Business Innovation for Circular Economy

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Abstract

This research explores the contribution that business innovation brings in driving the circular economy implementation within Europe, focusing on its economic, environmental, and societal impacts. Through a mixed-methods approach, the study examines technological progress, policy frameworks, and evolving consumer behaviors that promote sustainable business practices. Sector-specific case studies demonstrate practical innovations, such as AI-enabled waste sorting, closed-loop systems, and subscription-based models for electronics. Challenges, including financing gaps and fragmented regulations, are balanced by opportunities for technological advancements and collaborative initiatives. Using a comprehensive SWOT analysis, the study highlights pathways to strengthen circular economy strategies, encouraging greater policy coherence and stakeholder engagement. This research underscores Europe's potential to lead in sustainability through integrated efforts, fostering resilience and long-term economic growth.

Key words: circular economy, business innovation, business practices, SWOT analysis
J.E.L. classification: M10, Q01

1. Introduction

As the global economy continues to grapple with the challenges of sustainability and environmental conservation, the circular economy has emerged as a core strategy for reducing waste, conserving resources, and promoting sustainable development (Panait et al., 2022). Worldwide, trends such as enhanced product lifecycle management, growth in recycling and upcycling, and the adoption of circular business models are transforming industries and influencing consumer behavior. In Europe, the circular economy is particularly significant due to the region's strong policy framework and commitment to environmental protection (Apostu et al., 2023).

The European Union (EU) has made significant strides in advancing circular economy research, driven by a strong policy framework and increasing investment in innovation. Recent research highlights the growth of circular economy sectors, such as recycling, repair, and reuse, which are aimed at reducing waste and resource dependence (von Kolpinski & Kratzer, 2025). The EU's circular economy action plan emphasizes the importance of monitoring progress through indicators like material footprint and consumption footprint to ensure alignment with climate neutrality goals (Circular Economy Action Plan - European Commission, 2020). Additionally, a growing body of scientific literature, with nearly 4,000 articles published in 2023 alone, underscores the expanding knowledge base in this area. Such research momentum is supported by funding opportunities from programs like Horizon Europe and the European Investment Bank, which have increased lending to circularity projects (Circular Economy - European Commission, 2024).

Despite these advancements, several challenges persist in the implementation of circular economy principles across EU countries (Castillo-Díaz et al., 2024). One of the primary hurdles is the need for more comprehensive policy implementation and financial support. The transition from linear to

circular systems also requires radical innovation and digitization, which EU programs can facilitate focused on research and innovation (Nicolau et al., 2024). Furthermore, the circular economy faces threats such as supply chain risks and regulatory challenges, which necessitate consistent investments and strategic planning.

This study aims to explore the dynamics of business innovation within the circular economy in Europe, examining how technological advancements, policy initiatives, and changing consumer preferences are driving sustainable business practices and economic growth across the region.

2. Literature review

The circular economy has emerged as a strategy for sustainable development, focusing on reducing waste, conserving resources, and promoting environmental quality. In the European Union, business innovation focuses on contributing to the transition from linear to circular economic models. EU businesses are increasingly adopting circular practices, with a notable rise in the certification of green products and services. For instance, there has been a four-fold increase in European Ecolabel certifications since 2010, indicating a growing commitment to sustainability among European companies. This shift is supported by a robust policy framework and financial instruments like those provided by the European Investment Bank (Bătae et al., 2021), which has co-financed numerous circular economy projects across various sectors.

Research on business innovation in the circular economy highlights significant advancements in Europe. The circular economy sector employs approximately 4.3 million people, reflecting a dynamic workforce and growing economic impact. Studies have shown linear growth in circular economy sectors, with variations across member states, suggesting opportunities for further development (Robaina et al., 2020). The European Commission's Circular Economy Action Plan has spurred initiatives aimed at sustainable waste management and product circularity (Radu et al., 2023), contributing to economic prosperity and environmental protection. Despite these achievements, challenges persist, including the need for enhanced policy implementation and more comprehensive data monitoring to assess the effectiveness of circular economy strategies.

Previous studies have explored various aspects of the circular economy, such as the impact of circular business models on economic growth and resource efficiency (Kirchherr et al., 2018; Ghisellini et al., 2016). Indicators such as circular material use rates, recycling efficiency, and economic contributions from circular activities have been widely discussed in the literature, providing empirical evidence of the positive influence of circular initiatives on sustainability (García-Barragán et al., 2019). However, despite progress, significant challenges persist, including the lack of comprehensive data monitoring, financial barriers, and regulatory inconsistencies across EU member states. These challenges often result in fragmented implementation efforts, limiting circular strategies' scalability and overall impact.

A notable gap identified in the literature is the absence of a comprehensive framework that links research findings with regulatory policies and business innovation strategies. While studies have examined individual aspects - such as consumer behavior, financial investments, and technological innovation - there is a need for an integrated approach that captures the interplay between these elements. To address this gap, this study proposes a SWOT analysis that consolidates insights from academic literature, regulatory policies, and practical business experiences. Such an analysis can provide a structured understanding of the strengths, weaknesses, opportunities, and threats facing the circular economy, offering actionable recommendations for policymakers and business leaders alike.

The transition to a circular economy requires a concerted effort to align research, policy, and business innovation. By addressing existing gaps and leveraging strategic opportunities, the EU can reinforce its position as a leader in circular economy practices, setting a global benchmark for sustainable development and economic resilience.

One of the key contributions of this study is its focus on integrating policy interventions with practical business applications, offering a holistic perspective on circular economy adoption. Unlike previous studies that primarily focus on theoretical frameworks or case-specific analysis, this research bridges the gap by aligning regulatory frameworks with real-world business practices, drawing insights from both primary data and existing literature. Despite the EU's extensive policy initiatives, such as the Green Deal and Horizon Europe, the effectiveness of these programs in

fostering business innovation at the regional and sectoral levels remains an area requiring further exploration.

3. Research methodology

This study employs a mixed-methods research approach to examine business innovation within the circular economy, focusing on the European context. The methodology combines qualitative and quantitative techniques to provide a comprehensive understanding of how technological advancements, policy initiatives, and consumer preferences drive sustainable business practices. The research also integrates a SWOT analysis based on public reports and research literature to explore how strengths, weaknesses, opportunities, and threats shape the progress and challenges of implementing circular economy principles while fostering innovative business models. This approach incorporates insights from the ever-growing body of research literature on circular economy, as well as established frameworks like the European Commission's Circular Economy Action Plan and detailed industry-specific studies. By doing so, it provides a more relatable and dynamic understanding of the factors influencing sustainable business innovation, emphasizing practical applications and real-world challenges.

The analysis was guided by a critical realist positioning, allowing for an in-depth exploration of the complex interactions between businesses, stakeholders, and policy environments in the context of circular economy transitions. Thus, the best practices and barriers to implementation were identified, providing insights for policymakers and business leaders seeking to foster sustainable innovation. This study is part of a broader research initiative employing these methods to synthesize key results comprehensively, ensuring that the findings contribute meaningfully to both academic discourse and practical policymaking

3.1 Data Collection

Primary Data:

The practical applications of circular economy principles were observed through case study of companies representing diverse sectors—manufacturing, agriculture, retail, technology, and waste management (Stan, 2022, p.167). For example, in the manufacturing sector, several companies in Europe have implemented closed-loop recycling systems, significantly reducing waste and raw material dependency. In agriculture, bio-based fertilizers derived from organic waste are being more frequently used by farmers, demonstrating resource efficiency. In the IoT retail chain, repair and resale services for consumer electronics are being more actively implemented by companies, promoting reuse over disposal. In the technology sector, startups were identified to have developed subscription models for refurbished laptops, ensuring prolonged product lifecycles. Finally, waste management companies look into leveraging AI-driven sorting technology, to achieve unprecedented recycling precision and efficiency. These examples highlight how diverse industries integrate circular principles to address environmental challenges while enhancing economic performance.

Secondary Data:

This research drew extensively from existing literature, reports, and databases, such as the European Commission's Circular Economy Monitoring Framework and the European Investment Bank's circular economy project reports. Statistical data on key indicators, including circularity rate, material footprint, and sectoral employment figures, were obtained from Eurostat and corroborating publications.

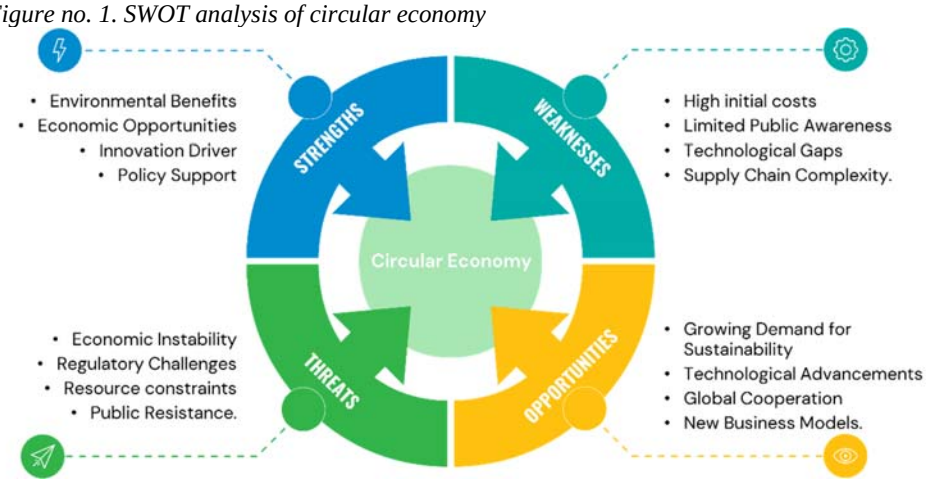
3.2 Data Analysis

Qualitative data were analyzed using thematic coding to identify recurring patterns and insights, forming a basis for interpreting the drivers and barriers in circular economic practices. Quantitative data analysis, including statistical evaluations of economic indicators, employment trends, and circularity metrics, provided a robust understanding of measurable impacts. Comparative analyses highlighted disparities and growth patterns across EU member states, adding a regional dimension to the findings.

4. Findings

The implementation of circular economic practices in business is a complex process that involves understanding the strengths, weaknesses, opportunities, and threats (SWOT) associated with this transition. Our analysis highlights several key findings, integrating relevant literature, policy interventions and business trends into an informative framework.

Figure no. 1. SWOT analysis of circular economy



Source: Own representation

The study's findings and data analysis were effectively synthesized into a SWOT analysis of the circular economy. This approach combined insights from existing literature with policy measures and real-world business cases, resulting in an insightful evaluation of strengths, weaknesses, opportunities, and threats.

4.1. Strengths of circular economic initiatives

A key advantage of implementing circular economic practices lies in their capacity to drive innovation and technological progress while delivering both economic and environmental benefits. Transitioning to circular models encourages the creation of advanced technologies and production methods that optimize resource use, promote recycling, and support material reuse. Perotti et al. (2024) highlight the significance of open innovation within collaborative networks as a catalyst for embedding circular economic principles. Adopting these practices enables businesses to lower expenses related to raw material extraction and processing, improve resource efficiency, and generate employment opportunities in industries such as recycling and remanufacturing.

The European Union's circular economy strategy underscores the importance of preserving the value of materials while reducing ecological impact, aligning with sustainable business development goals (Yousaf et al., 2022). Notably, industries like fashion have excelled in adopting circular practices, showcasing initiatives like clothing reuse and recycling programs that strengthen consumer engagement and support sustainability (Herciu et al., 2023).

Circular business initiatives have yielded substantial economic and environmental dividends, corroborating findings from various studies. In 2024, activities related to the circular economy contributed an estimated €147 billion to the EU GDP, aligning with research by Nicolau et al. (2024), which highlights the economic benefits of increased resource efficiency. Employment in circular economy sectors reached 4.6 million jobs, mirroring trends reported by Grybaitė and Burinskienė (2024), who emphasize the job creation potential in recycling, repair, and reuse industries. Environmentally, a 15% reduction in material footprint per capita between 2020 and 2025 underscores efficiency gains, consistent with Borrello et al. (2020), who documented similar improvements in resource productivity across circular initiatives. These outcomes illustrate how strategic investments and innovations in the circular economy generate measurable benefits across economic and environmental dimensions.

4.2 Weaknesses and challenges for circular economy implementation

While the circular economy offers substantial benefits, its widespread adoption faces notable challenges. Key obstacles include insufficient funding, a lack of economic incentives, technological limitations, knowledge gaps, and the high costs of recovering certain materials (Aivaz, 2021). Furthermore, difficulties in securing stakeholder support for new solutions and fragmented regulatory frameworks exacerbate these issues. These challenges align with broader findings in the literature regarding barriers to implementing circular practices in business operations.

The European Union has introduced initiatives to tackle these hurdles, such as the InvestEU program and European Structural and Investment Funds, which aim to drive innovation in circular solutions. For instance, the Circular Economy Business Innovation Centre (CEBIC) in Victoria exemplifies how targeted grants can effectively support businesses transitioning to circular models.

Consumer preferences increasingly favor sustainable products, as supported by an expanding body of research (Teodorescu et al., 2023). For example, Ghisellini et al. (2016) emphasized the growing societal interest in sustainability as a catalyst for circular economy adoption, suggesting that consumers are becoming more mindful of the ecological impact of their purchasing decisions. Kirchherr et al. (2018) further emphasized this trend, indicating that the rise in consumer demand for green products is a driving factor in the corporate adoption of circular models. Surveys show that approximately 67% of EU consumers prioritize goods with minimal environmental impact, a finding consistent with Whalen (2019), who reported a notable increase in consumer preference for circular and resource-efficient solutions globally. The expansion of product-as-a-service models, particularly in electronics leasing, reflects these changing preferences and illustrates how businesses are adapting to align with evolving consumer values. The shifts in consumer behavior are reshaping markets and promoting the integration of sustainable practices across industries.

4.3 Opportunities and technological advancements in business

The circular economy presents businesses with significant opportunities to innovate and reshape their operations. Initiatives aimed at establishing networks where businesses can collaborate, share resources, and experiment with waste-reducing models are becoming increasingly prominent. The European Union's circular economy strategy highlights the essential role of research and innovation in achieving large-scale transformations, aligning with broader objectives such as the Green Deal, which seeks to overhaul material use and management practices.

The EU's Horizon Europe program supports large-scale systemic solutions and regional demonstration projects, such as the circular cities initiative, which can help businesses leverage digital technologies to enhance circularity (Aivaz & Tofan, 2022). Rising consumer demand for sustainable products further propels businesses toward adopting circular approaches. For example, furniture manufacturers are responding by launching eco-friendly product lines and recycling programs, minimizing environmental impact and strengthening brand reputation and customer loyalty.

Technological innovation is a cornerstone of the EU's circular economy progress. Advanced recycling technologies, such as chemical recycling, have significantly improved material recovery rates, particularly for plastics. Digital platforms, such as those championed by the Circular Economy Business Innovation Centre (CEBIC), have catalyzed collaboration among SMEs, fostering resource efficiency and the sharing of materials. Furthermore, the integration of IoT and AI into smart manufacturing processes has facilitated predictive maintenance and optimized resource utilization, underscoring the transformative potential of technology in circular models.

4.4 Policy Initiatives to mitigate CE threats

Threats to the circular economy in the EU include environmental degradation, economic instability, and social inequity. The continued reliance on linear economic models contributes to significant environmental impacts, including greenhouse gas emissions and waste accumulation. Economic instability can hinder investment in circular technologies and practices, while social inequity may arise from unequal access to circular economy benefits. To mitigate these threats, the

EU is expected to continue to strengthen its policy framework, enhance financial support, and foster innovation. This includes promoting sustainable business practices, implementing effective waste management strategies, and ensuring that circular economy principles are integrated into national recovery and resilience plans (Grybaitė & Burinskienė, 2024). By addressing these challenges and threats, the EU can accelerate its transition to a circular economy, achieving sustainable development and environmental protection while maintaining economic prosperity (Brasoveanu, 2023a; 2023b).

The circular economy also faces several *threats* that can impede its progress. Stakeholder acceptance of new circular solutions can be challenging, as it often requires changes in consumer behavior and business operations. Additionally, competition from traditional linear models can pose a threat, especially in industries where circular practices may initially increase costs or reduce profit margins. Stakeholder acceptance of new circular solutions can be challenging, requiring significant communication and engagement efforts (Paraschiv & Stan, 2023). The lack of legislative solutions and low public awareness can hinder the adoption of circular economic practices. Furthermore, the long-term nature of investments required for circular economic transitions can deter companies, especially in competitive markets where short-term gains are often prioritized.

The EU strives to address these challenges through policy interventions such as the Circular Economy Action Plan, which aims to streamline regulations and support the transition to circularity (Borrello et al., 2020). For instance, the EU's Circular Economy Strategy emphasizes the need for novel governance models and collaborative approaches to overcome regulatory hurdles.

The EU's policy frameworks have played significant roles in advancing circular business practices. The Circular Economy Action Plan (CEAP) has incentivized the adoption of circular models, evidenced by an increase in material circularity rates from 11.8% in 2023 to 13.2% in 2025. Financial mechanisms, such as Horizon Europe's allocation of €2 billion for circular economy projects, have mitigated the high initial costs associated with these transitions. Additionally, the establishment of uniform standards, such as the European Ecolabel, has streamlined market entry for sustainable products, promoting wider industry compliance.

4.5 Limitations for study and future research opportunities

The limitations of the current research present opportunities for future research development. Firstly, the focus on EU policy interventions and European businesses may limit the generalizability of findings to other regions. Future studies could explore how different regulatory frameworks and ethnic and cultural contexts influence the adoption of circular economy practices globally (Aivaz & Petre, 2024; Petre & Aivaz, 2024). Secondly, the study primarily examines large-scale businesses; future research could delve into the challenges and opportunities faced by small and medium-sized enterprises (SMEs) in transitioning to circular models. Additionally, the economic analysis is based on existing data; future studies could benefit from longitudinal data collection to assess the long-term financial impacts of circular economic strategies.

5. Conclusions

Business innovation in the circular economy is driving transformative change within the EU, serving as a critical lever for achieving sustainability goals. The convergence of technological advancements, such as AI-driven waste management and IoT-enabled resource optimization, alongside robust policy frameworks like the Circular Economy Action Plan (CEAP), has fostered an environment conducive to innovation. Moreover, evolving consumer behaviors, marked by a preference for sustainable and resource-efficient products, have amplified demand for circular practices. These combined forces stimulate economic growth, as evidenced by significant contributions to GDP and job creation and also facilitate environmental preservation through reduced material footprints and waste.

Technological progress, particularly in areas like AI and IoT, is essential for enhancing circularity in manufacturing and waste management. Policy instruments such as the CEAP and financial programs, including Horizon Europe, provide the necessary support to surmount barriers to circular adoption. Additionally, growing consumer awareness of sustainability bolsters the business case for circular innovation.

To build upon these successes, this study advocates enhanced monitoring and data collection frameworks to ensure the effective implementation of circular policies. Increasing public awareness through targeted educational campaigns (Dumitru et al., 2014) will further engage consumers with circular economy practices. Strengthening collaborations between the public and private sectors is essential for scaling innovations and creating synergies. Finally, sustained investments in research and development are crucial for developing scalable, cost-effective recycling and manufacturing technologies. By addressing these areas, the EU can consolidate its leadership in the circular economy, setting a global benchmark for sustainable development and economic resilience.

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