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Do Public and Private Actors cooperate in the realization of circular economy innovations?

Results of the systematic literature review (SLR)

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Abstract:

Purpose: the study aims to explore the critical role of public private collaboration in implementation of systemic innovation for advancing the circular economy. The research investigates in particular collaborative processes in which both private and public actors play a critical role. A systematic review, following the PRISMA protocols, reconstructs the scientific debate on this topic, highlighting the state of art and gaps. The results provide useful pointers for future research.

Findings: Following the PRISMA protocols, the study utilized two databases, Scopus and Web of Science, primarily identifying 1448 papers, after applying filters the number was reduced to 700 with 168 repeated which were removed, leaving 532 research papers. Following an abstract screening, 190 research articles were selected for full reading, and ultimately 89 papers were included in the review. The research papers included were published up to 2024, encompassing studies from all geographical regions and focusing on the fields' public management, business management, management science, social science for circular economy.

The results highlight that efficacious collaborations lead to enhanced economic growth, job creation, and sustainable development. The study also highlights the poor connection from the public administration and the necessity of aligning public policies with private sector initiatives to effectively overcome the complications of the systemic change and scale successful circular economy practices. Thus, the study also finds existing collaboration models in the implementation of innovation for the progressing circular economy in the literature.

Introduction

The circular economy (CE) is an economic model considered to minimize waste and make the most of resources. The circular economy stresses the reuse; repair, refurbishment and recycling of products and materials while the traditional linear economy, which trails a 'take-make-dispose' approach (Abusin et al., 2023; Agrawal et al., 2022).

This regenerative method purposes to retain products, materials, and resources in routine for as long as possible, thus reducing environmental impact and foster the sustainability (Camilleri, 2020; Velenturf et al., 2018).

The adopting a circular economy model has become increasingly evident in the face of pressing environmental challenges such as resource depletion, climate change, and waste management (Do et al., 2024). The Earth's finite resources are being consumed at an unsustainable rate, leading to critical shortages and heightened geopolitical tensions over resource access (Ellen MacArthur Foundation, 2013). Moreover, the accumulation of waste, particularly plastic, is causing severe harm to ecosystems and human health. The circular economy offers a transformative solution by decoupling economic growth from resource consumption and environmental degradation, thereby promoting sustainable development (Bocken et al., 2018)

To report these challenges innovation is considered as a core pillar for advancing the circular economy (Chaurasia et al., 2020; Chistov et al., 2021a; Danvers et al., 2023). It includes the development and implementation of new technologies, new business models, Changes within the organization and practices that make possible and facilitate the transition from a linear model to the regenerative and circular economy. Moreover, the innovation is central to achieving the circular economy, helping as the engine driving transformative change towards sustainable resource management and waste reduction (Chistov et al., 2021a; Dokter et al., 2023). The concept of the circular economy highlights a regenerative approach to production and consumption, which aims to decouple economic growing from resource consumption and environmental degradation (Ellen MacArthur Foundation, 2019). Innovation plays a crucial role in this paradigm by catalyzing the development of novel technologies, business models, and practices that enable the effective use, reuse, and recycling of materials during the lifecycle. By endorsing eco-design values that arrange durability, reparability, and recyclability, innovation decreases waste generation and improves resource efficiency (Chistov et al., 2021b; Herrero-Luna et al., 2022). However, the employment of innovation needs active contribution from numerous actors, including the public

sector, private sector, and public-private collaborations (Brown et al., 2019; Danvers et al., 2023) and other actors which directly or indirectly relates to public or private sector to work or implement changes i.e. innovations, technological change and digital transformation to achieve circular economy.

Public Sector plays an essential role in creating policies for environment that supports the circular economy model. This includes developing regulations which promote resource efficiency, providing funding for research and development, and establishing values that boost circular practices. Public sectors creativities can set the way for systemic changes and create motivations for private sector participation (Klein et al., 2020; Sambell et al., 2019). Thus, the private sector's also has ability for speed and innovation makes it well-suited to grow and implement circular products and procedures. Even public-private collaboration is vital for overcoming the difficulties of systemic change (Brown et al., 2021; Danvers et al., 2023). These collaborations can influence public sector support and private sector vitality to develop and scale circular resolutions. The combined initiatives can address the gaps in knowledge, infrastructure, and financing, facilitating a more coordinated and effective transition to a circular economy (Brown et al., 2021). Therefore, based on this discussion in the importance of o the circular economy model, the study will fill the gap to find out the role of public or private actors to achieve circular economy in the implementation of innovation. The study does not found any evidence form the existing literature in this context. The study proposed these questions to bridge the gap. *Q1: What forces are driving innovations for circular economy, aside from collaboration of public and private actors?*

Q2: what are existing actors' collaborations are being used to implement systemic innovation for the circular economy?

Methodology

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol is a extensively known and rigorous background for conducting systematic literature review (SLR). PRISMA delivers a structured approach to identifying, selecting, and critically appraising relevant research; ensuring transparency and reproducibility in the review process (Moher et al., 2009). The application of PRISMA in SLRs improves the reliability and consistency of the results, making it a vital tool for synthesizing evidence across a broad range of studies. The PRISMA structured process minimizes bias and ensures that the review captures a comprehensive and representative sample of the existing literature.

Systemic literature review planning

Studies concentrating on the circular economy and innovation in public or private sectors as employment of aspects were identified using the Scopus database, which is renowned for its comprehensive coverage of peer-reviewed literature across numerous disciplines. With nearly 70 million records spanning from 1778 to the present day (Hernández-Torrano, 2019), Additionally, Web of Science was utilized to identify articles from journals not indexed in Scopus, thereby broadening the range of potentially relevant literature identified. To ensure the systematic literature review (SLR) was thorough and reliable, cross-verification methods were employed. A search query containing of a inclusive set of keywords was established based on earlier literature, useful to titles, abstracts, and keywords to compile relevant papers for review (Ramos-Rodríguez and Ruíz-Navarro, 2004). Keywords included (TITLE-ABS-KEY (public private collaborat* OR Collaborat* OR Actors) AND ("circular economy" OR regenerati* OR Circular) AND TITLE-ABS-KEY (innovation) AND (open OR systemic OR collaborat* OR cocreat*). However, asterisks (*) were used as wildcards to capture variations of the keywords (Gebhardt et al., 2022; Jesus and Jugend, 2023; Ratsimandresy & Miemczyk, 2023; Klein et al., 2020; Kasmi et al., 2022).

Table No. 1. Inclusion and exclusion criteria used in the screening process

Inclusion Criteria	Exclusion Criteria
Papers must comprehensively discuss the role of public private actors in implementing circular economy innovations.	The papers which do not attentive on the role of public private actors in the implementation of circular economy innovations.

Conducting a Review

The preliminary phase involved executing the search query, which initially produced 1448 articles. However, refinement in the show results is a critical aspect of conducting a systematic literature review (SLR). Therefore, this procedure was guided by wide discussions with senior researchers in the field. Discussions with the experts, who have published SLRs in reputable journals, the establishment of inclusion and exclusion criteria (see Table 1). The primary filter applied was to restrict the review to peer-reviewed research journal and, about studies from all geographical areas and concentrating on the fields' public management, business management, management science, social science and environmental science for circular economy articles, emphasizing quality research outputs. Language was the second criterion, with only English-language content selected to ensure clearness and avoid misunderstanding. To authenticate search results, two databases were employed, with duplicate articles removed as the third filter. This focus aimed to enhance the coherence and depth of the review, ensuring systematic analysis and broader applicability

(Filimonau and Krivcova, 2017). By following to these filters, the total quantity of articles was reduced to 700. Later, inclusion and exclusion procedures based on abstract review further advanced the selection, resulting in the 532 articles. After abstract screening the remaining papers were 190, with thorough full reading scrutiny resulting in the removal of an additional 113 articles that did not align with the study main theme. Conversely, 12 articles were identified through forward and backward searches of reference lists. The selection of articles followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which were instrumental in maintaining transparency and methodological consistency throughout the SLR procedure (See Fig. 1).

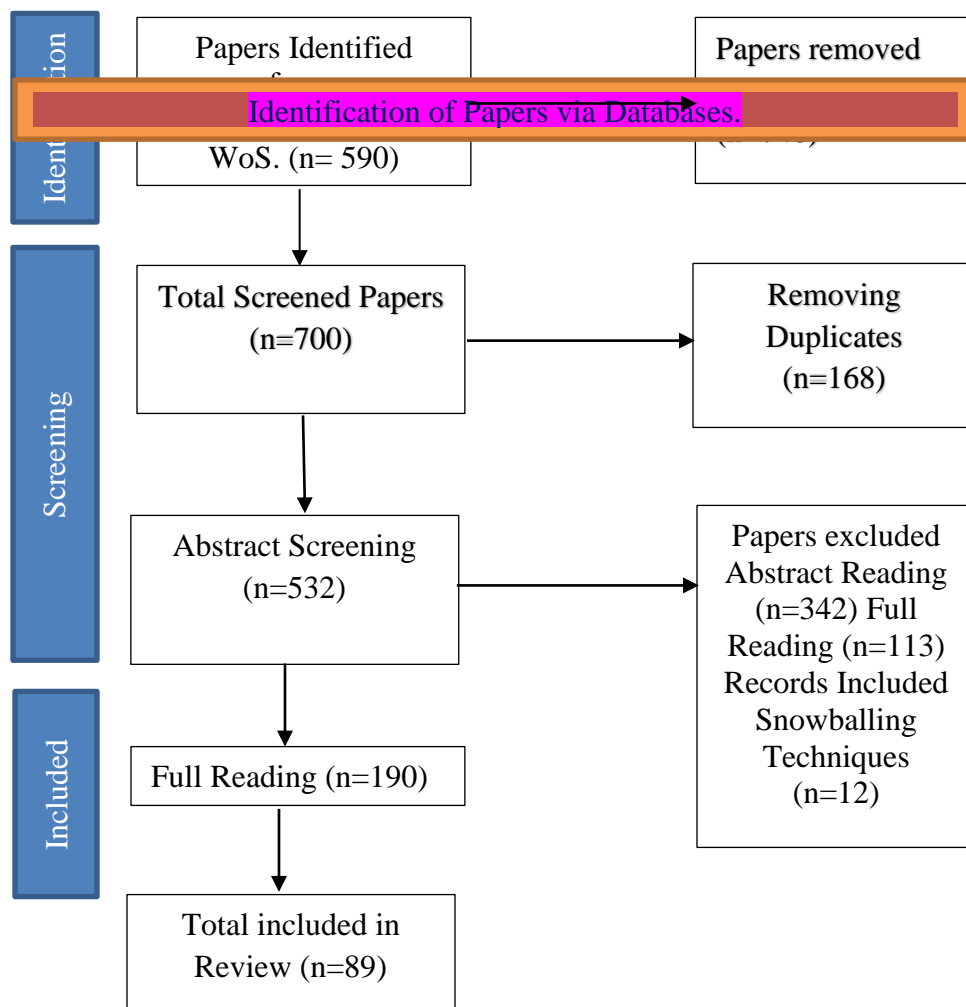


Figure.1: Systematic Literature Review Diagram (PRISMA method)
Source: based on Page et al. (2021)

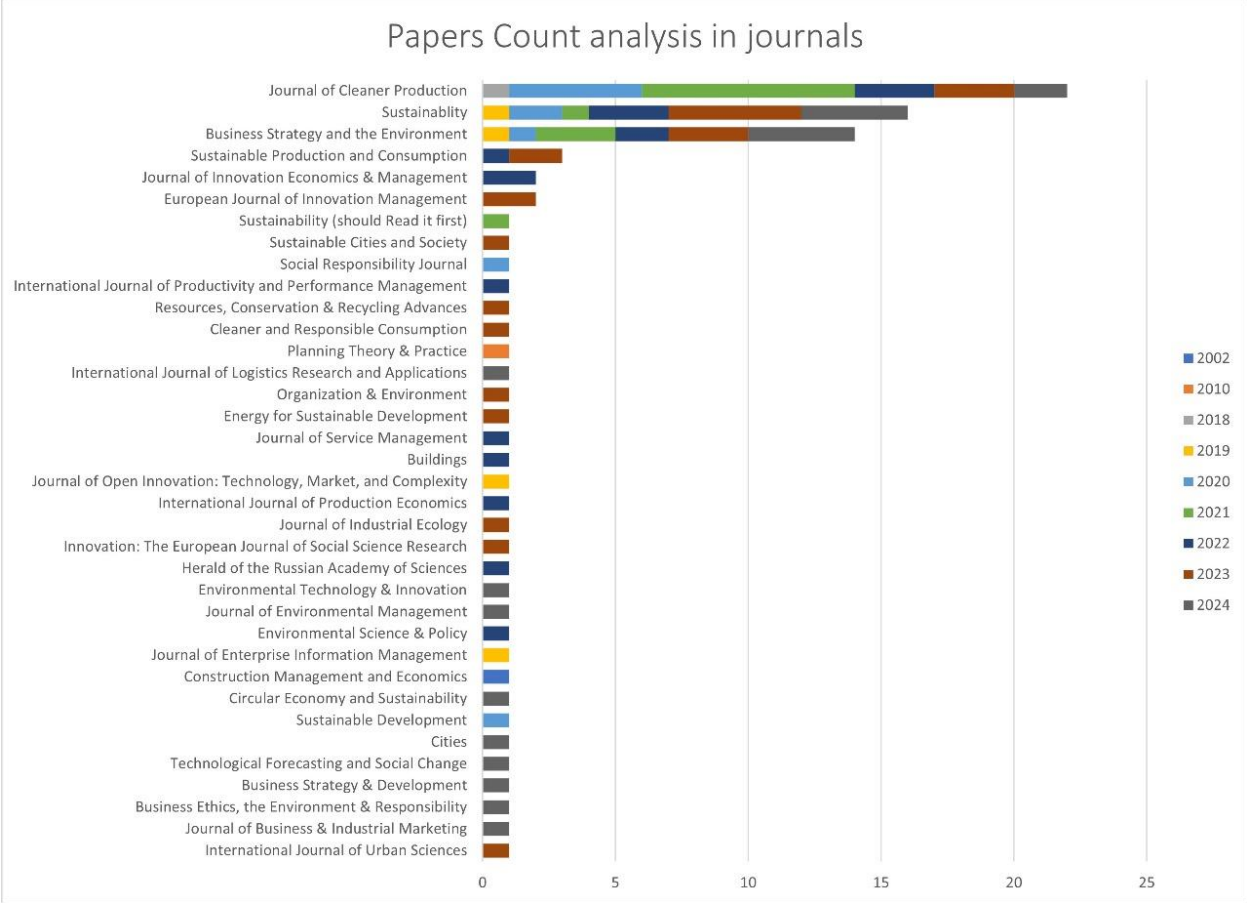


Figure.2: Papers count analysis in journals

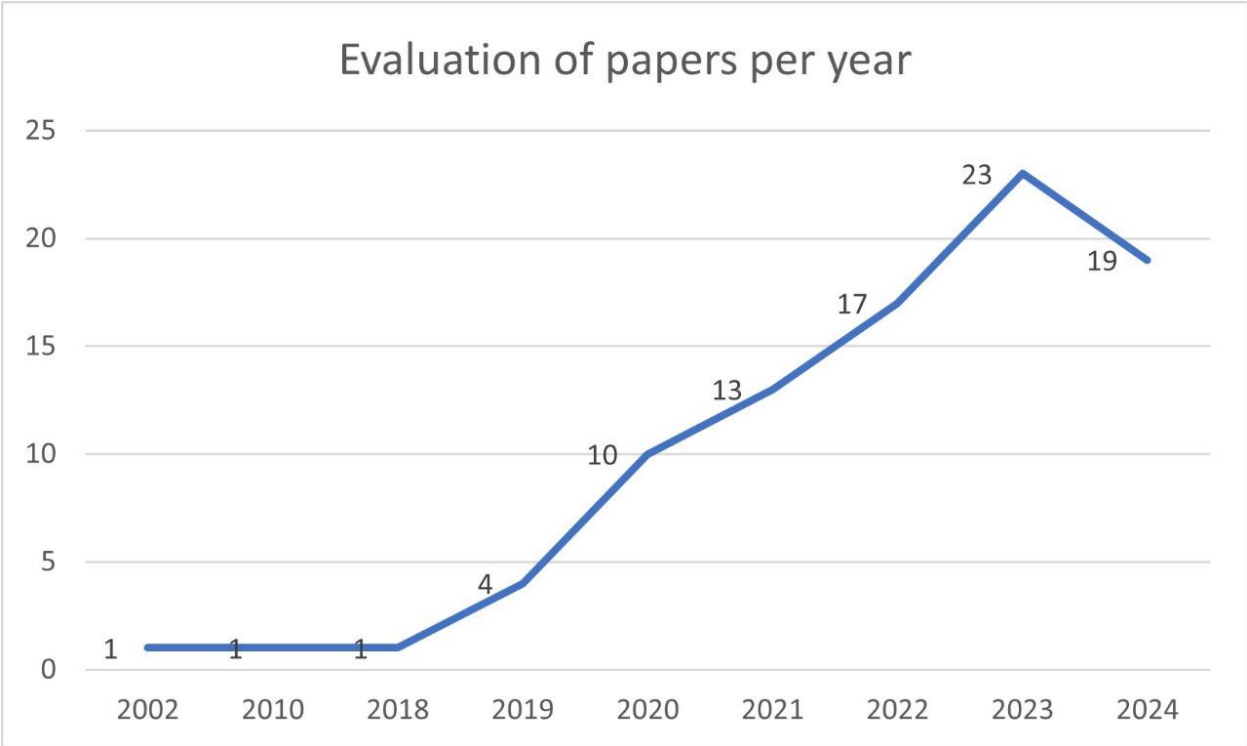


Figure.3: Evaluation of Papers per year

Discussions

The analysis of 89 papers discloses multiple forces driving innovations for the circular economy beyond public-private collaborations. Monitoring pressure and policy incentives are significant drivers, inspiring innovation through sustainability goals and financial incentives. Technological progresses, particularly innovation and digitalization are also crucial in enabling circular practices. The public sector, while critical in establishing regulatory frameworks and providing research funding, is often critiqued for its limited and poorly synchronized efforts, as discussed in approximately 15% of the papers. Conversely, the private sector, emphasized in around 30% of the papers, is more active, driven by market competitiveness and sustainability goals, with successful cases in manufacturing, food, and construction industries showcasing resource-efficient processes and eco-design.

While the Public-private collaborations, addressed in about 16% of the review, establish the synergistic potential of governmental support and private sector innovation, leading to pilot projects and large-scale implementations. Inter organizational collaborations, though less often discussed (14 of the included papers), play a crucial role in systemic innovation by promoting knowledge sharing and joint projects across sectors. Stakeholder engagement, emphasized in approximately 9% of the papers, highlights the position of connecting numerous stakeholders, including consumers, in the circular economy transition. The Triple Helix model, deliberated in 11% of the papers, integrates academia, industry, and government to determination innovation. Additionally rest of the reviews focuses on cities, municipalities, circular hubs, incubators, startups, and SMEs, highlighted in several studies, contribute to contained circular economies through innovative businesses with definite industries like manufacturing, food, and building sectors frequently mentioned as innovators in accepting circular practices to advance the circular economy.

Conclusion

This systematic review underlines the multifaceted nature of driving innovations for the circular economy, emphasizing the importance of collaboration among various actors. The initial results illustrate that governing burdens and policy enticements are essential in fostering innovation, as they establish environment for sustainability targets and deliver critical economic support. Technological progresses, particularly in digitalization or digital transformation, further drive the circular economy by enabling new business models and attractive resource efficiency. The role of

the public sector is vital but requires better coordination and arrangement with circular economy objectives to maximize its impact. The private sector emerges as a positive force, with noteworthy contributions in various businesses through the acceptance of eco-design, and resource-efficient processes. Public-private collaborations reveal benefits of combining governmental support with private sector innovation, resulting in successful large-scale implementations of circular practices.

However, the inter organizational collaborations, although less often discussed, are crucial for systemic innovation, promoting knowledge sharing and cross-sectorial combined ventures. Stakeholder engagement, particularly the inclusion of consumers, is highlighted as a key element in the transition towards a circular economy. The Triple Helix model, mixing academia, industry, and government, provides a robust framework for driving sustainable innovation. Therefore, the contributions of SMEs, Startups, cities, municipalities, circular hubs, are noteworthy in creating contained circular economies. These actors, along with specific businesses such as manufacturing, food, and construction, play groundbreaking roles in advancing circular practices.

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