supported by Mies and Gold (2025), who demonstrate that different bundles of CE practices and contextual conditions can be associated with positive outcomes, and by Prosman and Cagliano (2022), who demonstrate that manufacturing configurations must correspond to supply characteristics. The present review consequently strengthens the argument for moving CE research from a predominantly linear determinant oriented paradigm toward a configurational paradigm emphasizing causal complexity, equifinality, contextual fit, complementarity, and alternative pathways.

CONCLUSION

This qualitative systematic literature review demonstrates that circular economy (CE) adoption in manufacturing is fundamentally a configurational and context dependent phenomenon, rather than a linear process driven by isolated determinants. Successful circular transformation emerges from interactions among organizational motivation, strategic orientation, operational practices, technological capabilities, interorganizational collaboration, market conditions, and institutional pressures (Fiss, 2011; Misangyi et al., 2017).

The review confirms that no single best practice configuration universally supports CE adoption. Different combinations of practices and contextual conditions can generate comparable circular and sustainability outcomes (Prosman & Cagliano, 2022; Mies & Gold, 2025). Therefore, CE strategies should be context sensitive rather than based on universal prescriptions.

CE adoption is strengthened when organizational, technological, operational, and relational capabilities are aligned. Digital technologies can support information sharing, traceability, coordination, and resource management, but digitalization alone does not guarantee circular transformation (Schöggl et al., 2024; Skalli et al., 2024). Their effectiveness depends on complementary practices and organizational capabilities, supporting the practice based view (Bromiley & Rau, 2014).

Interorganizational collaboration is also critical because cooperation with suppliers, customers, logistics providers, governments, and other stakeholders facilitates information sharing, product recovery, joint design, reverse logistics, and circular supply chain coordination (Sudusinghe & Seuring, 2022).

Three broad pathways emerge: (1) strategic market driven, combining organizational motivation, competitive strategy, market demand, and circular practices; (2) technology operations, integrating Industry 4.0 and digital capabilities with circular production; and (3) collaboration supply chain, combining stakeholder collaboration, information sharing, recovery systems, and circular supply chain practices. These pathways represent recurring patterns rather than universally applicable configurations.

Overall, this review integrates fragmented CE literature into a configurational framework that explains adoption through combinations of mutually reinforcing or substituting conditions rather than isolated causal relationships (Assmann et al., 2023; Govindan & Hasanagic, 2018). The findings provide a foundation for future empirical studies using configurational methods such as fsQCA. Managerially, firms should develop coherent bundles of practices aligned with their resources, capabilities, supply chains, markets, and institutional contexts. Thus, successful circular transformation depends less on identifying a single “right” practice and more on constructing mutually supportive configurations of conditions and practices.

LIMITATION

Despite its theoretical contribution, this qualitative systematic literature review has several limitations. First, database coverage, search terms, language restrictions, and eligibility criteria may have excluded relevant studies not indexed in selected databases or using different CE and configurational terminology (Snyder, 2019; Tranfield et al., 2003). Second, restricting the review primarily to English peer reviewed publications may introduce language and publication bias, as significant or novel findings may be more likely to be published (Snyder, 2019).

Third, the literature shows substantial methodological and conceptual heterogeneity, including qualitative, quantitative, systematic review, contingency, practice based, and configurational studies. Differences in CE definitions, samples, measures, and analytical methods limit direct comparison, although qualitative synthesis can integrate these findings conceptually (Thomas & Harden, 2008). Fourth, the identified strategic market, technology operations, and collaboration supply chain pathways represent analytical syntheses rather than empirically validated causal

configurations; therefore, they require further empirical testing (Fiss, 2011; Misangyi et al., 2017).

Fifth, contextual differences across countries, sectors, firm sizes, and institutional environments limit generalizability (Mies & Gold, 2025; Prosman & Cagliano, 2022). Sixth, the literature emphasizes economic and environmental outcomes more than social sustainability, limiting assessment of balanced sustainability performance (Sudusinghe & Seuring, 2022). Seventh, rapid developments in AI, blockchain, IoT, digital twins, and Industry 4.0 may alter existing configurational relationships over time (Awan et al., 2021; Awan et al., 2022). Finally, qualitative coding and thematic interpretation involve researcher judgment despite systematic procedures (Harley & Cornelissen, 2022; Locke et al., 2022).

Future research should empirically test these configurations using fsQCA/QCA, longitudinal and cross country designs, while integrating digital technologies, social sustainability, stakeholder inclusion, and sustainability trade offs. Such research can clarify which combinations of practices work, under what conditions, for which manufacturing firms, and through which pathways.

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