Received: 13.12.24 | Revised: 19.03.25 | Accepted: 26.05.25

Blinded by Circularity: Ignoring Critical Limitations in the Quest for Sustainability – the Case of Operations and Supply Chain Management

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Abstract: This study critically examines the circular economy (CE) concept through two systematic literature reviews, conducted across general management and economics (28 articles) and operations and supply chain management (45 articles). The research addresses two key questions: how CE criticisms can be systematically categorised and how profoundly these criticisms are reflected in OSCM discussions. The analysis reveals six major criticism categories: conceptualisation, efficiency, implementation, regulation, product/process, and economic value. A critical finding shows that while OSCM literature acknowledges CE criticisms, only 20 % of publications move beyond superficial mentions to propose actionable solutions. The study challenges the prevailing utopian assumptions surrounding CE, revealing a disconnect between acknowledging limitations and addressing them in a meaningful way. The authors argue for interdisciplinary collaboration and deeper embedding of CE criticisms into research frameworks to develop realistic and implementable solutions rather than maintaining idealistic visions of circularity.

Keywords: Circular economy, criticism, sustainability, literature review, operations and supply chain management

Blind vor lauter Zirkularität: Das Ignorieren kritischer Limitationen auf dem Weg zur Nachhaltigkeit – der Fall des Operations und Supply Chain Managements

Zusammenfassung: Diese Studie untersucht kritisch das Konzept der Kreislaufwirtschaft (CE) durch zwei systematische Literaturübersichten in der allgemeinen Management- und Wirtschaftsliteratur (28 Artikel) sowie im Operations- und Supply Chain Management (45 Artikel). Dabei fokussiert sie auf zwei zentrale Fragen: wie CE-Kritikpunkte systematisch kategorisiert werden können und wie tiefgreifend diese Kritik in OSCM-Diskussionen reflektiert wird. Die Analyse identifiziert sechs Hauptkritikkategorien: Konzeptualisierung, Effizienz, Implementierung, Regulierung, Produkt/Prozess und wirtschaftlicher Wert. Die Ergebnisse zeigen, dass die OSCM-Literatur zwar CE-Kritik anerkennt, jedoch nur 20 % der Publikationen über oberflächliche Erwähnungen hinausgehen und konkrete, umsetzbare Lösungsansätze vorschlagen. Die Studie hinterfragt die vorherrschenden utopischen Annahmen zur Kreislaufwirtschaft und deckt eine problematische Diskrepanz zwischen der

Nennung von Limitationen und deren zielgerichteter wissenschaftlicher Behandlung auf. Die Autoren plädieren für verstärkte interdisziplinäre Zusammenarbeit und eine tiefere Einbettung der CE-Kritik in zukünftige Forschungsrahmen zur Entwicklung realistischer Lösungsansätze.

Stichwörter: Kreislaufwirtschaft, Systematische Literaturrecherche, Operations and Supply Chain Management, Kritik

1. Introduction

In a world struggling with environmental degradation, planetary boundaries, and social crises, the circular economy (CE) concept is widely promoted as a "silver bullet" for overcoming this grand challenge of our time (Rodriguez-Anton *et al.*, 2019; Desing *et al.*, 2020; Dzhengiz *et al.*, 2023). However, its enthusiastic and widespread acceptance as a universal solution towards sustainability risks reinforcing a comforting yet superficial illusion, promising change while masking deeper structural problems.

In its idealised form, a CE system harmonises socio-economic development with planetary boundaries by significantly reducing material system inputs and waste system outputs (Korhonen, 2004; Korhonen *et al.*, 2004). This justifies why companies, national governments, and supranational organizations like the EU push the development of corporate strategies and political agendas to realise CE policies (Korhonen *et al.*, 2018b; Alvarez-Risco *et al.*, 2022a). However, despite these efforts and the expanding body of literature postulating CE as a blueprint for ecological transformation (Centobelli *et al.*, 2020; Dzhengiz *et al.*, 2023), also critical voices have recently grown louder (Korhonen *et al.*, 2018a; Korhonen *et al.*, 2018b; Corvellec *et al.*, 2022).

Challenging its positioning as a solution to many (or even all) sustainability challenges, scholars criticising CE have emphasised that recent approaches to conceptualisation, operationalisation, and implementation fail to account for the economic system's true complexities (Murray *et al.*, 2017; Corvellec *et al.*, 2022). As Blomsma & Brennan (2017) have pointed out, CE currently resembles an umbrella concept, creating utopian enthusiasm while falling short of practical operationalisation. Vague theoretical foundations, difficulties in the implementation, and unintended systemic consequences are just a few potential problems raising doubts about whether CE can deliver its promised outcomes (Desing *et al.*, 2020; Corvellec *et al.*, 2022). Thus, the current CE literature often misses insights about (1) scholarly awareness of CE criticism and (2) implications for possible agendas to address them—thus, they may represent an idealistic utopia that is fundamentally unattainable.

This paper critically confronts these issues in the context of operations and supply chain management (OSCM) as an important field within business and management studies. We do so by conducting two distinct systematic literature reviews with subsequent categorisation approaches. To get a first impression of the scope and severity of CE criticism, we start by reviewing the general management and economics (GME) literature, one of the primary publishing streams on CE. From there, we synthesise a first comprehensive set of criticisms. After completing this first phase of our study, we conduct an independent review of the OSCM literature (providing an example of a functional management discipline) to identify a second, discipline-specific set of criticisms. Based on anecdotal insights and the fact that—to the best of our knowledge—there is currently no systematic work

on CE criticism in the context of OSCM, we assume the field to be unaware of the existence of these criticisms. Finally, we integrate both perspectives into a holistic criticism framework.

The goal of this study is to critically challenge the prevailing utopian assumptions surrounding the CE by raising awareness of its necessities and limitations within real-world business contexts. Further, we elaborate on the degree of consideration of these criticisms in the OSCM context. Thus, our research questions are as follows:

RQ1: What are the criticisms of CE, and how can they be systematically categorised?
RQ2: How profound are these criticisms reflected in OSCM discussions and implications?

Based on a selection of 73 papers, we aim to support scholars and practitioners moving to a deeper and actionable understanding of the true transformative potential inherent to the CE concept. Our analysis seeks to serve as a critical entry point, challenging scholars to rethink predominant mental models and established narratives, and confronting unresolved tensions in future interdisciplinary research. Compiling the GME and OSCM-specific criticisms offers an up-to-date overview to all scholars and practitioners interested in contributing to conceptualising and implementing a CE system. Further, our criticism framework marks a starting point for future work that delves deeper into the development of more attainable CE policy solutions.

We position this paper as a timely problematising statement in a period of a continuously growing body of CE literature. Based on our results, reviewing previous initiatives and research approaches to guide future CE implementation is instructive. Note that we acknowledge the limitations and imperfections of our work, which is not intended to serve as a contribution to CE conceptualisation or policy development, but rather as a provocative and critical examination of the shortcomings within current research agendas. We aim to raise scholars' and practitioners' awareness of the flaws of current approaches to achieve a more holistic understanding, with the aim of realising the full potential of CE systems. Thus, the contribution of this study is threefold:

1. The paper presents a problematising statement about the negligence of CE criticism in current research agendas in management and business. We advance prior systematic categorisations (Jesus & Mendonça, 2018; Korhonen *et al.*, 2018a) by responding to the evolving research landscape surrounding CE over the past years (Norouzi *et al.*, 2021).
2. Our analysis strongly recognises critical CE aspects, while at the same time, few approaches to overcoming these are supported with empirical or conceptual evidence.
3. The categorisation enables scholars and practitioners to raise awareness of the CE's limitations and to integrate these into the transition process towards circularity.

The subsequent sections are organised as follows: Section 2 presents a short review of existing literature. Section 3 outlines the methodology for data search and the results of our descriptive analysis. Section 4 presents the results of our analysis and the integration of our two frameworks. Further, theoretical and practical contributions are discussed. Finally, Section 5 addresses study limitations and highlights research avenues.

2. Related literature

Between 2016 and 2020, the total number of CE-related publications doubled (Norouzi *et al.*, 2021), with the top five publishing journals being the *Journal of Cleaner Production* (1,064 articles), *Sustainability* (926), *Resources, Conservation and Recycling* (445), *Waste Management* (223), and *Science of the Total Environment* (207) (Alvarez-Risco *et al.*, 2022b).[1] Many of these publications present CE as a restorative and regenerative system that balances socio-economic development with planetary boundaries. However, critical voices have emphasised several key limitations of the CE approach (Korhonen *et al.*, 2018b; Corvellec *et al.*, 2022). While several studies have critiqued singular specific CE aspects (e.g., Zink & Geyer, 2017; Babbitt *et al.*, 2018), relatively few have explored CE criticisms more systematically (e.g., Korhonen *et al.*, 2018b; Jesus & Mendonça, 2018).

One of the main concerns inherent in current CE approaches is their flawed conceptual definitions (Korhonen *et al.*, 2018b; Desing *et al.*, 2020). Predominantly shaped by practitioners, consultancies, and policymakers with the goal of emphasising expertise in the topic, these definitions prioritise economic benefits while overlooking the social dimensions of CE (Kirchherr *et al.*, 2017). Similarly, this practitioner-oriented approach lacks interdisciplinary collaboration in its scientific and conceptual development (Millar *et al.*, 2019). Other scholars have criticised the CE for issues related to supply limitations and price volatility (Babbitt *et al.*, 2018), inferior material quality (Zink & Geyer, 2017), and contamination (Baxter *et al.*, 2017). Further concerns include rebound effects, where, paradoxically, demand for materials increases rather than decreases (Greer *et al.*, 2021; Corvellec *et al.*, 2022).

Exploring CE criticism systematically, Jesus & Mendonça (2018) identify four major barriers to developing circular business models: (1) technical, (2) economic, (3) institutional and regulatory, and (4) social and cultural barriers. The development of viable business models is further complicated by unrealistic assumptions in CE research, which tend to overlook already implemented best practices in firm policies (Bansal *et al.*, 2024). Further, Korhonen *et al.* (2018a) identified six fundamental CE challenges related to:

(1) Thermodynamic principles; each material loop experiences dissipation and entropy, leading to material losses that inevitably necessitate the addition of new raw materials and energy (see also Cullen, 2017; Giampietro & Funtowicz, 2020),
(2) System boundaries; including the risk of surpassing physical and environmental constraints (see also Rockström *et al.*, 2009; Desing *et al.*, 2020),
(3) Limits to economic growth (see also Jesus & Mendonça, 2018),
(4) Path dependencies,
(5) Governance of inter-organisational and inter-sectoral circular material flows (see also Jesus & Mendonça, 2018),
(6) Physical energy flows.

Despite a substantial body of work addressing these criticisms within the GME literature, there remains a notable lack of critical exploration of the CE in OSCM. To date, no

1 As our article aims to take a critical stance, we acknowledge (but will not further discuss) recent criticism of supposedly unethical publication practices of at least two of these journals (Journal of Cleaner Production and Sustainability). We thank one of our reviewers for pointing this out. However, given the topical fit of these journals (and the fact that they have, of course, published good papers nevertheless), we retain them in our analysis.

review has focused specifically on criticisms of circularity or the extent to which these are considered in OSCM research on CE. This raises concerns that the overwhelmingly optimistic assumptions surrounding the concept may become normalised, limiting opportunities for critical reflection (Lazarevic & Valve, 2017).

3. Research method and descriptive results

The present study systematically categorised criticisms of CE into an integrated framework. A sequential two-step systematic literature review approach was employed, as illustrated by Figure 1. The two phases of our study were distinguished according to their respective purpose. In **Phase 1**, a systematic literature review was conducted in the field of GME as the primary literature stream publishing CE studies. Motivated by our initial assumption of OSCM literature (as a functional management discipline) not knowing about criticism aspects of CE, the purpose of this phase was to gain an initial understanding of the scope and severity of criticism discussed in the literature. Relevant literature for this phase was gathered in October and November 2023.

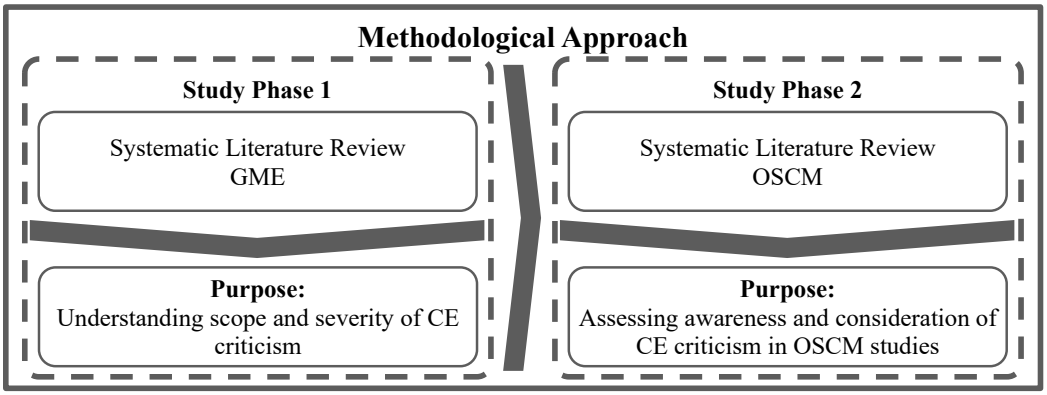


Figure 1: Sequential literature review approach

Phase 2 of our study involved an independent second systematic literature review in the field of OSCM. The objective was to assess the awareness of CE criticism in OSCM and, more importantly, the degree of their consideration in the discussions and implications in this field. Relevant literature for this phase was gathered in March and April 2024.

Combining the two perspectives of these separate, yet interlinked literature streams enabled the development of a holistic categorisation framework of CE criticisms. Both phases of our study adhered to established methodological guidelines for conducting systematic literature reviews. Although various types of literature reviews contribute significantly to research, systematic reviews are typically considered more objective than, for instance, narrative reviews. Such rigour is achieved through a transparent methodology that includes all relevant materials, enabling replication of the study by following the same steps (Thomé *et al.*, 2016). Our approach, aligned with the methodologies of Thomé *et al.* (2016), Seuring & Gold (2012), and Tranfield *et al.* (2003), involved four key stages after formulating the research question: (1) identifying and selecting sources, (2) extracting data, (3) analysing and synthesising data, and (4) presenting the results. Referring to stage

(1), the following scientific databases were selected for both phases of our study: EBSCO Academic Search Premier, EBSCO Business Source Premier, Scopus, and Web of Science. These databases were used in other literature reviews, for example by Beske-Janssen *et al.* (2015), and included all important scientific journals in the field of GME and OSCM.

For our qualitative content analysis, guidelines established by Mayring (2022) were used to ensure transparency and to achieve intersubjectivity. In both phases, data were independently reviewed line-by-line and relevant text passages were coded in-vivo (Manning, 2017). To reduce subjectivity inherent in data interpretation and to establish a certain degree of reliability, the approach followed the guidelines from Milne & Adler (1999). Thus, in both phases, coding and categorisation were performed independently by two scholars (one of which was one of the authors). The second scholar was an independent third person, different in each study phase. After each level of code aggregation, deviations between coding results were identified and discussed until consensus was reached. On the software side, analysis and synthesis were supported by MAXQDA, which facilitated coding, organisation of codes, and categorisation.

3.1 Study phase 1: Literature review in GME

Following the database selection, the keywords suitable for searching these databases were defined. For the GME review, search terms that aligned with our purpose of developing an initial understanding of the scope and severity of CE criticisms were selected. Thus, our GME search string was drafted using two keywords combined with an AND operator: "*Circular economy*" AND "*critic**". The search string was designed to be explicitly focused on CE criticisms, thus, limited to the articles' title and keywords. Restricting the search to titles and keywords ensured that selected studies directly engaged with CE criticism as a core topic, initially eliminating studies discussing CE more generally.

Our selection comprised journal and review articles, and conference proceedings in English, beginning in 1966, associated with the first notion of circularity (Boulding, 1966). A total of 669 publications were found in a first search. After screening publication titles and abstracts (1st check), articles were excluded from the analysis for the following reasons: (1) CE criticism discussed as secondary consideration only, (2) duplicate, and (3) restricted article access. Thus, 126 titles were identified as suitable for further analysis. In an initial screening of the full texts (2nd check), further articles were excluded from the sample (for instance Camacho-Otero *et al.*, 2018; Demestichas & Daskalakis, 2020). In these cases, the search term "*critic**" referred to other concepts rather than to CE. After this screening, 27 articles were found suitable for the review, enriched by one publication resulting from a backward search. Thus, 28 articles were selected for the sample. The full list of references is available at https://osf.io/zdaq9/ (DOI: 10.17605/OSF.IO/ZDAQ9).

Our process of data extraction in study phase 1 returned 157 in-vivo codes. Higher-order code categories were derived inductively through code generalisation and abstraction. This systematic approach allowed for tracing and verifying the procedure and, thus, established a certain level of inter-subjectivity.

The retrieved in-vivo codes were reviewed one by one. At the first occurrence of a criticism code, a first-order category was formed and assigned a name that was close or identical to the original text. For each subsequent in-vivo code, it was decided whether the code fell under an existing category or needed a new category. To identify overarching categories in the GME review, the level of abstraction was increased by clustering a total

of 86 first-order categories into 17 second-order categories. Then, overarching categories were derived by identifying commonalities and similarities among the second-order codes, a process known as axial coding (Corley & Gioia, 2004). Ultimately, six overarching criticism categories were formed in the GME review (see Section 4).

3.2 Study phase 2: Literature review in OSCM

Similar databases were selected for study phase 2. However, a new, yet targeted search string was developed for the OSCM literature review compared to the one used in the GME review. The rationale for the different search strategy was the distinct purpose of study phase 2: assessing the awareness and actual consideration of CE criticism in OSCM studies. OSCM research (if at all) was assumed to discuss CE criticism as secondary considerations, only in combination with broader topics such as supply chain barriers and material challenges. Thus, the OSCM review required a broader and more inclusive search strategy to account for the different ways, CE criticisms were addressed in the field. To capture these discussions, additional terms besides the obvious keyword "*critic**" were included. Related terms frequently used in OSCM literature to describe sustainable supply chain complexity were incorporated, such as "*barrier*" and "*boundaries*" (e.g., Sarkis, 2012; Gupta *et al.*, 2020), using Boolean operators. Furthermore, our search strategy was extended to the articles' full texts rather than solely titles and keywords. See Table 1 for the complete OSCM search string.

Operations and Supply Chain Management
"Circular Economy" OR *"Circularity"* OR *"Circular Business"* OR *"Circular**"* AND *"critic**"* OR *"challenge**"* OR *"barrier**"* OR *"boundaries**"* AND *"Operations Management"* OR *"Supply Chain Management"* OR *"Operations and Supply Chain Management"*

Table 1: Keyword string applied in database search

In the OSCM review, a test run in March 2024 resulted in over 12,000 literature items. Thus, the search was refined by implementing stricter formal criteria which comprised journal and review articles as well as conference proceedings in English over a ten-year period beginning in 2013. A total of 2,941 publications were found in a first search. After screening publication titles and abstracts (1st check), 133 titles were identified as suitable for further analysis. An initial screening of the full texts (2nd check) resulted in 41 articles suitable for the review, enriched by four publications resulting from a backward search. Thus, 45 articles were selected. The full list of references is available at https://osf.io/zdaq9/ (DOI: 10.17605/OSF.IO/ZDAQ9).

The larger size of our OSCM-specific sample compared to the GME sample can be attributed to two factors: (1) the distinct purposes of each sample, with the GME sample serving as an initial overview of the scope and severity of CE criticism, and (2) a variation in search strategy. The GME review searched for articles that *explicitly* focused on reporting CE criticisms, for instance Jesus & Mendonça (2018); Corvellec *et al.* (2022); thus, the restricted search string and search scope (only title and keywords). The second

search attempted to be more inclusive, identifying all sources within OSCM that somehow (usually only in combination with other topics) address the question of CE criticism, for instance Takacs *et al.* (2022); Sonar *et al.* (2023).

A similar procedure for data extraction, analysis, and synthesis as described in Section 3.1 was applied in the OSCM review. Thus, higher-order code categories were derived inductively through code generalisation and abstraction. Reviewing the OSCM sample of 45 articles, our data extraction returned 1,011 in-vivo codes. From there, 167 first-order categories were clustered into 28 second-order categories. Contradicting our initial assumption of the OSCM literature being potentially sparse on CE criticisms (and, thus, to our surprise), the similar six overarching categories as in GME resulted independently also for OSCM (see Section 4). Based on that insight, a "cross-case analysis" between the two reviews on the second-order code level was conducted to elaborate and align both coding frameworks. Through iterations, a clear and standardised coding scheme was developed. For both phases of our study, the coding and data synthesis are available at https://osf.io/zdaq9/ (DOI: 10.17605/OSF.IO/ZDAQ9).

3.3 Descriptive analysis and cross-citation check

A descriptive analysis of the two literature samples shows that our 73 articles are published across 33 different academic journals between 2007 and 2024. Of these, 16 journals primarily focus on economic and environmental issues. A total of 9 journals have published two or more articles, including: *Journal of Cleaner Production* (12 articles), *Resources, Conservation and Recycling* (9 articles), *Sustainability* (5 articles), *Business Strategy and the Environment* (5 articles), *Ecological Economics* (5 articles), *Sustainable Production and Consumption* (4 articles), *Production Planning & Control* (4 articles), *Journal of Industrial Ecology* (3 articles), and *International Journal of Production Research* (2 articles). In contrast, 24 other journals have published one article each. Over both samples, seven articles have been cited more than 1,000 times. Another seven articles have been cited between 500 and 1,000 times and twenty-two articles between 100 and 500 times.

As stated previously, the two reviewed literature streams and the selected samples were considered to be distinct, yet an intuitive expectation of a significant overlap is acknowledged. Although both reviews followed the similar procedural logic, the separation between GME and OSCM literature emerged during the OSCM sample's screening stage rather than through explicit pre-filtering of journals in the search process. The GME sample includes all papers explicitly focussing on CE criticism, whereas the OSCM review prioritised all studies addressing operational, logistical, and supply chain aspects of CE, even if they only indirectly mention CE criticism. This approach naturally limited the sample overlap, as studies centred on CE criticism as secondary considerations were excluded from the GME sample. Similarly, those that focus solely on CE criticism without sufficient OSCM relevance were filtered out of the OSCM sample, aligning with the objective of phase 2. Learning effects between searches (especially during the OSCM coding stage) were avoided, as an independent third person, different for each study phase, supported the process.

To support our claim of two distinct, yet interlinked literature samples, a cross-citation analysis was conducted to better understand the interrelations between the two samples. If a significant number of cross-citations were found, the streams would share similar

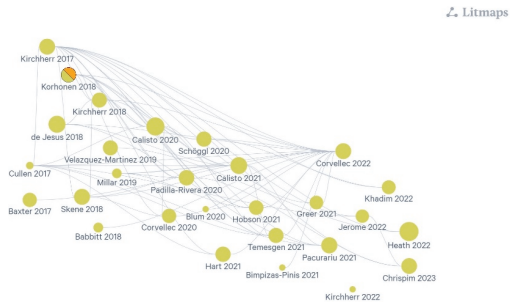
research directions and should not be considered distinct in the following comparative analysis. On the software side, the cross-citation analysis was conducted manually, with results documented in an Excel file available at https://osf.io/zdaq9/ (DOI: 10.17605/OSF.IO/ZDAQ9). LitMap was used to visualise the links between the publications with green knots representing GME articles and orange knots representing OSCM articles.

Notably, the article by Korhonen *et al.* (2018a) is the only publication that appears in both review samples, indicating its fundamental role in the literature on CE criticism. According to Google scholar, the article has been cited over 4,700 times (as of March 18, 2025). A key reason for the small overlap between the two samples, beyond Korhonen *et al.* (2018a), is the differing roles of CE criticism in each field. The GME literature often critiques CE at a fundamental level, questioning its theoretical consistency and policy implications, whereas OSCM research tends to incorporate these criticisms as secondary considerations within discussions of business feasibility and technological barriers. As a result, several OSCM papers reference foundational CE criticisms from GME literature but do not engage with them as a primary focus, leading to their exclusion from the GME sample in study phase 1.

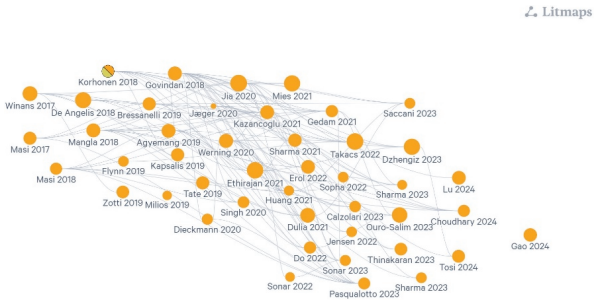
As shown in **Figure 2a**, our GME sample is densely interconnected. Of the 28 articles in the sample, 27 articles have one or more interconnections. Notably, one article (Kirchherr, 2022) appears fully independent and not connected to both the remaining 27 articles in the sample as well as to the OSCM sample. We assume that the paper's specific focus on post-growth circularity, coupled with a call for a CE model that incorporates growth, is the reason for the observed lack of interconnection. As shown in **Figure 2b**, also our OSCM sample shows strong interconnections. Of the 45 articles in the sample, 44 articles have one or more mutual linkages. Notably, one article (Gao *et al.*, 2024) appears fully independent and not connected to the remaining 44 articles in the sample or the GME sample. We argue that the paper's recent publication in 2024 is the reason for the missing interconnection.

As shown in **Figure 2c**, the articles in our GME sample are further influenced by the OSCM research stream. Of the 28 articles in the GME sample, ten articles (35 % of the total GME sample) contain references to our OSCM sample. Finally, as shown in **Figure 2d**, our OSCM sample is influenced by the GME research stream. Of the 45 OSCM articles, 30 articles (66 % of the total OSCM sample) reveal references to our GME sample. The higher influence of GME articles on the OSCM literature sample indicates the more specific research field of OSCM. Scholars interested in CE studies in OSCM build on the grounding literature majorly published in the GME stream to develop their own research cases and questions. This is supported by the fact that seven of the 12 GME articles referenced by the OSCM stream are cited over 200 times. In contrast, only four articles from the OSCM literature referenced by the GME sample receive over 200 citations.

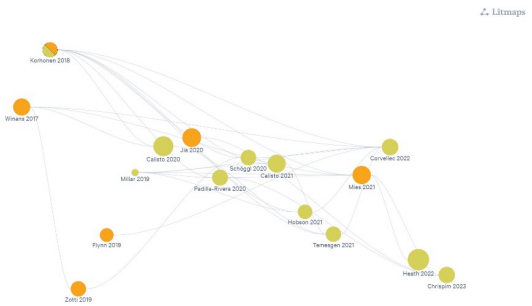
2a: Cross-citation network map: GME literature



2b: Cross-citation network map: OSCM literature



2c: Cross-citation network map: GME influenced by OSCM literature



2d: Cross-citation network map: OSCM influenced by GME literature

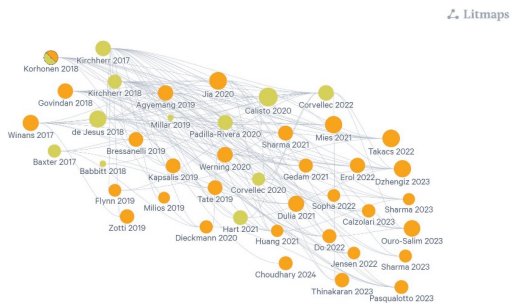


Figure 2: Cross-citation analysis of retrieved literature samples; green knots represent GME articles; orange knots represent OSCM articles.

4. Categorisation framework and discussion

4.1 Categorisation of criticisms of the CE concept

The subsequent section outlines the categories of criticism identified and compiled in both phases of our study. To ensure consistency in abstraction and comparability, all first- and second-order codes from both reviews were cross-checked, resulting in a clear and standardised coding scheme. As stated above, six very similar overarching categories emerged independently in both reviews, for which we report the consolidated names:

(1) Criticism inherent to the **conceptualisation**; related to the vagueness and inconsistency of CE definitions, the lack of clear metrics, and conceptual ambiguity regarding its economic, social, and environmental impact,
(2) Criticism related to **efficiency**; concerns about CE's actual transformative potential in reducing resource consumption, including, for instance, material losses, which undermine the long-term sustainability claims of CE,
(3) Criticism inherent to the **implementation**; practical challenges in adopting CE, such as infrastructural gaps, supply chain inefficiencies, and limited expertise,
(4) Criticism related to (political) **regulation**; legal and policy-related barriers to CE adoption, including weak incentives, fragmented regulations, and a lack of enforcement, leaving CE practices largely voluntary,
(5) Criticism related to the **products/processes**; technological and design-related challenges, such as, for instance, limited recyclability and production constraints, and
(6) Criticism related to the **economic value**; financial and market uncertainties in CE models, including, for instance, profitability concerns and fluctuating demand for recycled materials.

The compiled categorisation framework is illustrated in Table 2 at the second-order category level. The first and second column provide examples of the second-order categories and their related references. In addition, column three indicates the literature stream, the respective second-order code originated from. The overarching categories are displayed in the table headers. A full overview, including the complete coding framework, is available at https://osf.io/zdaq9/ (DOI: 10.17605/OSF.IO/ZDAQ9). This data (including, amongst others, first-order categories and second-order definitions), allows for a deeper understanding and distinction of seemingly overlapping second-order categories, like "lack of communication and information along supply chain" and "lack of supply chain cooperation and coordination". In this example, the first item relates to interactional aspects of actual communication processes in supply chains, the second to institutional and managerial aspects of supply chains. We refer to our complete coding scheme and the respective first-order codes for further insight.

The fact that both frameworks, despite originating from different datasets, contain similar overarching categories directly challenged our initial belief that OSCM scholars were unaware of the critical issues surrounding the CE concept. This also challenged the accepted notion of CE utopia, suggesting that criticism has (at least) been mentioned in the OSCM literature (Bocken *et al.*, 2023). However, a logical follow-up question remained: How thoroughly are criticisms considered in the field's discussions and implications?

Our consideration analysis resulted in a sobering insight. The OSCM literature, while acknowledging the criticisms, largely fails to rigorously integrate them into discussions

and implications (e.g., Biancolin *et al.*, 2023; Thinakaran *et al.*, 2023; Tosi *et al.*, 2024). Rather than confronting the referenced criticisms head-on, most publications solely "mention" them in passing within their literature reviews. Note that our result might even be over-optimistic since studies of CE in OSCM that do not at least mention criticisms of the concept are not included in the sample due to the design of our search string. Thus, our findings triggered the problematising statement that precise alignment between identified critical aspects and tangible solutions remains rare in the literature. Only 20 % of publications in our OSCM sample, 9 out of 45 articles, do more than merely state CE criticisms, proposing concrete policies or actionable levers to overcome criticism or discussing their findings in this context (Angelis *et al.*, 2018; Bressanelli *et al.*, 2019; Gedam *et al.*, 2021; Sopha *et al.*, 2022; Takacs *et al.*, 2022; Calzolari *et al.*, 2023; Saccani *et al.*, 2023; Sharma *et al.*, 2023b; Lu *et al.*, 2024). This lack of consideration casts serious doubt on the depth of many publications, raising concerns about their true value (Norouzi *et al.*, 2021). Such superficiality has plagued other research areas, weakening the rigour of both results and methodologies (Bachrach *et al.*, 2017).

Criticism Category #1: Criticism inherent to the conceptualisation		
Second-order categories	**Exemplary references**	**Literature stream**
Conceptual definition	Corvellec *et al.* (2022); Kirchherr *et al.* (2017)	GME
	Dzhengiz *et al.* (2023); Zotti & Bigano (2019)	OSCM
Poor/absent measurements	Jerome *et al.* (2022); Pacurariu *et al.* (2021)	GME
	Singh *et al.* (2020)	OSCM
Conceptual consideration	Corvellec *et al.* (2022); Korhonen *et al.* (2018b)	GME
	Jaeger & Upadhyay (2020); Korhonen *et al.* (2018b)	OSCM
Social ambiguity	Schöggl *et al.* (2020); Chrispim *et al.* (2023)	GME
	Takacs *et al.* (2022); Angelis *et al.* (2018)	OSCM
Conceptual grounding	Calisto Friant *et al.* (2021); Jesus & Mendonça (2018)	GME
Conceptual comprehension	Calzolari *et al.* (2023); Do *et al.* (2022)	OSCM
Contextual ambiguity	Jensen *et al.* (2022); Angelis *et al.* (2018)	OSCM

Criticism Category #2: Criticism related to efficiency		
Second-order categories	**Exemplary references**	**Literature stream**
Poor assessment of actual efficiency	Corvellec *et al.* (2022); Skene (2018)	GME
	Sopha *et al.* (2022); Bressanelli *et al.* (2019)	OSCM
Consumer ambiguity	Chrispim *et al.* (2023); Corvellec *et al.* (2022)	GME
	Do *et al.* (2022); Sopha *et al.* (2022)	OSCM
Environmental ambiguity	Corvellec *et al.* (2022); Skene (2018)	GME
	Zotti & Bigano (2019); Korhonen *et al.* (2018b)	OSCM
Lack of expertise	Huang *et al.* (2021); Bressanelli *et al.* (2019)	OSCM
Poor balance of priorities	Lu *et al.* (2024); Dzhengiz *et al.* (2023)	OSCM
Criticism Category #3: Criticism inherent to the implementation		
Second-order categories	**Exemplary references**	**Literature stream**
Lack of implementation infrastructure	Greer *et al.* (2021); Jesus & Mendonça (2018)	GME
	Singh *et al.* (2020); Bressanelli *et al.* (2019)	OSCM
Lack of supply chain cooperation and coordination	Corvellec *et al.* (2022); Jesus & Mendonça (2018)	GME
	Gao *et al.* (2024); Sharma *et al.* (2023a)	OSCM
False assumptions	Kirchherr *et al.* (2018)	GME
Organisational culture	Kirchherr *et al.* (2018)	GME
Lack of organisational change	Gao *et al.* (2024); Dieckmann *et al.* (2020)	OSCM
Lack of inclusion and support	Erol *et al.* (2022); Gedam *et al.* (2021)	OSCM
Lack of communication and information along supply chain	Sharma *et al.* (2023a); Bressanelli *et al.* (2019)	OSCM
Lack of clear responsibilities	Sharma *et al.* (2023a); Mangla *et al.* (2018)	OSCM

Criticism Category #4: Criticism related to (political) regulation		
Second-order categories	**Exemplary references**	**Literature stream**
Insufficient regulation and law enforcement	Calisto Friant *et al.* (2021); Jesus & Mendonça (2018)	GME
	Sharma *et al.* (2023a); Erol *et al.* (2022)	OSCM
Lack of appropriate incentives	Bimpizas-Pinis *et al.* (2021); Kirchherr *et al.* (2018)	GME
	Sharma *et al.* (2023a); Govindan & Hasanagic (2018)	OSCM
Lack of governmental participation	Erol *et al.* (2022); Winans *et al.* (2017)	OSCM
Criticism Category #5: Criticism related to the products/processes		
Second-order categories	**Exemplary references**	**Literature stream**
Technological innovation	Heath *et al.* (2022); Babbitt *et al.* (2018)	GME
	Sharma *et al.* (2023a); Do *et al.* (2022)	OSCM
Poor CE product design	Singh *et al.* (2020); Bressanelli *et al.* (2019)	OSCM
Poor CE process design	Do *et al.* (2022); Jensen *et al.* (2022)	OSCM
Poor chemical / physical material stability	Takacs *et al.* (2022); Dieckmann *et al.* (2020)	OSCM
Criticism Category #6: Criticism related to the economic value		
Second-order categories	**Exemplary references**	**Literature stream**
Business models	Chrispim *et al.* (2023); Kirchherr *et al.* (2018)	GME
	Calzolari *et al.* (2023); Takacs *et al.* (2022)	OSCM
Economic uncertainty	Kirchherr *et al.* (2018); Jesus & Mendonça (2018)	GME
	Sharma *et al.* (2023a); Bressanelli *et al.* (2019)	OSCM
Cost uncertainty	Singh *et al.* (2020); Jaeger & Upadhyay (2020)	OSCM
Market uncertainty	Bressanelli *et al.* (2019); Govindan & Hasanagic (2018)	OSCM

Table 2: Criticism frameworks and comparison on second-order category level

4.2 Discussion of results

This study compiled six key categories of CE criticism encountered in the GME and OSCM literature. We propose a systematic framework that structures these criticisms to foster future development on the topic. The results emphasise the growing need to integrate these criticisms more thoroughly into the scientific discourse on CE, particularly within the OSCM domain. Our six-part categorisation advances prior systematic categorisations, such as Jesus & Mendonça (2018) and Korhonen *et al.* (2018a), by responding to the evolving research landscape surrounding the CE over the past years (Norouzi *et al.*, 2021). At the time of earlier considerations of criticism, "*the scientific and research basis of the CE approach seems to be only in its infancy*" (Korhonen *et al.*, 2018a: 41), with limited empirical grounding and fragmented conceptual development. In contrast, our study is situated in a period of scientific progress in the field, based on an expanded body of literature.

Enabling a more differentiated and rigorous analysis of CE criticisms, we do not merely refine previous categories, but recognise that the identified categories (conceptualisation, efficiency, implementation, regulation, product/process, and economic value) are deeply interlinked rather than standalone concepts, influencing and reinforcing each other in multiple ways. Acknowledging and analysing these interdependencies more granularly is essential for advancing both research and practice. For instance, we identify conceptual ambiguities regarding CE definitions and measurement gaps (Category #1), which directly impact efficiency assessments (Category #2). Vague indicators based in these ambiguities lead to misleading and comforting conclusions about CE's environmental and economic benefits. Similarly, implementation barriers (Category #3), such as supply chain inefficiencies, are often exacerbated by regulatory weaknesses (Category #4). Insufficient policy incentives often fail to support a systemic transition from a linear to a circular economy. Furthermore, the economic applicability of circular business models (Category #6) is closely linked to product and process innovations (Category #5). Material limitations and technological innovation determine whether circular strategies can be profitably implemented and scaled. These interconnections emphasise the broader risk of treating criticisms in isolation and highlight the necessity of an integrated CE initiative; one that does not isolate individual criticisms but instead examines how they interact across different levels of analysis. Accordingly, our contribution attempts not only a more comprehensive taxonomy, but a critical advancement that allows the future discourse to be based on a more nuanced and actionable understanding of CE's limitations.

The different systemic levels of analysis (macro, meso, and micro; see Dopfer *et al.*, 2004) each affect various aspects of the CE criticism. The meso-level (networks, industries, or supply chains) represents the intermediate level of analysis between the macro-level (broad, systemic structures like national economies or global policies) and the micro-level (individual firms, consumers, or products). Adding a level-of-analysis perspective helps to understand how designed CE interventions can be most effective. At the macro-level, CE criticisms are most relevant in discussions on policy development and global economic structures. For instance, regulatory barriers and economic uncertainties arise at the macro level. Research at this level should explore policy alignment and applicability, economic effects, and geopolitical challenges influencing CE transitions. At the meso-level, criticisms related to supply chain integration and industry-specific CE implementation are investigated. Challenges such as supply chain inefficiencies, material-

flow and sourcing constraints, and cooperative barriers between firms necessitate network analysis and cross-industry case studies. Finally, at the micro-level, criticisms focus on firm-level and consumer-level dynamics, including consumer behaviour and acceptance as well as technological feasibility. Product design flaws, production inefficiencies, and behavioural resistance to CE solutions are best studied at the micro level.

The identified criticism categories necessitate distinct research approaches to investigate their implications for CE theory and practice (Korhonen *et al.*, 2018b). Overall, we propose interdisciplinary mixed-method research, for instance, combining descriptive literature reviews with practitioner insights. Bressanelli *et al.* (2019) demonstrated that many criticisms and key solution strategies are not fully captured in the literature alone but emerge through case studies involving firms actively engaged in CE practices already. Elaborating the identified categories in more detail, we propose specific research approaches for each category. For instance, conceptualisation-related criticisms, such as vague definitions, are best examined through qualitative research methods, including systematic literature reviews, expert interviews, and conceptual modelling (e.g., Lowe *et al.*, 2024). Similarly, regulatory criticisms, such as weak policy incentives, can be examined through qualitative policy analysis and stakeholder interviews to assess the fit of existing and future governance strategies. On the other hand, product- and process-related criticisms, which focus on technological feasibility and material quality, necessitate quantitative research, including prototyping, modelling and simulation, and industry-specific case studies (e.g., Kreye & van Donk, 2021). Economic value criticisms, which question the financial viability of CE business models, are best explored quantitatively through surveys and business case simulations (e.g. Mishra *et al.*, 2018). Efficiency-related criticisms, such as rebound effects, require quantitative research to assess empirical evidence. Life cycle assessments and material flow analyses are just a few approaches to quantify CE's impact on sustainability (e.g., Nasir *et al.*, 2017). Lastly, implementation-related criticisms, such as supply chain inefficiencies, would benefit from mixed-method research that combines case studies, surveys, and interviews with quantitative evaluations (e.g., Bansal *et al.*, 2024).

Note that our findings further reveal a much more profound issue in OSCM research on CE: articles in the field of OSCM often acknowledge CE criticisms, especially in their literature review sections, indicating why these articles were included in the sample. However, these articles rarely address the criticisms in their discussions and implication sections. Thus, despite the well-documented and even referenced limitations, the comforting and utopian illusion of CE remains largely unchallenged, suggesting a critical form of academic complacency. Such a disconnect raises concerns about the rigour and practical relevance of CE literature in OSCM. Notably, our review shows that only 20 % of the analysed studies moved beyond mentioning CE criticisms to propose actionable strategies, which underscored a broader reluctance to confront the complexities of CE head-on (Angelis *et al.*, 2018; Bressanelli *et al.*, 2019; Gedam *et al.*, 2021; Sopha *et al.*, 2022; Takacs *et al.*, 2022; Calzolari *et al.*, 2023; Saccani *et al.*, 2023; Sharma *et al.*, 2023b; Lu *et al.*, 2024). Without a shift towards integrating criticisms into discussions on future best practices and policies, OSCM risks further contributing to the utopian and idealised mental model of circularity that needs to be reconsidered.

It is crucial to note that the identified criticisms are not confined to one discipline. Instead, they are prominent across various fields, underscoring the need for interdisciplinary

collaboration rather than entrenching path-dependent silos (Brandão *et al.*, 2020). The multifaceted role that OSCM plays in the CE transition, from product design and manufacturing to end-of-life renovation, makes such cooperation even more critical (Bressanelli *et al.*, 2019). Without interdisciplinary efforts, realising the holistic vision of CE will remain an elusive goal (Lieder & Rashid, 2016). Furthermore, considering the broader impacts on social welfare strengthens the case for a discussion that transcends disciplinary boundaries (Merli *et al.*, 2018).

4.3 Contribution to theory and practice

This paper contributes to previous CE research in OSCM that has conceptualised CE drivers, enablers, and practices by emphasising the crucial need not only to incorporate the critical aspects of the concept into the conversation but to take their impacts into account when discussing CE in the context of OSCM. Thus, we connect our insights to the field of circular OSCM (Farooque *et al.*, 2019; Amir *et al.*, 2023). Our results enable future conceptual and quantitative studies to clarify each criticism's impacts on the CE effects on sustainability goals. Further, our results contribute to the conversation regarding how OSCM structures must develop to hold actual CE requirements rather than following a lock-in linear history.

Addressing these challenges requires a more integrated approach in future research, combining conceptual clarification with empirical validation. Scholars should focus on interdisciplinary collaboration to develop actionable solutions. Moreover, empirical research should prioritise assessing real-world impacts of CE initiatives, ensuring that future strategies are both economically viable and environmentally sustainable. By embedding these criticisms more deeply into research agendas, scholars can move beyond the idealised vision of CE towards more realistic, implementable solutions that drive systemic change.

Our findings also hold relevance for practitioners and policymakers. Although originating from the scientific literature, our framework builds a comprehensive reference of the most significant criticisms of the CE concept. Practitioners actively transforming existing linear structures could incorporate the findings into the development process of circular structures or policy action plans. It is crucial to critically reflect on current implementation plans together with existing and potentially new supply chain partners to succeed in the transition. For instance, conceptual ambiguities and inconsistent definitions hinder the development of standardised CE strategies, leading to inefficiencies in policy design and corporate adoption. Additionally, infrastructural and logistical barriers, such as inadequate reverse logistics systems and fragmented supply chain coordination, create operational inefficiencies that limit the feasibility of circular business models. Economic uncertainties, including high initial investment costs and secondary material markets, further discourage firms from adopting CE principles at scale. Thus, practitioners need to understand how CE is conceived, consented to, and implemented in their organisation, as proposed by Corvellec *et al.* (2022).

5. Conclusion, implications, and limitations

Motivated by the absence of a systematic categorisation of CE criticisms in the OSCM literature, this paper seeks to systematically map the criticisms of the concept based on both the GME and the OSCM literature. We conducted two independent systematic literature

reviews analysing 73 journal articles. Compiling the results of two distinct, yet interlinked data sets, our proposed criticism framework includes six overarching criticism categories: (1) conceptualisation, (2) efficiency, (3) implementation, (4) regulation, (5) product/process, and (6) economic value. The fact that both literature reviews independently resulted in similar categories directly challenged our initial assumption that OSCM scholars are unaware of the critical aspects of CE. Instead, the established theory of CE as utopia seems to be challenged even within the OSCM literature (Dzhengiz *et al.*, 2023).

However, our analysis exposes a more problematic reality: while scholarly research acknowledges the critical dimensions of CE, there remains a lack of robust integration of these criticisms into meaningful solutions addressing them. While most OSCM articles mention CE criticism in their literature reviews, only a minority truly engages with them in their analyses and discussions (e.g., Gedam *et al.*, 2021; Sopha *et al.*, 2022; Lu *et al.*, 2024). Considering this, it appears important that future conceptual and indicator-based models of CE not only acknowledge the identified criticisms but integrate them meaningfully with their implications during the analysis and discussion stages. This is crucial to successfully develop a CE concept that is actually suitable for addressing the grand challenge of our time (Korhonen *et al.*, 2018b) while preventing a naïve utopian approach to circularity.

From a methodological perspective, despite the principal rigour of our systematic literature review, certain limitations remain. The results are shaped by inclusion criteria, which might have led to the omission of relevant studies due to search terms or scope restrictions. Additionally, given the increasing dynamics surrounding CE research, some criticisms may become less relevant over time. Nevertheless, this study can serve as a reference point for periodic updates. The potential subjectivity in coding remains another limitation.

We have focused on one management discipline only: operations and supply chain management. Granted, we cannot completely exclude the possibility that peculiarities of this field bias our findings. However, based on our limited insights into the literature in other management disciplines, we perceive this as a rather unlikely issue, with other disciplines most likely following the pattern identified in our study for OSCM. Nevertheless, replication studies in other disciplines could shed more light on this potential shortcoming.

Looking forward, further research is essential to develop robust CE implementation examples incorporating the critical dimensions mapped in this review. Fostering a more realistic understanding of CE among scholars and practitioners, our criticism categories should inform future research and practical projects in this instance. Developing such research and project initiatives will be highly beneficial for both scholars and practitioners.

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Acknowledgements

We gratefully acknowledge the help of doctoral student Julia Elter and three master students (Kerstin Lutzenberger, Lucia Premec, Julius Pahde) in preparatory work for this study.

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