

Circular Supply Chain Barriers and Enablers: A Scoping Review

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ABSTRACT

Sustainability has long been an issue of concern to society, countries, and the economy. In this context, circular supply chain management is a good strategy for reducing material consumption, reducing waste and carbon footprints, and creating recycling opportunities throughout the supply chain. To ensure the successful integration of the circular supply chain practices by the Malaysian Micro, Small and Medium Enterprises (MSMEs) businesses, it is imperative to investigate the key structures to the barriers and the main enablers that can drive its successful adoption. Thus, this study used the scoping review procedure based on the preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) involving 188 shortlisted articles. Five interconnected influential structures which are the government agencies, industry stakeholders, MSMEs management, customers and consumers, and financing institutions were identified as key roles in ensuring the successful implementation of circular supply chain practices. Subsequently, 33 barriers and 27 key enablers were identified as the catalysts for the successful adoption of circular supply chain practices by MSMEs. The circular supply chain framework is envisaged to motivate policymakers in Malaysia, as well as other interested countries, to implement the proposed framework through a greater number of supportive legislative measures as well as practical promotion and education policies to further enhance its acceptance.

Keywords: *circular supply chain, enablers and barriers, micro, small and medium enterprises, scoping review, sustainability*

1. INTRODUCTION

Since the early days, people have been integrating themselves into the traditional linear production and consumption model. In which, raw materials are processed and turned into goods that are sold, utilised, and finally turned into waste which has been unconsciously disposed of and recycled many times (Ellen MacArthur Foundation, 2015). The implementation of this traditional consumption model is also associated with various limitations, such as the formation of waste, the depletion of natural resources, and the adverse environmental consequences stemming from production and consumption activities (S. Khan *et al.*, 2022). In line with the increased level of competition in the business world today and the profound ramifications resulting from the COVID-19 pandemic, these challenges have made companies exercise increased caution when making decisions that could pose potential harm to their financial performance (Attinasi *et al.*, 2022). Furthermore, the disruptions caused by COVID-19 to the global economy hindered enterprises' ability to sustain operations and attain effective supply chain management (Usman, 2024). Therefore, businesses must contend with the intense competitive pressures and the quick shift in market demands brought forward by the current economic conditions.

In order to maintain competitiveness amidst these challenges, organisations must undertake necessary measures to restructure their supply chain networks and strategies (Alshahrani & Salam, 2022). Consequently, concepts such as sustainable supply chain management, reverse logistics, green supply chain management, and closed-loop supply chain management have surfaced as a consequence of endeavours to modernise the field of supply

chain management (Ayati *et al.*, 2022; Singh & Trivedi, 2016). Despite the efforts of numerous organisations to include these concepts in their sustainability and supply strategies, there are certain limits and gaps in their implementation (Ayati *et al.*, 2022). According to the Ellen MacArthur Foundation (2015), the successful integration of the circular economy into supply chain management has led to the emergence of a novel supply chain framework referred to as circular supply chain management, which effectively addresses the aforementioned deficiencies.

The circular supply chain which is part of the circular economy efforts is a regenerative model that can be used to increase resource performance and combat the volatility that climate change may bring to enterprises (Farooque *et al.*, 2019). Circular supply chain management addresses these limitations by effectively managing important resource loops through strategies such as eliminating, decelerating, restricting, improving, or dismantling (S. Khan *et al.*, 2022). The integration of circular supply chain practices has operational and strategic benefits and brings together a vast potential for value creation within the economic, business, environmental and societal spheres (Jain *et al.*, 2018). Circular supply chain integration is also expected to facilitate companies in their efforts to contribute to the development of a sustainable economy while fostering engagement with a socially equitable society (Ayati *et al.*, 2022).

The issue of best practices for circular supply chains and their implications on organisations, as well as the many factors that drive their adoption, has received substantial interest from academic and corporate communities throughout the world. Unfortunately, there is a significant lack of empirical study on the subject within the Malaysian industrial setting. As a result, in the endeavour to incorporate the circular supply chain strategy into the Malaysian organisation's business model, the study identified various research gaps relevant to the problems under consideration. Firstly, there is a shortage of research on how to integrate circular supply chain ideas into Malaysian business operations. This predicament has necessitated a study into how circular supply chain strategy might be implemented into Malaysian enterprises' current linear supply chain architectures. This includes understanding the barriers to implementation and identifying enablers for overcoming these barriers.

The second gap is related to the collaboration and stakeholder engagement. This includes understanding the role of different stakeholders, such as suppliers, customers, and regulators in the circular supply chain and identifying strategies to engage them in the circular practices. Subsequently, this leads to the third research gap which is related to the policy and regulatory frameworks. This includes understanding the regulatory barriers to circular practices and identifying enablers for overcoming these barriers. Thus, to ensure the successful integration of the circular economy concept within the Malaysian Micro, Small and Medium Enterprises (MSMEs) business supply chain, it is imperative to investigate the determinants contributing to its successful adoption. Enabling all players involved in the supply chain network to effectively embrace and implement the circular supply chain concept.

Therefore, it is imperative to conduct a systematic evaluation of previous research to address the limitations of

traditional literature reviews. Hence, carrying out a structured review of prior research work is essential because according to Robinson and Lowe (2015), traditional literature reviews frequently fall short of being complete, are prone to reviewer bias, and rarely take into account differences in the calibre of studies. As such, the utilisation of a scoping review procedure will enable a comprehensive and methodical examination of the existing literature. This study will present a comprehensive summary of the current literature in determining factors that influence the effective implementation of the circular supply chain. The elucidation of the factors influencing the expansion of research in this particular topic will provide valuable knowledge and contribute to its further development.

Subsequently, based on the comprehensive survey of the existing literature, this study aims to construct a framework that establishes a connection between the issues faced by MSME businesses and the specific strategies that companies may pursue to effectively address these challenges. The framework can serve as a valuable resource for managers embarking on the journey of implementing circular supply chain practices. Therefore, this study holds significance as it aligns with the objectives and goals of the Malaysian government, as outlined in the Twelfth Malaysia Plan (2021–2025) under Theme 3: Advancing Sustainability via the Game Changer Effort of Embracing Circular Economy. The created framework is anticipated to serve as a point of reference and provide instructions for policymakers in Malaysia concerning circular supply chain management.

2. LITERATURE REVIEW

A supply chain is commonly recognised as a comprehensive and interconnected process encompassing the procurement of raw materials and their components, the production and assembly of goods, and the transportation or dissemination of the finished products to consumers (Beamon, 1999). Despite the significant contributions of the linear chain concept to the economic development of a country and organisation, its practicality has diminished in light of contemporary economic circumstances. Businesses are currently grappling with challenges such as raw material scarcity and the volatility of associated costs, particularly due to the disruptions stemming from geopolitical challenges on a global scale (Deloitte, 2023). Furthermore, economic, environmental, and social sustainability challenges addressed by environmentalists, ecologists, and governments have drawn additional attention to supply chain practices worldwide (Jain *et al.*, 2018). Hence, to maximise the company's competitive advantage and increase customer values, the supply chain functions need to be re-evaluated to ensure a proper supply chain management strategy (Heizer *et al.*, 2017).

In light of the concerns highlighted over the escalating scarcity of resources, scholars, policymakers, and industry leaders have called for the adoption of the circular economy framework as a means to tackle this issue. The Ellen MacArthur Foundation (2021) posits that the concept of a circular economy necessitates the integration of restorative and regenerative economic and commercial principles to attain the goal of zero waste. As a consequence, this change has given rise to a novel supply chain paradigm referred to

as Circular Supply Chain Management, which seeks to mitigate material flows and diminish the occurrence of pollution and waste generation across the entire supply chain network (Genovese *et al.*, 2017). Therefore, rather than adhering to a conventional disposable product paradigm, the utilised components have the potential to undergo refurbishment or transformation into a novel raw material state (Farooque *et al.*, 2019).

Unfortunately, despite the growing recognition of Circular Supply Chain Management among academics, businesses, and policymakers, little is still known about its key enablers and barriers to ensuring successful circular supply chain management practices in Malaysia. Therefore, this phenomenon causes a lack of clarity in their conceptual boundaries and limits the effectiveness of circular supply chain practices for both research and practical applications. Moreover, there is a lack of comprehensive scholarly research on the enablers and barriers of circular supply chain management practices focusing on the Malaysian Micro, Small and Medium Enterprises (MSMEs) business setting. Thus, this study aims to provide support to Malaysian MSMEs in comprehending the fundamental factors involved in understanding the key determinants in managing the uncertainties that are linked to the implementation of circular supply chain management practices. Through this, the study aims to address the current gap in knowledge by advancing the conceptual comprehension of circular supply chains and consolidating the practices for tangible implementation, particularly in the context of MSMEs.

The recognition of supply chain management's relevance as a vital driver of economic growth among organisations has been extensively acknowledged (Alshahrani & Salam, 2022). It plays a pivotal role in aiding the progress of MSMEs in facilitating economic growth, generating employment prospects, and making substantial contributions to the general development of the nation. MSMEs play a critical role in the Malaysian domestic and global economy according to the Department of Statistics

Malaysia (2022) as they contribute approximately 38.4 percent of the Gross Domestic Product (GDP), with a value-added amounting to RM580.4 billion. In the Malaysian context, the categorization of MSMEs is established by considering either their yearly sales turnover or the number of employees they hire. It is imperative to acknowledge that the categorization may vary among different industries. However, the category of MSMEs does not include entities that meet any of the following criteria: being public-listed on the main board, being subsidiaries of public-listed firms on the board, being subsidiaries of multinational corporations, being subsidiaries of government-linked companies, being subsidiaries of Syarikat Menteri Kewangan Diperbadankan, or a state-owned enterprise entity (SME Corp Malaysia, 2024a).

SME Corp Malaysia (2024b) categorises the Malaysian MSME sector into three distinct classifications: micro, small, and medium enterprises. The first categorization is the micro-enterprises sector, which includes companies with a staff of less than five employees or an annual sales turnover below RM300,000.00. The second group is the small-enterprises sector, with two important segments: the service and others segment, and the manufacturing section. The service and others section are intended for enterprises with a workforce of 5 to 29 people or with sales turnover ranging from RM300,000.00 to below RM3 million. Companies under the manufacturing segment are businesses that employ between 5 to 74 employees or generate a sales turnover between RM300,000.00 to below RM15 million. The third group is related to the medium-sized business sector. In this category, enterprises in the service and related industries are companies that employ between 30 to 74 workers or have an annual sales turnover ranging from RM3 million to less than RM20 million. In the manufacturing sector, companies under this category employ between 75 to 199 employees or have an annual sales turnover ranging from RM15 million to below RM50 million. Table 1 below depicts the different categories of MSMEs in Malaysia.

Table 1 Malaysian MSMEs categories

Categories	Segments	Num. Employees		Annual Sales Turnover
Micro-enterprises	-	Less than 5	OR	Less than RM300,000
Small-enterprises	Service and others	5 to 29	OR	RM300,000 to below RM3 million
	Manufacturing	5 to 74	OR	RM300,000 to below RM15 million
Medium-enterprises	Service and others	30 to 74	OR	RM3 million to below RM20 million
	Manufacturing	75 to 199	OR	RM15 million to below RM50 million

Presently, there are 1,173,601 officially recorded MSMEs in Malaysia and these MSMEs contribute up to 38.4% of the total value of the country's gross domestic product (GDP) (SME Corp Malaysia, 2024a). Therefore, further improvements to the business processes of MSMEs are essential in order to boost their performance. The suggested integrative circular supply chain management framework for MSMEs tries to clarify the key aspects that contribute to the efficacy of circular supply chain management techniques, which differ from the traditional methods that focus on cost, quality, and output. The purpose of the framework is to identify key characteristics that can enhance the efficiency of circular supply chain practices and provide a strategy to mitigate any adverse impacts on operations.

3. METHODOLOGY

This study utilises the scoping review methodology to systematically identify and analyse pertinent works of literature to synthesise key determinants relevant to the efficacious adoption of circular supply chains by Micro, Small and Medium Enterprises (MSMEs). This approach ensured a rigorous, transparent, and reproducible process at each stage of the review procedure and it functions as a great tool for determining the scope and comprehensiveness of scholarly literature related to a certain topic (Tricco *et al.*, 2018). Munn *et al.* (2018) assert that scoping reviews serve as a succinct portrayal of the available literature and studies, encompassing both their amount and diversity. Additionally, these reviews provide a full examination of the central aspects of a given issue, whether in a broad or specific manner. Scoping reviews are a powerful technique for

exploring emerging evidence, especially when there is uncertainty in formulating more precise research objectives (Armstrong *et al.*, 2011). These evaluations serve as a foundation for subsequent systematic reviews that are characterised by a greater level of focus and precision in their methodology (Munn *et al.*, 2018).

In conducting the scoping review, this study followed the procedure put forward by the Joanna Briggs Institute (JBI). The procedure was centred on the works of Peters *et al.* (2015), which was built upon earlier contributions by Levac *et al.* (2010) and Arksey and O'Malley (2005). Peters *et al.* (2017) conducted a subsequent revision, which acts as the guiding procedure for the present scoping review methodology. To uphold the integrity of the results, the findings given in this study adhere to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist, introduced by Tricco *et al.* (2018).

The overarching question addressed in ascertaining the key elements of the study was “What are the pertinent barriers and enablers of circular supply chain adoption?”. Thus, the study utilises the PRISMA-ScR scoping review technique to understand the issue and suggest relevant strategies to ensure its successful implementation. The review process encompasses a set of four distinct stages, namely identification, screening, eligibility, and inclusion. The identification phase of this systematic review process involved searching for synonyms, similar phrases, and variations of the study's keywords as described in Table 2. To ensure the quality of the articles to be appraised, only articles published in Scopus and Web of Science were chosen. A total of 188 articles were produced as a consequence of the search from the databases. As highlighted in Figure 1, among all the publications, only 25 were specifically centred on Southeast Asia countries, and only 4 articles were relevant to the Malaysian context. The insufficiency of research on this topic justifies the need for more investigation.

Table 2 The search string.

Database	Search String
Scopus	TITLE-ABS-KEY ("circular* supply* chain*" AND NOT "circular* economy*")
Web of Science	TS= ("circular* supply* chain*" Not "circular* economy*")

The identified articles were then progressed to the next systematic search strategies process known as screening. Through this process, the article selection was done automatically using the sorting functions provided by the databases. As recommended by Okoli (2015), since it is nearly difficult to review every article that has ever been published, a reasonable period should be set. The restriction on timeline publishing, however, should only be applied if it is clear that related studies could only have been reported during a certain period (Higgins & Green, 2011). Based on the search results from the chosen databases, it was discovered that the research on circular supply chains began in 2016 and has proliferated starting from 2018. Therefore, this study is needed to explore the latest information on circular supply chain practices. However, since the research process started only in January 2024, thus, the study limit was set from January 2018 to December 2023. Figure 2

below highlights the detailed analysis of circular supply chain articles published from 2018 to 2023.

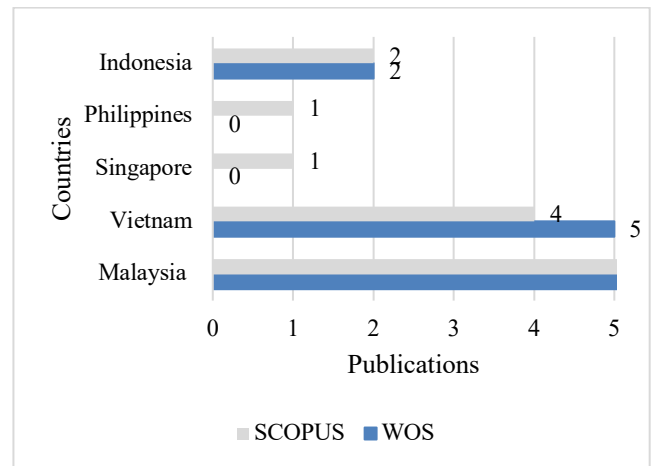


Figure 1 Southeast Asia publication trend.

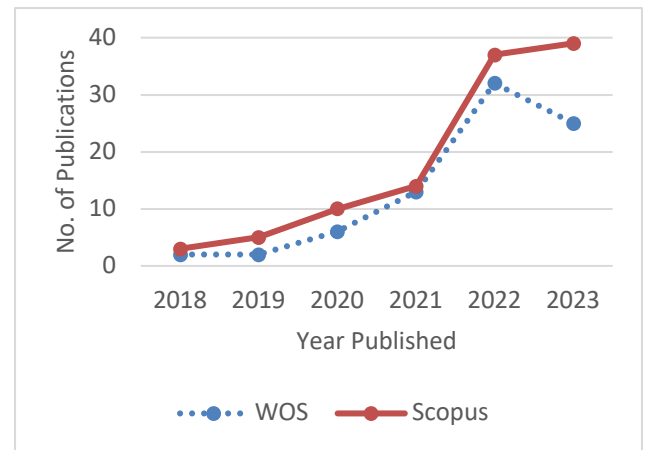


Figure 2 Year-to-year publications trend.

To ensure the review's quality and to avoid misconceptions, only papers published in the English language were selected. Articles that were published as article reviews, chapters in a book, book series, books, conference proceedings, theses, reports, studies not related to social sciences, business and management, and inaccessible articles were also excluded from the study. Subsequently, the screening process narrowed the pool of articles that meet the inclusion and exclusion criteria to 70 publications. The articles subsequently progressed to the third process, which is eligibility. In this process, the titles and abstracts of the articles were manually screened to ensure they fulfilled the criteria set earlier in the process.

Through the screening process, 51 articles were excluded for various reasons. These included articles that focused on creating digital technologies or artificial intelligence integrated systems instead of circular supply chain implementation, articles that focused on energy utilisation rather than integrating circular supply chain management, articles that focused on leadership development rather than the practices of circular supply chain, articles that focused on the impact of circular supply chain on climate change from the perspective of energy management, articles that had discussions unrelated to circular supply chain, articles that emphasised the review of empirical data, articles that lacked definition in the methods

section, and articles that were published as book chapters or conference proceedings. Consequently, only 19 articles satisfied the selection criteria. Figure 3 depicts the PRISMA flow diagram used in this investigation. The articles were

subjected to content analysis in order to determine the barriers and enablers for the successful implementation of circular supply chain strategies.

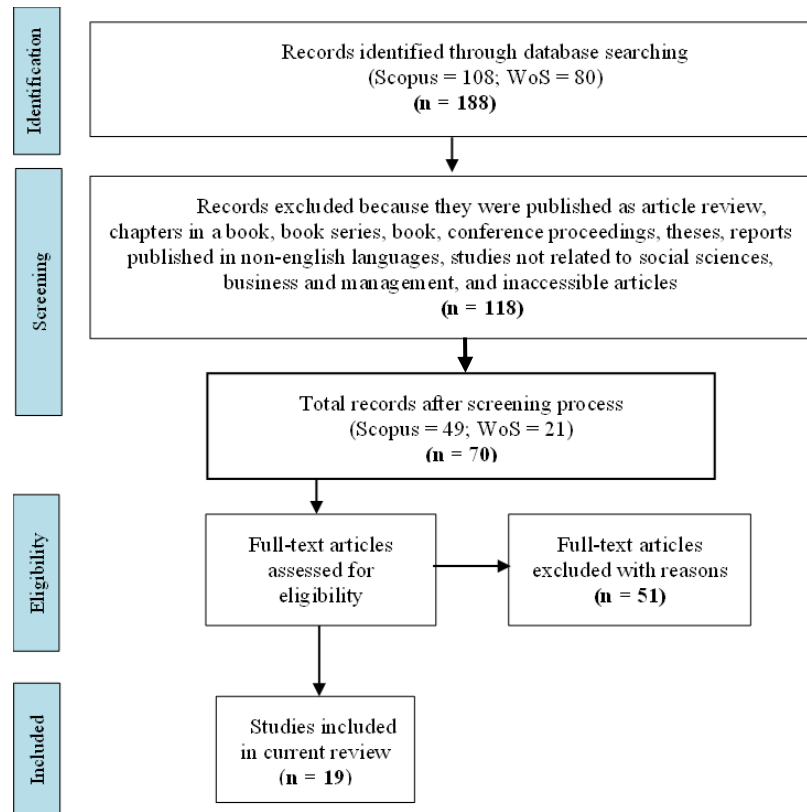


Figure 3 PRISMA flow diagram.

4. ANALYSIS

This research used integrative review to obtain and interpret facts collected in this study. Integrative reviews are useful because they let researchers mix numerous study designs and help researchers identify, assess, and synthesise literature on a particular subject. The integrative review approach gives a reliable evaluation of expertise in a field and may help solve the pertaining issue under study (Souza *et al.*, 2010). As a result, 19 articles were selected after the identification, screening, eligibility, and inclusion process. The relevant information pertaining to the articles and the publishing journals is presented in Table 3. A comprehensive review of the papers' introductions, results, and conclusions was subsequently done to identify the key points.

The research questions that had been identified earlier in the investigation served as the foundation for data analysis. The obtained findings underwent thematic analysis, which included grouping, numbering, identifying similarities, and emphasising relationships between data points. The goal of this research was to discover relevant patterns and topics in the data, as well as the components and sub-components that comprise those patterns. According to Braun and Clarke (2006), thematic analysis is a very effective method for discovering, analysing, and interpreting

noteworthy patterns in a given dataset. The thematic analysis of the articles revealed the role of ensuring the successful implementation of circular supply chain practices surrounded by five interconnected influential structures as depicted in Figure 4. They are government agencies, industry stakeholders, MSMEs management, customers and consumers, and financing institutions.

The analysis conducted suggests that to overcome the identified barriers, it is imperative for government agencies, industry stakeholders, MSMEs management, customers and consumers, and financing institutions to collaborate in integrating the circular supply chain culture and practices to enhance its adoption and implementation nationwide. The study also identified several barriers that have been impeding the integration of all key parties. Additionally, enablers that may act as catalysts to drive and assist its development were also proposed. The identified barriers, enablers and the responsible parties are listed in Table 4. A total of 33 barriers were identified after a closer look at the classification of the five influential structures. Further to that, 27 key enablers were acknowledged as the backbone of the proposed framework that supports the circular supply chain practices' successful implementation. Figure 5 depicts the numbers of circular supply chain barriers and enablers according to the identified structures.

Table 3 Articles and journal details

Authors (Years)	Title	Journal	Methods	Research Objective(s)
S. Khan <i>et al.</i> (2022)	A grey-based framework for circular supply chain management: a forward step towards sustainability	Management of environmental quality: An international journal	A two-step process of literature review and grey-Delphi approach.	To identify and prioritise the significant enablers related to the effective management of the circular supply chain
Chen and Tan (2021)	Exploring the Circular Supply Chain to Reduce Plastic Waste in Singapore	Scientific journal of logistics (LogForum)	Exploratory and explanatory case study approach	This research proposes that the circular supply chain could be a way to reduce plastic waste concerning the triple bottom line: economy, society, and environment. It applies the life-cycle assessment (LCA) and target sampling method.
Saroha <i>et al.</i> (2020)	Pressures in the implementation of circular supply chain management (CSCM) for sustainability: An analysis from Indian industries perspective	Management of environmental quality: an international journal	A two-step process of literature review and fuzzy analytical hierarchy process (F-AHP)	To address various pressures to circular supply chain management implementation for sustainability
Tseng <i>et al.</i> (2023)	Causality of circular supply chain management in small and medium-sized enterprises using qualitative information: A waste management practices approach in Indonesia	Annals of Operations Research	An approach consisting of the fuzzy Delphi method (FDM), best worse method (BWM), and fuzzy decision-making trial and evaluation laboratory (FDEMATEL)	(1) To critically validate the hierarchical structure of CSCM for SMEs; (2) identify the causal interrelationships among the attributes; and (3) determine the practical attributes for SME improvement in Indonesia
Bui <i>et al.</i> (2023)	Causality of total resource management in circular supply chain implementation under uncertainty: a context of textile industry in Indonesia	Annals of Operations Research	The fuzzy Delphi method and the fuzzy decision-making trial and evaluation laboratory	To obtain the causal interrelationships among the attributes in the circular supply chain and total resource management and to identify those that are to obtain better performance
Ciccullo <i>et al.</i> (2023)	Designing circular supply chains in start-up companies: evidence from Italian fashion and construction start-ups	The International Journal of Logistics Management	Multiple case study approach	To fill the gap and focus on how and why companies design their CSCs and what value these design choices help to create across different Industries.
Yan <i>et al.</i> (2022)	Exploring the factors to promote circular supply chain implementation in the smart logistics ecological chain	Industrial Marketing Management	Case study methodology	How do factors in the SLEC development process affect CSCI? What role does SDM play in the relationship between factors affecting CSCI and CSCI?
Tseng <i>et al.</i> (2022)	Healthcare industry circular supply chain collaboration in Vietnam: vision and learning influences on connection in a circular supply chain and circularity business model	International Journal of Logistics Research and Application	Fuzzy Delphi method	To classify a set of circular supply chain collaboration attributes and propose a cause-and-effect framework
Cao <i>et al.</i> (2022)	Identifying critical eco-innovation practices in circular supply chain management: evidence from the textile and clothing industry	International Journal of Logistics Research and Application	Fuzzy set theory	Identifying critical eco-innovation practices in circular supply chain management
Kayikci <i>et al.</i> (2022)	Analyzing the drivers of smart sustainable circular supply chain for sustainable development goals through stakeholder theory	Business Strategy and the Environment	A systematic review and Best-Worst Method	To discover the drivers of a smart sustainable circular supply chain (SSCSC) in achieving the SDGs in LMIC through stakeholder theory

Table 3 Articles and journal details (cont'd).

Authors (Years)	Title	Journal	Methods	Research Objective(s)
Bhattacharya and Kalakbandi (2023)	Barriers to circular supply chain: the case of unorganized tire retreading in India	The International Journal of Logistics Management	Grounded theory methodology	To understand the role of the unorganized sector in the push toward a circular economy
Mangla <i>et al.</i> (2018)	Barriers to effective circular supply chain management in a developing country context	Production Planning and Control	Interpretive Structural Modelling - MICMAC approach	To identify the contextual interactions among identified barriers and to examine their hierarchical levels in the effective adoption and implementation of circular supply chain management
Milki and Islam (2021)	Barriers to Circular Supply Chain Adoption: A Perspective of Electric Battery Industries of Bangladesh	Research Square	PESTEL (Political, Economic, Social, Technological, Environmental and Legal) framework	To explore the barriers to implementing Circular Supply Chain (CSC)
Lahane and Kant (2021)	Evaluating the circular supply chain implementation barriers using Pythagorean fuzzy AHP-DEMATEL approach	Cleaner Logistics and Supply Chain	Pythagorean fuzzy analytic hierarchy process (PF-AHP) and Pythagorean fuzzy decision-making trial and evaluation laboratory (PF-DEMATEL) approaches	To identify and analyze the inter-relationships among the CSC barriers and their impact on CSC implementation.
Saroha <i>et al.</i> (2022)	Identification and analysis of circular supply chain management practices for sustainability: a fuzzy-DEMATEL approach	International Journal of Productivity and Performance Management	Fuzzy Decision-Making Trial and Evaluation Laboratory (F-DEMATEL) methodology	To analyse the circular practices in CSCM implementation towards sustainability in the Indian auto sector
F. Khan and Ali (2022)	Implementation of the circular supply chain management in the pharmaceutical industry	Environment, Development and Sustainability	Fuzzy full consistency method (F-FUCOM) and total quality management tool. fuzzy quality function deployment (FQFD)	To devise a model that will help the pharmaceutical industries adopt CSCM in their organizations
Chhimwal <i>et al.</i> (2021)	Measuring Circular Supply Chain Risk: A Bayesian Network Methodology	Sustainability	A Bayesian Network methodology	To analyze how the risk propagation takes place in a circular supply chain network of an automobile organization
Tseng <i>et al.</i> (2021)	Modelling hierarchical circular supply chain management enablers in the seafood processing industry in Vietnam under uncertainties	International Journal of Logistics Research and Applications	This study adopts the fuzzy Delphi method and the best-worst method	To build enablers for industrial improvement under qualitative information
Luthra <i>et al.</i> (2022)	Overcoming barriers to cross-sector collaboration in circular supply chain management: a multi-method approach	Transportation Research Part E: Logistics and Transportation Review	employing a multi-method approach of Agglomerative Hierarchical Clustering (AHC), Fuzzy Delphi and Fuzzy Decision-Making Trial and Evaluation Laboratory (F-DEMATEL)	Assesses the barriers to Cross-Sector Collaboration for CSCM and suggests a strategic roadmap to overcome these barriers

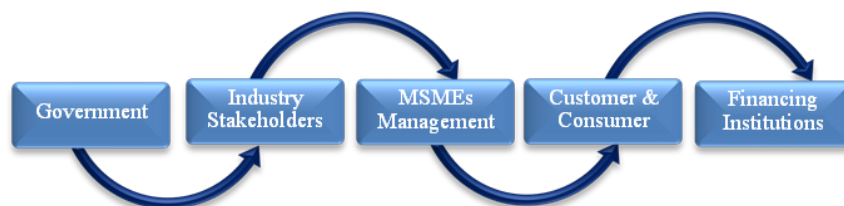


Figure 4 Circular supply chain influential structures.

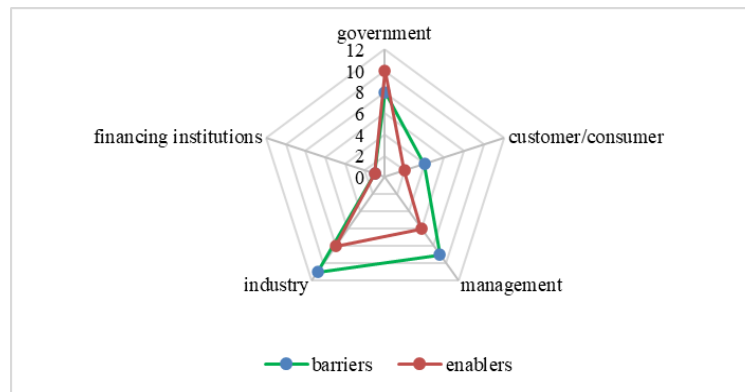


Figure 5 Circular supply chain barriers, enablers and structures.

Table 4 Summary of reported barriers and enablers of circular supply chain practices.

Responsibility	Barriers	Enablers
1. Government	<ol style="list-style-type: none"> Lack of government funding schemes or financial resources Lack of efficient taxation norms Lack of effective promotional methods Lack of import duty reduction incentives Poor implementation of standards Lack of environmental/ecological laws, policy standards and regulations Nonexistence of a suitable performance measurement system/standard Inflexible policy, lack of legitimacy, command-control government regulations and lack of power asymmetry 	<ol style="list-style-type: none"> Strict regulations and policies Enforcement of rules and legislation Economic pressure Governmental systems Offering tax benefits Offering of research and development support by the government Technological upgradation-related practices by government Alignment of circular supply chain goals with strategic objectives Development of circular supply chain culture Investment in environmental awareness and education
2. Industry	<ol style="list-style-type: none"> The absence of an industry's legislative mechanism to incorporate eco-friendly solutions to operations Lack of sustainable development planning Lack of industry incentives Lack of coordination among industry and supply chain partners Lack of investment in technological innovation Lack of economic benefits in the short-run Market challenges thus induce a lack of cooperation, collaboration and information sharing among industry players Differences in perception or misaligned interests Lack of trust among cross-sector collaborators resulting in lack of networking Each organisation have their policies and vision. It is difficult to develop one common policy and vision across sectors The mismatch between the powers of the partners' organisations because of different levels of resources 	<ol style="list-style-type: none"> Industry collaboration in terms of exchanging expertise, information, and materials Enabling collaboration by information technology Knowledge sharing of eco-innovation information Knowledge and skills training for enhancement-related practices Design for longevity, reliability, and durability Synergistic partnerships Fund utilization Technological upgradation-related practices by industry players
3. Management	<ol style="list-style-type: none"> Lack of management support, readiness, willingness and commitment to adopt the practice Internal resistance to adapting to change restricts the organisation's willingness to collaborate Lack of knowledge about the environment, health and future generations Financial pressure Technical pressure Lack of skilled labour Demand uncertainty Increased competition Increasing material prices 	<ol style="list-style-type: none"> Management support, commitment and clear vision Long-term planning Resource optimization Technological innovation Embedding circular supply chain practices in design-related practices will result in a saving of resources Upskilling and reskilling of employees
4. Customer/ Consumer	<ol style="list-style-type: none"> Customer's price-conscious behaviour Customer's perception Customer lack of knowledge Low quality of circulated products 	<ol style="list-style-type: none"> Marketing pressure Customer/consumer awareness campaign to support circular supply chain practices. Societal practices act as a key factor in the success or failure of its implementation.
5. Financing Institutions	Lack of financial resources and capabilities	Offering financial support

5. DISCUSSION

The circular supply chain business model was found to be an essential practice in achieving sustainability objectives. This is because the adoption of a circular supply chain strategy fundamentally changes supply chain management by redirecting attention from efficiency and waste reduction to the principles of redesign, reuse, and product transformation (Ellen MacArthur Foundation, 2021). Thus, the successful implementation of circular supply chain management relies on the crucial elements of collaboration, trust, and transparency of all related parties (S. Khan *et al.*, 2022). Moreover, the incorporation of industry

4.0 technologies in conjunction with circular economy concepts facilitates circular supply chain management and provides advantages such as enhanced resource availability and traceability throughout the supply chain (S. Khan *et al.*, 2022). Therefore, this study provides valuable insights into the structure and techniques required to overcome the barriers, while enabling businesses to undertake circular supply chain practices and promote sustainability objectives. Following the foregoing findings, Figure 6: Circular supply chain framework depicted the five main important structures and the key enablers for successful circular supply chain adoption for Malaysian MSMEs.

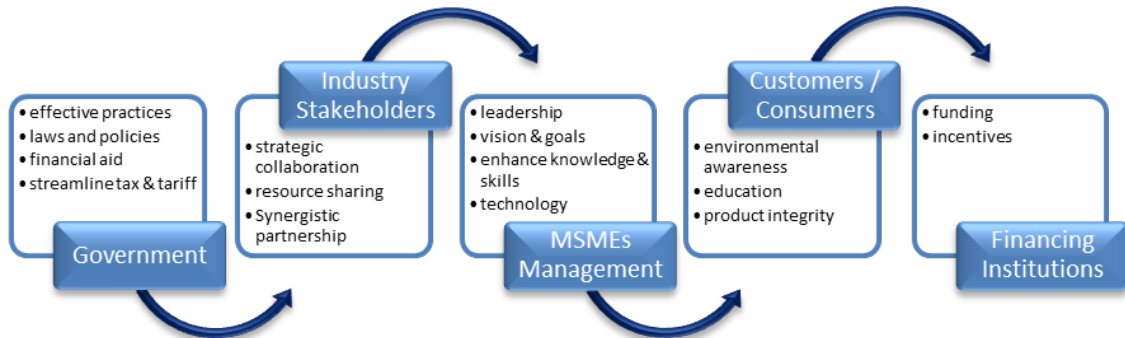


Figure 6 Circular supply chain framework.

The study revealed that the implementation of circular supply chain practices relies heavily on effective governmental practices since they are the responsible party in establishing the necessary laws and policies to encourage and support its enactment. Governmental pressures, in terms of lack of policies for circular supply chain implementation and lack of strong implementation of laws, are some challenges, which affect the implementation process and incorporation of sustainable solutions (Saroja *et al.*, 2022). Thus, strong laws and policies enactment by the government need to be framed for sustainable concepts implementation. This is because legislative and economic pressure plays a vital role in supporting the circular supply chain practices and sustainable activities implementation in business. These laws and policies are necessary to create environmental taxes or duties for firms that implement circular supply chains, hence offering stronger economic incentives for the organisation (Saroja *et al.*, 2022). This is important because as global crises expand in scope, enterprises will increasingly rely on geopolitical institution support, thus, the government need to play an important role, without such support, access to critical resources, infrastructure, transportation, and connectivity is at a high risk of being cut off (Takeda *et al.*, 2024). Additionally, government should provide financial aid, streamline tax regulations, and import tariff systems to facilitate the execution of the measures.

Industry stakeholders' pressure is the second pillar which acts as a motivator for employees to have faith in circular activities for cleaner production. It has the power to implement, modify and make changes in any system of organisation and it is their will to which extent they adopted the concept (Yan *et al.*, 2022). Without the industry's support, businesses will display hesitancy in endorsing initiatives aimed at promoting sustainable operations. Circular supply chain implementation relies on strategic

industrial and managerial partnerships to establish well-defined and standardised objectives (Bui *et al.*, 2023). Industry could try to promote circular supply chain implementation by augmenting their investment in intelligent facilities or technology, as well as building dedicated platforms for partner resource sharing and communication (Yan *et al.*, 2022). Leading, promoting and investing in the implementation of circular supply chain practices will not only allow the industry to implement a smart and ecological transformation of business strategies but also lay the foundation for the successful integration of circular supply chain practices by the industry players. Industry leaders and government agencies must educate, motivate and provide necessary training to the stakeholders to create awareness about the benefits of circular supply chain adoption.

The next crucial component in the framework is the MSMEs management team of the companies. While the top management of the company has the responsibility for important decisions, managers who possess a clear vision and specific goals will play a pivotal role in driving the transformation of the business. Thus, organisations must establish structures, strategies, and processes to facilitate supply chain management participation (Scannell & Curkovic, 2024). An alignment of circular supply chain goals with companies strategic goals is important and needed to ensure wide acceptance of its practices within the organisation. They will function as major motivators in accomplishing the aim of implementing a circular supply chain management system (Bui *et al.*, 2023). By implementing methods connected to technology upgrades and enhancing knowledge and skills, the business may effectively achieve successful circular supply chain practices. The use of advanced technology will lead to improved product quality while simultaneously reducing

energy consumption and minimising waste (Tseng *et al.*, 2022). Therefore, equipping the workforce with technological advancements is crucial for optimising the use of current resources. MSMEs need to also work on the training of workers, offering apprenticeship schemes or knowledge enhancement workshops are also among the initiatives that can be undertaken to ensure successful implementation (Lahane & Kant, 2021).

Pertaining to customers and consumers, the integration of knowledge, social, cultural, and marketing influences is considered an effective tool for assuring the acceptance and adjustment of mentality among customers and consumers (Saroja *et al.*, 2020). This is because the effective implementation of circular supply chain strategies relies only on their acceptability. It is important to motivate customers and consumers to engage in eco-friendly purchasing and refurbishing of items since this promotes the acceptability of circular supply chain activities. The integration of circular thinking and a waste minimization understanding, in which the managed waste can be treated efficiently in the manufacturing and supplying process while maintaining product integrity and preventing product obsolescence is important information that needs to be shared with them (Tseng *et al.*, 2023). Customers and consumers need to understand that environmental practices prevent the loss of valuable resources by viewing waste as potential resources for something else.

Financial pressure is one of the important factors that need to be considered in the implementation of circular supply chain management. The MSMEs will put their focus on financial factors on a priority basis. This is because funding and incentives are very important factors for the MSMEs in the implementation of any new concept and it affects their implementations (F. Khan & Ali, 2022). The offering of funding by relevant agencies would be one of the best drivers in getting support from the industry and the MSMEs management. Attaining their support becomes useless without financial aid as well as funding from relevant agencies (Kayikci *et al.*, 2022). The funding will allow the industry and MSMEs to increase their investment in intelligent facilities or intelligent technologies and establish specific partner resource-sharing and communication mechanisms. The offering of the funding will not only allow the MSMEs to engage in the smart and ecological transformation of the company but also lay the foundation for a smart circular supply chain partnerships.

6. IMPLICATIONS, LIMITATIONS & FUTURE RESEARCH

The rapid expansion of supply chain management accentuates the significance of the supply chain in enhancing business operations. However, given the limitations of traditional supply chain approaches in dealing with the complexities of today's economic situations, businesses are facing challenges in identifying the most effective supply chain strategies to mitigate the effects of resource scarcity and rising raw material costs. This ultimately results in the recognition of circular supply chain management. While the impact of circular supply chain practices in today's business world is still being researched, their importance has generated the need for further comprehensive examination to explore their implementation. As such, this study scrutinizes

188 journal publications within the circular supply chain research domain from the Scopus and WOS databases, which finally led to the final 19 articles that fulfil the PRISMA-SCR methodology, revealing valuable insights. The study identifies five main interconnected influential structures that are vital to the circular supply chain implementation, which are the government, industry stakeholders, MSMEs management, customer and consumer, and financing institutions. Subsequently, 33 barriers and 27 key enablers were identified as the catalysts towards the successful adoption of circular supply chain practices by MSMEs.

This study carries significant importance for both academics and practitioners. The identification of the benefits of circular supply chains towards MSME operations prompts further exploration into the identification of the barriers and enablers for its successful adoption. The method employed holds substantial theoretical implications, through the well-structured methodological process, the study offers significant recommendations to uphold circular supply chain implementation by MSMEs. Moreover, it highlights that circular supply chain practices adoption by MSMEs transcends mere technological innovation adoption, evolving into government, industry and financing institutions support. MSME businesses stand to benefit from the insights provided by this study, leveraging its findings to enhance business operations and foster sustainability as a source of cost reductions.

Pertaining to the limitation of the study, it should be noted that the study is limited to journal articles published in English and indexed in Scopus and Web of Science within the time limit of January 2018 to December 2023. Thus, future research may explore a bigger pool of databases with additional coverage up to the latest publication period. Nonetheless, it is important to highlight that the review managed to provide a comprehensive, systematic and up-to-date summary of research on circular supply chain practices related to MSMEs.

In conclusion, this paper provides practical and theoretical contributions on the required practices that should be implemented by MSMEs instituting circular supply chain management in their operations. The identified barriers and enablers posed significant responsibilities played by the government, industry stakeholders, MSMEs management, customers and consumers, as well as the financing agencies in upholding circular supply chain management practices, which provides a practical perspective in creating sustainable business practices. The proposed framework highlighted important enablers of circular supply chain practice, thus it can be used by relevant governing bodies to produce a standard or guidelines that can be used to monitor the services delivered by the MSMEs. The development of circular supply chain management practices framework or guidelines is deemed important and timely to ensure that the service deliveries are in line with the industry's standard. This is also to prevent any abuse from the business providers and ensure strict compliant services benefitting and fulfilling the needs of the customer and the industry.

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