

A Literature Review of Institutional Performance and Circular Economy

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Abstract

In recent times, there has been notable advancement in the exploration of the circular economy concept. The challenges posed by the global crises generated by the pandemics and wars have underscored the importance of comprehending and adopting new consumption patterns guided by the principles of Reduce-Reuse-Recycle-Recover, as well as streamlining distribution networks. The key research areas pertaining to the circular economy continually evolve. This study conducts a bibliographic analysis based on 2430 research papers indexed in Clarivate Web of Science Core Collection from 1985 to 2023. The bibliometric examination specifically focuses on the economic aspects of the circular economy, and the hierarchical investigation enables the creation of a treemap that captures the most frequently explored research themes. The findings reveal a close association between circular economy research and sustainable development, business performance, breakthroughs in industrial advancements, research on environmental impact, and human involvement in supply chain management.

Key words: circular economy, institutional performance, bibliometric analysis, treemap hierarchical analysis

J.E.L. classification: D80, E20, G00

1. Introduction

In the field of the circular economy, numerous studies delve into various facets of the concept. Some researchers focus on the circular economy by employing bibliometric analysis (Goyal et al., 2021; Camón Luis, 2020), while others concentrate on the practical application of technology or the optimization of consumption within this framework (Georgantzis Garcia et al., 2021). Additionally, there is a growing body of research that examines the interplay between the circular economy and the environment.

Past discussions regarding the tension between economic factors such as growth, institutional performance and administrative efficiency (Rus, 2022; Stan et al., 2023), social well-being, and environmental preservation (Brasoveanu, 2013; Paraschiv et al., 2023) for future generations have gradually given way to the imperative integration of all these aspects within the concept of the "circular economy." This concept aims to advocate for the sustainable development of both the economy and environmental well-being, ensuring their harmonious coexistence.

The current research offers a review of previously published economic studies centred on the concept of the circular economy. Utilizing bibliometric analysis of keywords, along with quantitative analysis and a visual representation of hierarchical data, it was observed that further progress is required in the exploration of circular economy within the realm of business economics. Nevertheless, the existing studies emphasize a rigorous empirical application.

The study's methodology aims to enhance the understanding of current literature trends and is rooted in the subjectivity of research argumentation. Bibliometric analysis proves to be a valuable tool for delving into historical or current research paths. It allows for a thorough exploration of relationships between keywords, actively contributing to the knowledge mapping of various trending topics. The utilization of treemap representation enhances the comprehensiveness of the findings and provides a hierarchical visual portrayal on notable outcomes.

2. Literature review

Due to its comprehensive and interdisciplinary nature, the concept of Circular Economy (CE) lacks a singular definition and has been interpreted in various ways, holding different meanings for diverse audiences and contexts. Some scholars, such as Yuan and Bi (2006), have contended that there is no universally accepted definition of CE. Nevertheless, it is evident that the understanding of CE has undergone changes in recent years. Circular Economy is envisioned as an economic development model aimed at environmental protection and pollution prevention, ultimately fostering sustainable economic growth (Ionescu-Feleaga et al., 2023). For some researchers, CE is viewed as an economic strategy that advocates for innovative approaches to transition from the current linear consumption system to a circular one, emphasizing material conservation. In a broader sense, CE serves as a generic term encompassing all activities that contribute to the reduction, reuse, and recycling of materials throughout the production, distribution, and consumption processes (Herciu et al, 2023). Alternatively, other authors conceptualize CE as a production and consumption system that minimizes material and energy losses through extensive practices of reuse, recycling, and recovery.

The specific actions that circular economy encompasses, such as reuse, refurbish, repair, eco-design, transform (Reike, 2018, Thapa, 2023), have a common predilection for change to a new and performant business system of sustainable consumption and production (UNEP 2012) which requires important investments and commits to hold off lavishness, fraud (Rus, 2019; Rus, 2020) or waste.

The 4R framework, Reduce-Reuse-Recycle-Recover, defines fundamental principles that guide sustainable development efforts to improve environmental quality, achieve economic prosperity, encourage social equity, and strengthen the foundations for the well-being of future generations. The circular economy (CE) generally aims to improve the strategies oriented towards the achievement of sustainable development goals (Schroeder, 2019), to restore environmental resources, strengthen the economy, and develop social well-being.

Bibliometric analysis is a commonly used analytical method in systematic literature reviews. This approach involves quantitatively analysing scholarly works and presenting results objectively using various visual representations. By employing bibliometric analysis, one can assess the productivity of published works and their impact as indicated by citations. This analysis also involves evaluating contributors in the field, addressing aspects related to "performance analysis", which is a major component of bibliometric analysis. Moreover, bibliometric analysis incorporates "science mapping," enabling the identification of key themes (such as economics and management) and topics (like sustainable development, organizational behaviour, circular supply chains, consumer behaviour, and others). This method helps uncover significant trends, historical evolution, and gaps in the field. Consequently, performance analysis and science mapping constitute the essential components of bibliometric analysis (Lim, 2023).

3. Research methodology

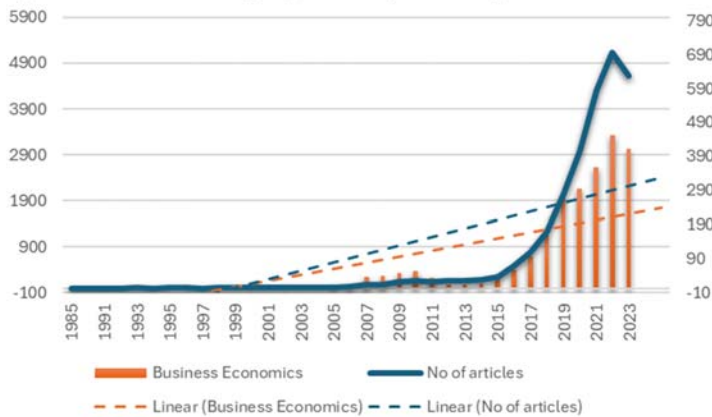
To identify relevant data for our analysis, we interrogated the Web of Science database and systematically reviewed literature on the circular economy main topic, undergoing multiple steps. Our observation period spanned from 1985 to 2023. Initial research phases concentrated on establishing an analytical foundation and refining pertinent information for the study. Criteria for relevance and validity were established to encompass articles and conference papers written in English specifically addressing the "circular economy" topic. A total of 23,015 publications meeting the established criteria were initially identified. Although bibliometric analysis is an objective, quantitative research method, it requires interpretation and, consequently, it encompasses a dose of subjectivity. This paper suggests employing a sensemaking approach to guide researchers from simple description to actively interpreting bibliometric results. This transition transforms raw information into highlighted patterns and insights, enhanced by the visual representation of data in a treemap format.

The first research article addressing the circular economy was published in the Web of Science database in 1985 according to our selection results. From 2003 onward, there was a gradual uptick in research interest regarding the circular economy, and it wasn't until 2018 that the number of

published research papers in the WOS database surpassed the numerical threshold of 1000. The identified research manuscripts spanned various disciplines, including Environmental Sciences, Ecology, Engineering, Science Technology, Chemistry, Energy Fuels, Agriculture, Physics, among others. To narrow the focus of our analysis, we recalibrated our approach and introduced an additional filtering criterion to include only research articles published in the Business Economics research area. This refinement resulted in a database containing 2430 research items.

Figure 1 presents a comparative display of the numerical development of publications within the examined sample. It contrasts the numerical evolution of total published articles on the circular economy with those specifically published in the Business Economics area on the same topic. Dashed trend lines have been computed to project the trend of research on the circular economy. These estimations suggest an increasing interest in the topic of circular economy in the forthcoming periods. Notably, there has been a growing interest among economic researchers in the subject of circular economy since 2006, making it a prominent research topic.

Figure no. 1. Numerical progression of research publications on circular economy



Source: own research

The subsequent stages of the analysis were focused on pinpointing the keywords and examining the connections between them to uncover prominent themes associated with the circular economy. We generated a treemap showcasing interconnected keywords, allowing for an assessment of the significance of links between various items. Additionally, a network of keywords was established to visually represent the interplay among primary research focuses. Utilizing VoS Viewer and bibliometric analysis, we conducted descriptive and quantitative assessments of the data. This included identifying patterns for concurrent and collaborative networks, conducting co-word analysis, and generating word clouds.

The subsequent stages of the analysis focused on reducing the dimensionality of the sample data and investigating the patterns of the temporal progression of key topics associated with the circular economy. The objective was to determine whether there was an observable relationship between the research pathways and their evolution over time. To achieve this, factor analysis was employed to scrutinize the significance of the connections among the examined elements, ultimately resulting in the identification of several research gaps.

4. Findings

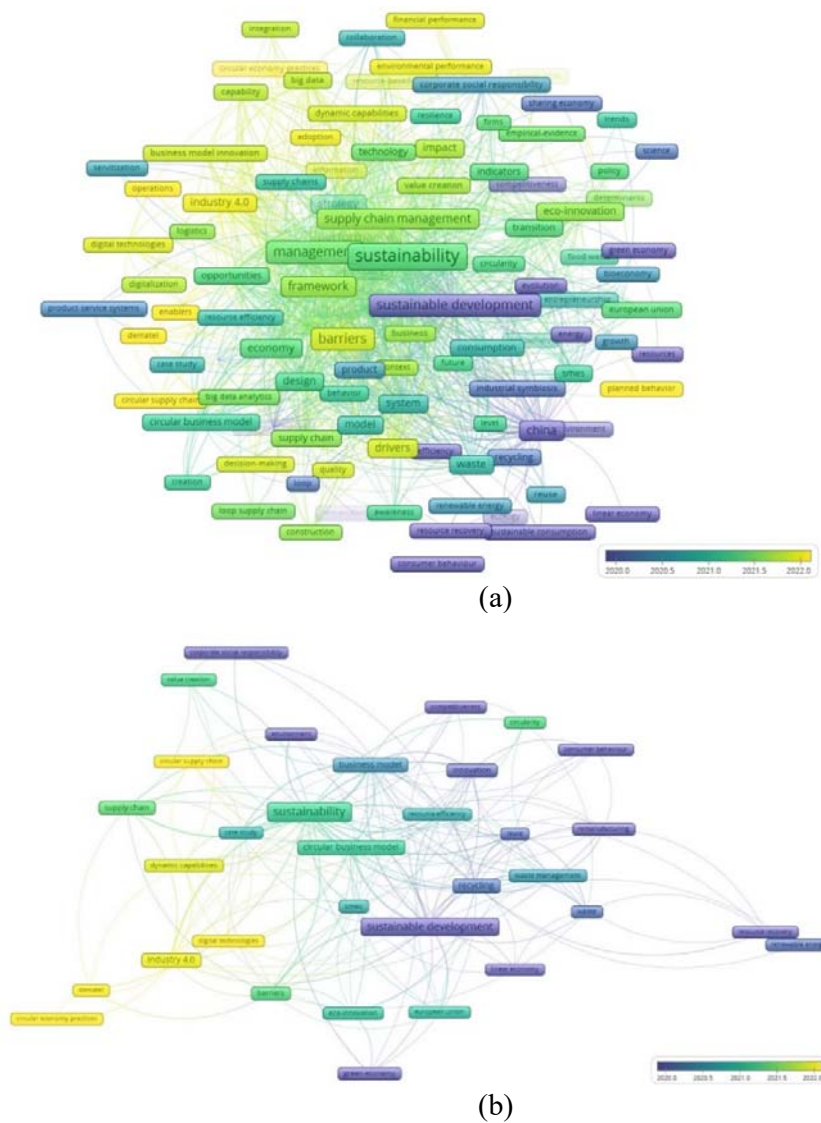
The bibliometric analysis assessed the significance of each chosen research paper and the appropriateness of the included keywords. To enhance the relevance of the analysis, the subsequent phase involved further filtering of the database, requiring that each keyword had a minimum occurrence of 10. Out of the 3204 initially identified keywords, only 130 met this refined selection criteria. The total link strength between the selected keywords was 10327, and 5 clusters were observed based on their association with research topics and their frequency of use in research papers.

The verification of keyword validity occurred in the subsequent data processing phase, wherein filtering targeted similar keywords, such as those in plural and singular forms with identical meanings. Following the application of this final filter, a total of 3191 keywords were recognized, for which the minimum threshold of occurrence was set to 10. Out of the identified 3191 keywords, 117 keywords met this specified threshold, manifesting a total link strength of 10032.

Further analysis was carried out on the set of keywords provided by the authors, yielding a refined sample of 2423 items. After applying filters to remove duplicates, 2417 unique items were identified. To ensure relevance, a minimum occurrences threshold of 10 was set, resulting in 33 author keywords that met this criterion, demonstrating a combined total link strength of 396.

The examination of keywords also considered the historical significance of both the keywords identified through bibliometric analysis of the sample dataset and those provided by authors. The overlay visualization map generated with VosViewer offered insights into the evolving trends of these keywords over time. In Figure 2, darker violet shades represent keywords that have been utilized in circular economy research for more extended periods of time, while yellow shades indicate the most recent trends in research paths.

Figure no. 2. Overlay visualisation for historical use of keywords: (a) all keywords identified by VosViewer, (b) author keywords.



Source: own research

As shown in Figure 2(a), the present analysis has recognized a significant number of emerging topics, indicated by the yellow color in the visual representation. The novelty of these diverse research trends implies the presence of underexplored subjects within the Circular Economy (CE) field or research paths that scholars have recently identified as requiring further development. The overlay visualization map revealed that terms such as “sustainable development”, “resource recovery”, and “consumer behaviour” were keywords prevalent in research conducted over three years ago. Conversely, current trending topics concentrate on the exploration of digital technologies (Apostol et al., 2021; Aivaz, 2022), circular supply chain, Industry 4.0, practices related to the circular economy and new research methods such as the Decision-Making Trial and Evaluation Laboratory (DEMATEL) method.

Besides being a prominent subject in the Western economy (Stan, 2022), the circular economy (CE) has experienced rapid expansion in various countries, particularly in China. China stands out as the first country globally to enact legislation in 2008 that streamlines the adoption of circular economy practices. In the socioeconomic context of business advancement, CE is acknowledged as a crucial approach for achieving sustainable economic and environmental development (Brasoveanu, 2015; Ogunmakinde, 2022; Brasoveanu, 2023). Consequently, the European Union has responded by introducing a Circular Economy package, extending its previous waste directive.

Keywords serve as the essence of analysed contextual ideas, and their recurrent appearance in numerous studies facilitates the identification of prominent research themes. VosViewer establishes a connection between two keywords whenever there is a co-occurrence relationship in a publication. The total link strength (TLS) indicates the number of papers in which the two keywords appear together. Out of the 117 keywords identified through the bibliometric analysis of all manuscripts and the 33 keywords consistently provided by authors, those with a co-occurrence frequency exceeding 10 were chosen for subsequent stages of analysis, as outlined in Table 1.

Table no. 1 C-occurrence of the keywords most frequently used according to the sample data.

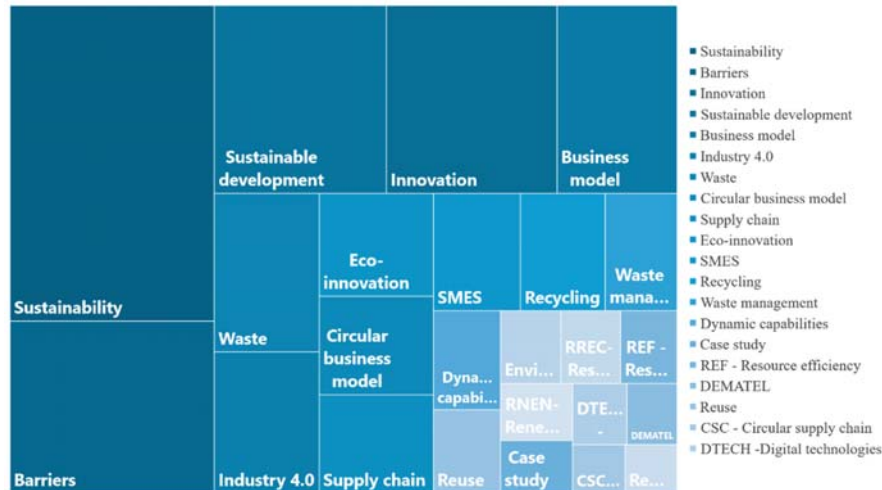
Keyword	All Keywords			Author keywords		
	Occurrences	TLS	Links	Occurrences	TLS	Links
Sustainability	252	1274	114	140	122	28
Barriers	138	889	109	26	29	15
Innovation	125	716	109	30	33	15
Sustainable development	126	453	100	99	65	23
Business model	88	472	100	47	57	21
Industry 4.0	58	340	85	41	42	17
Waste	65	322	86	17	16	9
Circular business model	44	247	86	44	44	19
Supply chain	44	275	82	27	27	11
Eco-innovation	46	281	81	17	13	8
SMES	40	249	75	22	17	13
Recycling	39	129	58	39	47	19
Waste management	33	148	68	24	32	16
Dynamic capabilities	26	161	63	20	17	12
Case study	15	77	89	15	26	13
Resource efficiency	16	96	54	15	24	13
DEMATEL	12	98	71	12	12	6
Reuse	22	84	45	15	26	15
Circular supply chain	10	68	85	10	10	8
Digital technologies	13	72	68	10	15	8
Environment	17	66	42	14	10	6
Resource recovery	17	46	26	15	15	6

Remanufacturing	10	38	29	10	15	11
Renewable energy	16	31	21	13	11	3

Source: own research

Figure 3 illustrates the subcategorization of all significant research paths associated with the circular economy, offering an overview of the areas that have seen the highest publication activity during the sample period. The treemap diagram presents a structured perspective of the sample data, facilitating the identification of patterns in the prominent research directions linked to the concept of the circular economy. Rectangles symbolize the tree branches, with each sub-branch depicted as a smaller rectangle, reflecting the current exploration status of various analytical trends. The most notable specialization was the connection to sustainability (with 252 papers), followed by the exploration of challenges and barriers (138 papers), innovation (125 papers), sustainable development (126 papers), business models (88 papers), Industry 4.0 (58 papers), waste (65 papers), eco-innovation (46 papers), and other relevant research paths. It is essential to acknowledge that each article could be classified under more than one specialization depending on the subject matter.

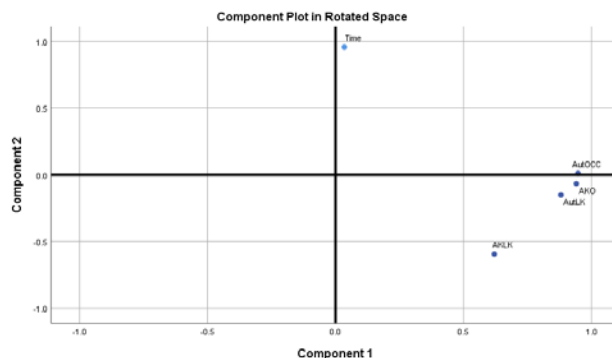
Figure no. 3. Treemap with hot research paths on circular economy



Source: own research.

We view our bibliometric analysis as a method akin to creating a knowledge map. Similar to a web mapping platform, it offers an overview of research, aiding policymakers, academics, and practitioners in identifying overlooked areas (comparable to knowledge gaps), determining where researchers are most engaged (similar to areas of scientific interest), and forecasting where future research efforts should be directed, such as focusing on the most prevalent issues in circular economy breakthroughs.

Figure no. 4. Calculated relationship between time evolution and co-occurrence of keywords



Source: own research

The Kaiser criteria was used for factor analysis, with the principal component matrix (PCA) as the extraction method and oblique rotation for interpretation. Adequacy testing of the factor analysis on the sample data yielded a Kaiser-Meyer-Olkin result of 0.704, indicating relevance, and the test was highly significant ($p < 0.001$). The analysis resulted in the extraction of two factors that collectively accounted for 84.67% of the variance. The component plot in Figure 4 illustrates that the occurrence (AKO) and total link strength of all keywords (AKLK) are significantly associated with the occurrence (AutOCC) and total link strength of keywords determined by authors (AutLK). However, these variables did not exhibit a notable connection to time evolution. The interpretation of the obtained treemap and the outcome of the factor analysis suggested that the links between research pathways over time are likely influenced by the identification of significant research gaps.

5. Conclusions

Our study aimed to provide an authentic insight into the prominent research directions within the circular economy field. We aspire to pave the way for future literature research that can significantly contribute to the advancement of innovative theoretical and empirical studies in this highly crucial and relevant subject. Upon reviewing the existing literature with bibliometric analysis, we have identified research gaps and recently developed new pathways which aim to enhance the understanding and proactive implementation of the circular economy concept. From an economic standpoint, addressing issues such as the diversification of effective business models, fostering awareness of consumer preferences for eco-friendly products, and optimizing industrial eco-efficiency are crucial considerations for contemporary society.

In recent times, there has been a notable increase in publications focusing on the circular economy within the field of business economics. Correspondingly, studies have explored the implementation of the circular economy to enhance business and operational performance. These investigations have shed light on the potential benefits that the circular economy can offer to companies inclined towards eco-innovation and the optimization of supply chains. However, it is equally crucial to recognize the application of the circular economy within specific sectors, particularly in service-oriented companies with a distinct technological aspect.

Our investigation uncovered various challenges demanding further research and emphasized that resolving these issues is not a quick fix. It is crucial multiple researchers and practitioners alike to significantly intensify their efforts in addressing the complexities of the circular economy. Our study identified several unexplored avenues that require attention. Further bibliometric analysis is essential to refine our understanding of the nuances in theoretical research on the circular economy and its connection with empirical requirements.

We acknowledge the limitations of this study, primarily rooted in its reliance on a single representative research database, the Clarivate Web of Science Core Collection. Although our investigation has established a benchmark for future comparisons in the literature on circular economy, there are additional unexplored avenues that require urgent attention. Nevertheless, our study has furnished valuable insights into the research trajectory and temporal evolution of circular economy concepts, contributing to more informed decision-making and theoretical foundations. By comprehending our past achievements, we can refine our current strategies and strive for a more promising future.

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