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Conceptual Analysis Of Circular Economy, Perspectives, And Applications: A Critical Review.

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Summary

The circular economy is based on the principles of reducing waste, retaining value and closing material circuits. Emphasizes the importance of designing durable, repairable and recyclable products, as well as promoting the reuse and remanufacturing of materials This article presents an overview of the circular economy, exploring its foundations, practices and perspectives through a literature review and use of data mining (QDA Miner), The results revealed the importance of reuse, reduction and recirculation of materials, as well as the need for systemic changes and multi-stakeholder collaboration. Although the implementation of the circular economy faces challenges, its potential to address the negative impacts of linear production and promote economic-environmental sustainability is recognized. The circular economy offers a strategy for a more sustainable and resilient future.

Keywords: *Circular economy, Value chains, Recycling, Environmental benefits*

Introduction

The current linear economic model, characterized by the take-make-dispose approach, has led to significant environmental degradation, resource depletion and waste generation. (Almeida & Díaz, 2020; Melendez et al., 2021). The growing recognition of these challenges has sparked interest in alternative approaches that can decouple economic growth from resource consumption and environmental damage. (Ceballos Pérez & Azamar, 2022). The concept of circular economy has emerged as a viable solution to address these issues by rethinking the entire lifecycle of products and resources. (Eisenreich et al., 2022; Foraste, 2023).

The Circular Economy is a philosophy that allows addressing broader sustainability issues in society, including various industries. However, the implementation of this philosophy is

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constrained by a lack of understanding of how to apply these principles throughout the entire product lifecycle. (Marsh et al., 2022; Palafox-Alcantar et al., 2022).

As he explains (Babkin et al., 2023) The circular economy has experienced a slight decline globally, from 9.1% in 2018 to 8.6% in 2020. However, the potential of the circular economy can still be harnessed through the use of digital technologies. To ensure a sustainable world for future generations, the level of global circularity needs to double to 17%. Although progress has been made in the transition to the circular economy, significant effort is still required worldwide.

The circular economy is defined as a model that promotes recycling and reuse of resources to reduce waste and pollution, improve sustainability and generate economic, social and environmental value. Circular industrial ecosystems refer to networks of organizations collaborating to promote circular practices in entire value chains. (Agliardi & Kasioumi, 2023).

The circular economy is based on the principles of reducing waste, retaining value and closing material circuits. Emphasizes the importance of designing durable, repairable and recyclable products, as well as promoting the reuse and remanufacturing of materials (Rocha et al., 2021). By shifting from a linear to a circular model, the goal is to create a regenerative system where resources are used efficiently, waste is minimized and environmental impacts are reduced. (Garabiza et al., 2021; Ortíz-Palomino & Fernández, 2021).

In recent years, there has been a growing body of literature exploring the conceptual foundations and theoretical foundations of the circular economy. (Daglis et al., 2023).

Academics and practitioners recognize their potential to drive sustainable development and mitigate the negative environmental and economic impacts of traditional linear systems (Resnitzky et al., 2021). However, despite the growing interest in the circular economy, there are still challenges in terms of implementation, measurement and evaluation of its effectiveness.

This article contributes to the existing body of knowledge by synthesizing and consolidating circular economy research, providing a comprehensive understanding of its perspectives, applications, and implications.

The findings presented here can inform policymakers, businesses and researchers in their efforts to move towards more sustainable and resilient economic systems. By embracing the principles of the circular economy, we can pave the way to a future where economic prosperity and environmental sustainability go hand in hand.

The aim of this article is to provide an overview of the perspectives and applications of the circular economy. Examining the conceptual and theoretical frameworks underpinning this concept, exploring the fundamental principles and benefits of adopting circular economy practices. In addition, we delve into the practical implications of the circular economy in various sectors and value chains, highlighting successful case studies and best practices.

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Methodology

The study consisted of a bibliographic review based on preselected articles from a scientific database QUE BASE. Using the compound word "Circular Economy", by 2023, filtering by type of review articles, open access, 18 articles that met the selection criteria were identified, generating a set of 10 articles, which were organized in Excel for coding obtaining the following **Table 1.**

Table 1 Base of used articles

Code	Title	Author
ART 1 EC	Sometimes linear, sometimes circular: States of the economy and transitions to the future	(Morseletto, 2023)
ART 2 EC	Conceptualizing the Circular Economy (Revisited): An Analysis of 221 Definitions	(Kirchherr et al., 2023)
ART 3 EC	The anatomy of a passport for the circular economy: a conceptual definition, vision and structured literature review	(van Capelleveen et al., 2023)
ART 4 EC	Circular economy practices and sustainable performance: A meta-analysis	(Yin et al., 2023)
ART 5 EC	The role of blockchain technology in the transition toward the circular economy: Findings from a systematic literature review	(Rejeb et al., 2023)
ART 6 EC	Closing the loop: Establishing reverse logistics for a circular economy, a systematic review	(Mallick et al., 2023)
ART 7 EC	Unraveling the effect of circular economy practices on companies' sustainability performance: Evidence from a literature review	(Mora-Contreras et al., 2023)
ART 8 EC	The underrepresented key elements of Circular Economy: A critical review of assessment tools and a guide for action	(Chrispim et al., 2023)
ART 9 EC	From circular strategies to actions: 65 European circular building cases and their decarbonisation potential	(Nußholz et al., 2023)
ART 10 EC	Integration of energy systems, circular economy and efficiency measures	(Seljak et al., 2023)

Own source, from the information raised. To perform the analysis of the information, the QDA Miner software version 6 was used. This software allowed the coding of the database shown in **Table 1** by data mining. Coding was done by creating a unit of analysis that included three main categories and six subcategories presented in **Figure 1.**

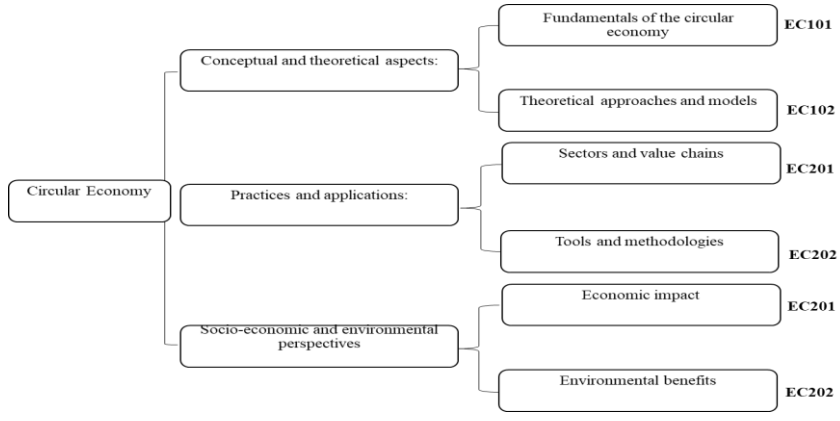

Figure 1 Coding of analysis categories

Own source according to the object of the study. The methodology applied in this study allowed to obtain a comprehensive and updated vision of the advances and perspectives in the field of circular economy through the systematic review of the selected articles.

The use of QDA Miner software facilitated the analysis and coding of information, ensuring rigor and consistency in the process.

Results and discussion

Below are the results obtained:

Table 3 Coding frequency

Category	Code	Account	% Codes	Cases	% CASES
Conceptual and theoretical aspects	EC0101	7	17,5%	7	70,0%
Conceptual and theoretical aspects	EC0102	7	17,5%	5	50,0%
Practices and applications	EC0201	13	32,5%	8	80,0%
Practices and applications	EC0202	5	12,5%	3	30,0%
Socio-economic and environmental perspectives	EC0301	1	2,5%	1	10,0%
Socio-economic and environmental perspectives	EC0302	7	17,5%	3	30,0%

Own source. from the information analyzed with QDAminer

These results indicate that the conceptual and theoretical aspects of the circular economy are mentioned in 17.5% of the codes and are presented in 70% of the cases.

In addition, the fundamentals of the circular economy are mentioned in 7 codes and found in 7 cases, accounting for 70% of cases.

Circular economy approaches and theoretical models are also mentioned in 17.5% of the codes, but are found in a smaller number of cases, 50% of cases.

In the category of practices and applications, sectors and value chains related to the circular economy are mentioned in 32.5% of the codes and are found in 80% of the cases.

On the other hand, tools and methodologies are mentioned in 12.5% of the codes and are presented in 30% of the cases.

In the category of socio-economic and environmental perspectives, the economic impact related to the circular economy is mentioned in 2.5% of the codes and is found in 10% of cases. On the other hand, environmental benefits are mentioned in 17.5% of the codes and are presented in 30% of cases.

The results show the frequency and distribution of codes and categories related to the circular economy in the analysis carried out with QDA Miner.

They provide information on the conceptual and theoretical aspects, practices and applications, and socio-economic and environmental perspectives present in the coded data.

Conceptual and theoretical aspects

Fundamentals of the circular economy

According to Morseletto (2023), the circular economy can be defined as an economic framework aimed at the conscious and efficient use of products and resources through their reuse, reduction and recirculation, with the aim of closing cycles in production/consumption and minimizing waste. This definition highlights the importance of shifting from traditional linear approaches to production and consumption towards a circular model that promotes resource conservation and reduces environmental impact.

On the other hand Kirchherr et al. (2023) emphasize that the circular economy requires a fundamental systemic change in existing supply chains and is not considered an end goal in itself, but a means to achieve sustainable development. In addition, it highlights the need for a broad alliance of stakeholders, including not only consumers and producers, but also policymakers and academics, to foster the transition to the circular economy.

Industrial modernization has produced harmful impacts on the ecosystem, such as carbon emissions, leakage of hazardous chemicals, and pollution. In response to this, circular economy practices have been developed to promote economic development and sustainable performance (Yin, et al, 2023).

In this sense, Rejeb et al. (2023) highlight the growing global interest in the concept of circular economy and offer a definition in which the circular economy is presented as an economic system that replaces the concept of 'end of life' by the reduction, reuse, recycling and recovery of materials in the processes of production / distribution and consumption. This definition underlines the importance of operating at different levels (micro, meso and macro) to achieve sustainable development and environmental, economic and social benefits.

The increasing focus on the recirculation of products, components and materials through recovery routes such as reuse and recycling in the transition to the circular economy. The importance of implementing reverse logistics is recognized and the challenges that organizations face in this process, such as lack of knowledge and experience are mentioned (Mallick et al., 2023). In that order of ideas Chrispim et al. (2023) emphasize that there are different understandings of the circular economy among stakeholders. It provides a representative definition that highlights the reduction, reuse, recycling and recovery of materials in the processes of production, distribution and consumption. The importance of energy as a recoverable resource in the circular economy is also mentioned and the different levels of operation (micro, meso and macro) are described.

Finally, Nußholz et al. (2023) highlight that the circular economy proposes strategies to keep resources at their highest possible quality for as long as possible, using renewable energies and materials with low environmental impact. Four categories of circular economy principles are identified: narrowing resource cycles, slowing down resource cycles, closing resource cycles and

regenerating resource loops. In addition, the application of circular economy strategies in construction is mentioned.

Of the fundamentals of the circular economy, considering the contributions of all the authors mentioned, highlights the importance of the reuse, reduction and recirculation of materials, as well as systemic change, multi-stakeholder collaboration and the balance between economic development and environmental protection. The implementation of the circular economy presents challenges, such as the need for additional capabilities and a deeper understanding of reverse logistics. However, it is recognized that the circular economy offers a strategy to address the negative impacts of industrial modernization and promote sustainable development.

Theoretical approaches and models

Circular economy solutions are derived from the application of principles such as waste reduction, value retention and the reduction and closure of cycles in production/consumption. These principles can bring economic, environmental and social benefits, such as optimization, cost reduction, increased efficiency, promotion of innovation and economic growth (Morseletto, 2023).

In that sense, Kirchherr et al. (2023) point out that circular business models have gained attention in the circular economy literature. They also highlight the importance of consumers and the responsibility of policies and academia in the transition to the circular economy. In addition, they mention the need for technology, innovation and capabilities to enable the circular economy. On the other hand Yin et al. (2023) emphasize that circular economy practices have been developed to promote economic development and sustainable performance, addressing the harmful impacts on the ecosystem caused by industrial modernization.

The transition to a circular economy model involves keeping materials, components and products in circulation for as long as possible. They highlight the importance of reducing, reusing, recycling, remanufacturing, redesigning, recovering, rejecting, restoring and reusing. They also mention that the circular economy offers growth prospects, reduces waste and optimizes resource consumption (Rejeb et al., 2023).

Mora-Contreras et al. (2023) mention different circular economy practices, such as materials management, safety and health, reverse logistics, and skills and capabilities for the circular economy. In addition, they present various theories that support the study of the effects of circular economy practices, such as general systems theory, dynamic capability view, practice-based vision theory, and resource orchestration theory.

The adoption of circular economy, such as political and economic benefits, social development, environmental concern, regulatory requirements and competition in the market. They also highlight circular economy strategies, such as ecodesign, energy and material efficiency, practices related to the 9Rs (reduce, reuse, recycle, remanufacture, recover, repair, reject, restore and reuse), business model innovation and industrial symbiosis (Chrispim et al., 2023).

The aforementioned authors emphasize the importance of reducing waste, reusing, recycling and closing material cycles in the circular economy. They also highlight the need for systemic changes, circular business models, consumer engagement, policy and regulatory support, technology and innovation, skills and capacities, scaling up circular economy practices and integrating circular principles into business practices.

Practices and applications

Sectors and value chains

The importance of reduction on both the demand and supply sides of the circular economy. This involves eliminating the unnecessary, abandoning corporate practices such as aggressive marketing and overselling, and rethinking product design towards durability and high value. In addition, it mentions the need for educational programs and choice options that encourage the reduction and exchange of products (Morseletto, 2023).

For their part, Seljak et al. (2023) highlight the interconnection between sustainability, energy management and the circular economy. They mention that the implementation of circular processes is a prerequisite for addressing these issues and highlight the importance of circular supply chain management in the circular economy. Kirchherr et al. (2023) point out that reducing waste and maintaining value are important dimensions in the circular economy. They also mention that the implementation of circular economy practices can be affected by different factors, such as the size of the company and the characteristics of the industry.

The size of the company can influence the adoption of circular economy practices, and that SMEs can perform better on environmental aspects by following the principles of the circular economy. They also mention that the adoption of circular economy practices can vary between industries and that networked collaboration is a critical success factor for developing circular supply chains (Yin et al., 2023).

In this sense, Rejeb et al. (2023) emphasize the potential of blockchain (BC) technology to support the implementation of circular economy practices. They highlight that BC can facilitate supply chain traceability, cooperation and coordination in commercial ecosystems, and resource regeneration. However, they also mention economic and social concerns that need to be addressed.

In this order of ideas, different circular economy practices studied in the literature are identified, such as ecodesign, recycling, remanufacturing, internal environmental management, green purchasing, sustainable manufacturing, reverse logistics and investment recovery. They highlight the importance of promoting these practices and their impact on the sustainability performance of companies Mora-Contreras et al. (2023). Finally, Nußholz et al. (2023) mention that there is limited knowledge about the application and decarbonization potential of circular economy strategies in the construction sector.

The authors analyze various aspects related to sectors and the value chain in the circular economy,

such as reduction, value maintenance, company size, industry characteristics, blockchain technology and specific circular economy practices. These analyses contribute to a broader understanding of how circular economy practices are implemented and affected in different contexts.

Tools and methodologies

A circular economy seeks to maintain the value of products and materials for as long as possible, minimizing waste and the use of resources. They highlight that companies must close the material and energy cycles within and between companies to improve their performance. They also note that the impact of circular economy practices on corporate performance varies by country type, being most significant in developing countries (Yin et al., 2023).

In this sense, Mora-Contreras et al. (2023) mention that the theory of organizational sense (OST) suggests that a persuasive organizational narrative of circular economy allows a strategic shift towards a future state of circular economy and high sustainable performance. They highlight the importance of influencing the behavior of organizational actors through a persuasive circular economy narrative.

There are various circularity tools and metrics available, but they focus primarily on complete products or company performance. However, they also mention the existence of more specific metrics that focus on specific stages of the life cycle. They highlight the need to incorporate key elements such as stakeholder engagement, the social dimension, resource management and industrial symbiosis into circular economy assessment tools (Chrispim et al., 2023).

The authors point out the importance of closing the material and energy cycles, adopting environmental approaches, influencing the behavior of organizational actors, and using tools and metrics that consider key aspects such as stakeholder engagement, the social dimension, resource management and industrial symbiosis in the circular economy.

Socio-economic and environmental perspectives

Economic impact

The achievement of business objectives is the basis for accepting circular economy practices in different manufacturing industries. Some previous studies have pointed out that circular economy practices do not have a positive influence on the business performance of companies, as they can increase operating costs in the initial stage of implementation. However, other studies have found a significant positive correlation between circular economy practices and corporate performance (Yin et al., 2023).

In terms of green performance, the reviewed articles indicate a positive relationship between circular economy practices and environmental performance in manufacturing industries. Reducing waste and adopting circular economy practices has been shown to improve companies'

environmental performance. However, some studies point out that circular economy practices within a supply chain can have a negative impact on green performance.

Several articles have explored the relationship between circular economy practices and operational performance. A positive relationship has been found between the adoption of circular economy practices and improving operational efficiency, including waste treatment, recycling and reducing costs related to waste disposal and regulatory compliance.

Environmental benefits

The environmental benefits of the circular economy are associated with reducing pollution, recovering energy and materials, and reducing demand for inputs (Morseletto, 2023). These benefits are derived from practices such as reuse, recycling and reduction in the production of new products.

Implementing circular economy activities in collaboration with consumers helps companies better understand consumers' needs for green products, enabling them to offer better goods and services. This can generate business benefits, such as improving consumer loyalty and strengthening the relationship between buyers and sellers. They note that cooperation between companies and suppliers in terms of circular economy practices, such as eco-design and the use of eco-friendly resources and packaging, can have a positive impact on environmental performance Yin et al. (2023).

On the other hand, academics on the positive effects of eco-design and green procurement on the economic and environmental performance of companies. Green manufacturing has also been identified as a circular economy practice that can have a positive impact on organizational performance. In addition, reverse logistics has been associated with improvements in the social performance of companies. They point out that different theories, such as ecological modernization theory, resource-based view theory, and signaling theory, provide theoretical foundations for understanding the effects of circular economy practices on the sustainable performance of enterprises Mora-Contreras et al. (2023.

The studies reviewed indicate that the circular economy can generate environmental benefits by reducing pollution, recovering resources and reducing demand for inputs. In addition, the positive relationship between circular economy practices and the economic, environmental and social performance of companies is highlighted. Collaboration with consumers and suppliers, as well as the implementation of specific practices such as eco-design and green purchasing, are identified as key factors in achieving these benefits.

Critical analysis

The circular economy has emerged as a response to the negative impacts of linear production and consumption on the environment. The authors reviewed highlight the importance of shifting traditional approaches towards a circular model that promotes resource conservation and reduces

environmental impact. However, despite the theoretical benefits associated with the circular economy, there are critical challenges and considerations that need to be taken into account in the current situation of the business world.

As expressed (Fatimah et al., 2023) The current "take, make, dispose" model has led to an increase in the amount of resources used and waste generation globally. This situation represents a challenge for the industry, as a balance needs to be found between economic growth and environmental protection. In response to this, companies have begun to explore the circular economy as an alternative, where products are reused and transformed into new resources through reuse, refurbishment, remanufacturing, recycling and proper waste management. This offers new opportunities to avoid the risks associated with economic and environmental degradation.

There is a lack of consensus on the definition and understanding of the circular economy among stakeholders. The diversity of approaches and perspectives makes it difficult to coherently implement circular practices. In addition, implementing the circular economy requires systemic changes and multi-stakeholder collaboration, which can be challenging in today's business world, where decisions are often focused on maximizing short-term profits.

In that sense he explains (Aliaga Churruarrin, 2023) that the implementation of the circular economy faces significant challenges due to ingrained habits in all actors in the supply chain, including manufacturers, consumers and users. Convincing political decision-makers and the general public of the need to minimize the consumption of non-renewable natural resources and promote reuse is also a difficult task. However, it is recognized that the circular economy can contribute to decoupling production and consumption models, reduce social inequality and generate economic benefits.

In economic terms, a positive correlation has been found between circular economy practices and corporate performance. However, some studies point out that circular economy practices can increase operating costs in the initial stage of implementation, which can generate resistance from companies. The lack of clear economic incentives and the need for significant investments can hinder the widespread adoption of circular practices.

As mentioned by (Abdelmeguid et al., 2022), the circular economy is based on eliminating waste and pollution in design, keeping products and materials in use and regenerating natural systems. In this sense, to achieve global sustainability through the reduction, narrowing or closure of the material and energy cycles, it is necessary to make several changes in all stages of production and consumption of materials and energy, generating difficulty in the decision to adopt these new process models.

In terms of environmental benefits, it is recognized that the circular economy can reduce pollution, recover resources and minimize the demand for inputs. However, the implementation of circular economy practices can have negative impacts in certain contexts. For example, it is mentioned that circular economy practices within a supply chain can have a positive impact on ecological

performance. In addition, significant resources and capabilities are required to implement circular economy practices, which may limit their adoption in companies with limited resources.

In this sense they state (Oanh Thi-Kieu Ho, 2023; Saccani et al., 2023) that the transition to a circular economy faces challenges and barriers that must be addressed to achieve successful implementation. Challenges include a lack of knowledge about the circular economy, financial issues, and organizational structures that make it difficult to collaborate and work on shared goals. Key enablers are an enabling regulatory environment and collaboration between businesses and organizations. Barriers include a lack of specific guidelines and standards, the misperception of the circular economy as synonymous with waste, and financial challenges. These factors can be used by government and businesses to guide their strategies and actions in the transition to a circular economy. (Hojnik et al., 2023).

Synthesizing although the circular economy theoretically presents economic, environmental and social benefits, its implementation faces challenges in today's business world. Lack of consensus on definition, economic resilience, potential negative impacts, and lack of clear assessment tools are critical aspects to consider. Overcoming these challenges will require greater collaboration between businesses, clear policies and legislation, investment in research and development, as well as the promotion of economic incentives and awareness of the long-term benefits of the circular economy.

Conclusions

The circular economy represents a promising approach to addressing the negative impacts of linear production and consumption on the environment. Its goal of reusing, reducing and recirculating products and resources can generate significant environmental benefits, such as reducing pollution and conserving natural resources.

Although there are theoretical benefits associated with the circular economy, its implementation in today's business world faces significant challenges. Lack of consensus on the definition and understanding of the circular economy, economic resilience due to upfront costs and lack of clear assessment tools are obstacles that need to be addressed.

The implementation of the circular economy requires systemic changes and broad collaboration of multiple stakeholders, including consumers, producers, policymakers and academics. This raises the need for greater awareness and commitment from all parties involved to drive the transition towards a more circular economic model.

Despite the challenges, there are opportunities to promote the circular economy. The adoption of circular practices can generate economic benefits by improving corporate performance and operational efficiency. In addition, collaboration with consumers and suppliers can strengthen business relationships and improve consumer loyalty. The implementation of clear policies and regulations, as well as the promotion of economic incentives, can facilitate the widespread adoption

of circular economy practices.

In short, the circular economy offers a valuable strategy to address environmental challenges and promote sustainable development. However, greater collaboration and efforts are required to overcome obstacles and make the most of the potential benefits of the circular economy in today's business world.

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