

Exploring Barriers to Circular Economy Transitions in Slow Fashion SMEs: Insights from the Balanced Scorecard Framework

Rodrigo Bruno Santolin^{,**}, Nicoletta Fadda^{*}, Sofia Siotto^{*},
Ludovico Marinò^{*}*

Received: 30 November 2025

Accepted: 29 June 2026

Abstract

This study examines the barriers hindering the transition to a Circular Economy (CE) in Sardinian textile SMEs, a slow-fashion context characterized by artisanal, durable, and small-batch production. Through a multi-case study among five companies, twelve barriers were identified across a Balanced Scorecard (BSC) structure spanning the financial, customer, internal process, and learning and growth perspectives. Leveraging the DEMATEL technique, the cause-and-effect relationships among these barriers were mapped. The results show that “Difficult to increase turnover with more circular and exclusive products” and “Lack of supportive regulations” are the most prominent barriers, acting respectively as the strongest effect and the strongest cause in the system. These findings highlight the central role of economic viability and policy support in enabling CE adoption. The study also reveals that, despite strong structural alignment with CE principles, limited market incentives and financial constraints restrict deeper circular transformations. Methodologically, this work contributes by offering a relational understanding of CE barriers rather than isolated lists, providing clearer guidance for prioritizing interventions. The approach supports managers in integrating CE goals into strategic decision-making and underscores the need for targeted regulatory and financial measures.

Keywords: Circular Economy, Barrier, Balanced Scorecard, DEMATEL, Sardinia, Slow Fashion

* University of Sassari, Department of Scienze Economiche e Aziendali. Corresponding author: santolin.rodrigo@gmail.com

** Instituto Federal de Educação, Ciência e Tecnologia do Rio Grande do Sul (IFRS), Campus Sertão, Brazil.

1. Introduction

The transition to a Circular Economy (CE) is hindered by several barriers, including limited know-how, insufficient government support, weak supply-and-demand ecosystems, and a limited sustainable organizational culture (Dorrego-Viera et al., 2025; Sinha, 2022). More broadly, CE transition barriers form a complex system of interrelated factors that may also generate causal interactions (Santolin et al., 2023; Khan et al., 2022). Around the world, scholars have adopted diverse methodological approaches to structure cluster classifications of CE barriers (Rizos et al., 2016; Sinha, 2022), analyze internal relationships within these clusters (Khan et al., 2022), assess their relative importance in designing Circular Business Models (CBMs) (Urbinati et al., 2021), examine how they evolved during a global pandemic (Santolin et al., 2023), and explore the interplay of different enablers and elements in the context of the digital revolution (Dorrego-Viera et al., 2025).

Despite the vast body of literature on the argument, there is a scarcity of studies addressing a specific industrial sector: the textile industry. This sector is estimated to be a \$1.3 trillion market, making it the third-largest manufacturing industry worldwide after automobiles and technology (House of Commons Environmental Audit Committee, 2019). It is projected to account for a quarter of the world's carbon emissions by 2050 (Ellen MacArthur Foundation, 2021), making the adoption of targeted environmental strategies and control mechanisms increasingly relevant (De Camillis et al., 2025). Additionally, fabric production requires enormous amounts of energy and water and often results in pollution from the chemical processes involved in textile manufacturing (Abbate et al., 2024; Hasanbeigi & Price, 2015). The sector is also characterized by strong consumerism, which poses significant challenges to achieving sustainability goals.

In the context of barriers to CE transition in the textile industry, Laitala et al. (2021) found that the fast-fashion model, characterized by poor material quality and low prices, discourages consumers from extending the lifecycle of their products. Additionally, Huang et al. (2021) identified six key barriers that hinder companies in transitioning to a CE: low customer demand for recycled textile products, the absence of successful CBMs, challenges in collaborative innovation among supply chain partners, a lack of high-quality recycled materials, and high costs with low short-term economic benefits. From this list, Hartley et al. (2022) highlighted high production and marketing costs, along with a lack of consumer interest, as the most significant barriers. This finding is corroborated by Maher et al. (2023), who observed similar evidence in a multiple-case study. In a separate research, Dace et al.

(2024) presented a complementary perspective, revealing that, from a company's standpoint, the lack of stakeholder collaboration is one of the most critical barriers. Furthermore, Schmutz & Som (2022) emphasized the shortage of recyclers at the end of the textile lifecycle and the lack of technological solutions for mixed-material recycling as additional key barriers.

Despite the aforementioned literature, to the best of our knowledge, no studies have yet provided a strategic approach to CE barriers in the textile sector using a bottom-up cause-and-effect lens within a structured framework. Accordingly, a strategy map of these barriers is still missing, although it could provide a comprehensive overview and enable a deeper understanding of the challenges surrounding the CE transition. Our research addresses this gap by analyzing the specific context of Sardinian textile Small and Medium-sized Enterprises (SMEs), which are renowned for their customized, niche, artisanal, and high-quality production (Zuddas & Cocco, 2024). These characteristics are common in slow-fashion ecosystems, whose CE-related barriers still require further investigation. Therefore, the paper responds to the following Research Questions (RQs):

1. *What are the main barriers faced by the Sardinian textile SMEs transitioning to CE?*
2. *How can these barriers be structured into cause-and-effect relationships to develop a strategy map for overcoming them?*

To answer these RQs, we employed a mixed-method approach. First, we conducted a multiple case study in Sardinia's textile and apparel industry to understand the business ecosystem and identify the main barriers to CE transition. These barriers were then categorized according to the four Balanced Scorecard (BSC) perspectives: Learning and Growth, Internal Process, Customers, and Financial (Kaplan & Norton, 1992, 2000, 2004). Second, the DEMATEL method was applied to the identified barriers, using input from nine practitioners and scholars to establish cause-and-effect relationships and develop a strategy map of CE barriers.

The remainder of the article is organized as follows. Section 2 presents the theoretical background, Section 3 describes the methodology, Sections 4 and 5 report and discuss the results, and Section 6 concludes with the main theoretical and managerial contributions, adding also the main limitations.

2. The relevance of the CE transition to textile SMEs

The CE offers a transformative approach to shifting textile SMEs toward

more sustainable and regenerative practices (Schmutz & Som, 2022), reducing pollution, energy consumption, and natural resource extraction while extending product lifecycles and contributing to carbon neutrality (Santolin et al., 2024). Implementing CE principles in the textile SMEs involves rethinking how textile products are designed, produced, consumed, and disposed of (Alves et al., 2022). This includes strategies such as designing for durability, recyclability, and modularity; promoting repair, reuse, and rental business models; and improving recycling systems to close the material loop (Bukhari et al., 2018; Diddi & Yan, 2019; Jia et al., 2020). These practices aim not only to reduce waste and resource dependency but also to generate new forms of economic and social value, making the SMEs more resilient and innovative in the long term.

Circular approaches are especially relevant as consumer awareness around sustainability grows and regulatory pressure increases, particularly in regions like the European Union (Dorrego Viera et al., 2024; European Commission, 2022; European Parliament, 2021). Brands are being pushed to demonstrate environmental responsibility, and CE provides a clear pathway for doing so (Saha et al., 2021). Embracing CE not only helps companies meet compliance demands but also builds brand loyalty and competitiveness in a rapidly evolving market (Wells et al., 2021). Moreover, the transition to CE supports the creation of localized, high-value jobs and stimulates innovation in materials science, supply chain management, and digital traceability (Chen et al., 2022; de Boissieu et al., 2021). In artisanal or niche sectors, such as those producing customized products, strategies like slow fashion and design for longevity align naturally with CE values (Bhandari et al., 2022; Gasulla Tortajada et al., 2024). Thus, the CE is not just a solution to the textile industry's environmental footprint but also a strategic opportunity for long-term value creation, differentiation, and resilience.

However, as interest in the CE transition grows and its implementation advances, several barriers continue to emerge, making the achievement of the CE paradigm more difficult. In this context, SMEs may not only be strongly affected by these barriers but may also become key actors in overcoming them, particularly due to the specific characteristics of slow fashion (Centobelli et al., 2022). Contributing to this discussion, the following section presents up-to-date literature on the main sectoral barriers.

2.1 Barriers to CE transition in textile SMEs

The transition to a CE in the textile industry faces a complex array of barriers, many of which are deeply embedded in the industry's traditional

linear business models (House of Commons Environmental Audit Committee, 2019). One of the most pressing challenges is the lack of supportive regulations and incentives that encourage companies to adopt circular practices. Many businesses, particularly SMEs, operate under tight financial constraints and lack access to subsidies, tax reliefs, or regulatory frameworks that reward sustainability or penalize waste (Hartley et al., 2022). As SMEs account for 60-70% of the World's industrial pollution and, at the same time, represent 60-70% of employment (OECD, 2018), further exploration of this context becomes particularly relevant. Without external support, investing in circular solutions such as closed-loop production systems, sustainable materials, or product take-back schemes remains financially unviable for many SMEs (Jia et al., 2020).

Technical limitations also pose substantial obstacles to CE implementation in the sector. For instance, the recycling of textiles is often constrained by material quality and composition (Leal Filho et al., 2019). Many recycled fibers do not meet the durability or aesthetic standards required for high-quality garments, especially in industries producing customized, exclusive, or luxury products (Sandin & Peters, 2018). In addition, current recycling technologies are not always capable of handling mixed-material textiles or garments with chemical finishes, further limiting circularity (Schmutz & Som, 2022). This is particularly critical for companies that rely on top-tier product quality as a core part of their value proposition.

Cultural and organizational resistance play a critical role in slowing down the transition. Many firms lack internal awareness, training, and leadership support for CE initiatives, resulting in a hesitant company culture that is slow to embrace change (Hartley et al., 2022). Employees may not have the skills or knowledge needed to integrate circular principles into product design, sourcing, or logistics (Jia et al., 2020). Furthermore, the absence of proven best practices within the industry, especially for niche or region-specific segments, leaves companies uncertain about which circular strategies are both effective and feasible (Fischer & Pascucci, 2017). Without clear guidance or success stories to follow, the path toward circularity remains unclear for many actors in the textile industry (Shirvanimoghaddam et al., 2020).

Another significant barrier is the absence of standardized certifications and clear communication tools to demonstrate CE-related product attributes to customers (Dragomir & Dumitru, 2022). Despite growing consumer awareness about sustainability, many buyers still struggle to identify which products are genuinely circular due to greenwashing and inconsistent labeling (Adamkiewicz et al., 2022). This lack of transparency reduces market demand for circular products and discourages businesses from differentiating

themselves based on environmental performance (Mizrachi & Tal, 2022). Moreover, without widely accepted standards, it is difficult for companies to benchmark progress (Riso et al., 2026) or align with supply chain partners in developing circular processes (Bin Hameed et al., 2026). By the end, Table A1 in the Appendix presents a set of the main CE barriers collected from the literature.

Solutions developed in other sectoral contexts may help support and clarify the CE transition in the textile industry (Liu et al., 2023). In several industrial sectors, such as chemicals, plastics, and packaging, there are already well-established certifications related to the sustainable use of raw materials, such as FSC (Forest Stewardship Council) for wood and Cradle to Cradle for renewable materials, as well as certifications for post-consumer recycling and end-of-life product management (Niero et al., 2016; Schepers, 2010). In these sectors, research on lifecycle mapping and barriers to circularity has contributed to the development of clearer standards and certification schemes. Moreover, during our literature review, no studies were identified that map cause-and-effect relationships among CE barriers in the context of textile SMEs. Although the literature has extensively explained, identified, and clustered these barriers, a proper strategy map linking foundational barriers to their effects is still lacking. This highlights the relevance of our study, which addresses this gap by proposing a strategy map of CE barriers in the textile SMEs.

2.2 The Balanced Scorecard as a strategic management lens for analyzing barriers to CE transition

Despite the growing body of literature assessing the barriers to CE transition in the textile sector, most studies typically classify these barriers into technical, economic, institutional, or behavioral clusters (Kazancoglu et al., 2020; Farrukh & Sajjad, 2024; Gomes et al., 2023; Hartley et al., 2022), which, although useful, remain largely descriptive and disconnected from managerial practice. Furthermore, within existing literature, only a few studies attempt to assess the interrelationships among the barriers (Hartley et al., 2022; Rayhan et al., 2025; Wei et al., 2024). Considering these limitations, we propose the adoption of the Balanced Scorecard (BSC) as a structured framework to classify and evaluate the interconnections among CE barriers across the financial, customer, internal process, and learning & growth perspectives (Kaplan & Norton, 1992, 2000, 2004). The BSC provides a systemic, strategy-oriented lens that translates organizational challenges into in-

terrelated performance domains, thereby enabling a more integrated understanding of how different barriers constrain circular transitions. By aligning financial and non-financial perspectives, this approach bridges managerial, operational, and learning dimensions, allowing the identification of cause-and-effect linkages among barriers related to organizational capabilities, process design, stakeholder engagement, and economic outcomes (Balluchi et al., 2024; Madonna et al., 2024). Therefore, applying the BSC framework to cluster CE barriers addresses a conceptual gap in literature: it reframes fragmented categories of barriers into a coherent, theory-driven structure that supports both analytical rigor and managerial decision-making. This integration enhances the practical relevance of CE research and facilitates the design of strategic solutions to overcome barriers to CE transition at both managerial and policy-making levels.

3. Research method

The study followed a two-phase methodological design. First, a multiple case study was conducted through interviews with top management from five textile SMEs in the Sardinia region to identify and describe the main barriers to CE transition in the Financial, Customer, Internal Process, and Learning & Growth perspectives. In the second phase, these barriers were analyzed using the DEMATEL (Decision-Making Trial and Evaluation Laboratory) method to illustrate the relationships among them under the BSC lens, generating a strategy map.

3.1 Research Context and Case Selection

Sardinia is an Italian island located in the Mediterranean Sea, characterized by a strong territorial identity, geographical insularity, and a distinctive socio-economic context. Its textile industry is renowned for customized, niche, artisanal, and high-quality production, being composed predominantly of SMEs (Zuddas & Cocco, 2024). Building on these historical roots, and reinforced by the regional sustainability agenda *Sardegna2030*, the sector has been advancing its development through CE initiatives (Sardinia Region, 2021). This context is particularly suitable for investigating barriers to CE transition for three main reasons. First, Sardinian textile SMEs operate within a slow fashion ecosystem characterized by small-scale production, local embeddedness, craftsmanship, product durability, and strong territorial

identity. Second, the sector faces specific constraints related to limited resources, fragmented supply chains, and challenges in scaling CBMs. Third, the regional context offers an opportunity to examine how SMEs located in peripheral or insular areas approach CE transitions under conditions of geographical distance, market limitations, and dependence on local networks.

To capture this regional particularity, we employed a convenience sampling approach (Seawright & Gerring, 2008) to explore common difficulties faced by Sardinian SMEs advancing the CE transition. The criteria for company selection were: (i) inclusion in the list of Sardinian textile SMEs from the *Telemaco* online system; (ii) the existence of a dedicated website containing references to sustainability or CE initiatives; and (iii) the availability of top management to participate in interviews. These criteria ensured the inclusion of SMEs embedded in the region and with accessible secondary data (Eisenhardt, 1989). Using multiple data sources is essential for information triangulation, as it combines different investigative techniques to reduce single-source bias and enhance data credibility (Eisenhardt & Graebner, 2007; Santolin et al., 2026).

3.2 First phase: data collection and CE barriers identification

A total of ten companies were invited by email to participate in the study, with five accepting the invitation. This number aligns with the literature, as it is typically sufficient to achieve data saturation (Yin, 2003). Interviews with top management were conducted between February and May 2025, using a semi-structured questionnaire. Three SMEs were visited directly in their production facilities, where the interviews took place, and two were interviewed by telephone. Further details of these SMEs are available in Table 1.

Table 1 – The five selected SMEs

Company	Turnover	Employees (n)	Main sector
A	€0.5-1.0 million	11	interior textiles
B	€0.5-1.0 million	10	spinning mill
C	€0.1-0.5 million	15	interior textiles
D	€0.1-0.5 million	10	interior textiles
E	€1.0-5.0 million	17	textile production

For data processing, we conducted a content analysis with a systematic coding approach to identify all relevant barriers (Dorrego-Viera et al., 2025). The coding began deductively, drawing on existing CE barriers literature

(see Table A1 in the Appendix), and was followed by an inductive phase to capture new or unexpected barriers (Azungah, 2018; Santolin et al., 2026). Secondary data (e.g., company websites) were cross-checked to ensure triangulation and reduce single-source bias (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). Multiple rounds of discussion within the research team were held to refine interpretations until consensus was reached (Tellis, 1997). To be included, a barrier needed to be reported by at least two different companies. Synonyms and similar words or phrases were clustered together during the interpretation of the interviews, resulting in unique barriers representing similar content. Table A2 in the Appendix provides a description of the coding process. This iterative process resulted in a consolidated set of CE transition barriers faced by the interviewed Sardinian textile SMEs, organized according to the BSC perspectives.

3.2 Second phase: DEMATEL data analysis

Considering the CE transition barriers identified in the first phase, we conducted a cause-and-effect analysis using the bottom-up logic of the BSC. This was operationalized using the DEMATEL method, a multicriteria decision-making technique that identifies interdependencies among system elements through a causal diagram (Wu & Lee, 2007). DEMATEL represents relationships using directed graphs that illustrate both direction and intensity of influence (Santolin & Nonemacher, 2024), relying on expert judgments to explore the relational structure among variables (Boutkhoul et al., 2021; Kumar et al., 2022). Rooted in graph theory, the method offers a visual and systematic approach to addressing complex problems (Huang et al., 2007) and is robust for ranking factors and modeling outputs (Asadi et al., 2022).

Originally developed by the Battelle Memorial Institute (Gabus & Fontela, 1972), DEMATEL converts qualitative data into quantitative results (Santolin et al., 2024). Its applicability to constructing causal maps within a BSC framework has been demonstrated in earlier studies (Acuña-Carvajal et al., 2019; López-Ospina et al., 2022), and it has been used to examine CE barriers in the textile sector (Kazancoglu et al., 2022; Wei et al., 2024). However, no studies have applied DEMATEL to illustrate CE barrier causality specifically from a BSC perspective. This approach provides both methodological novelty and managerial relevance by revealing hierarchical causal pathways, from foundational, learning-related barriers through internal process and customer barriers up to financial barriers. Therefore, the DEMATEL method was used to examine the causal relationships among the CE barriers identified in the multiple case studies.

Nine experts from both practice (i.e., top management of SMEs providing managerial insights) and academia (i.e., researchers from Sardinian universities and research centers, contributing up-to-date knowledge) were selected to be involved in the study. Given that CE remains an emerging field, small expert panels are acceptable (Urbinati et al., 2017), and the number aligns with DEMATEL recommendations of 5–10 experts (Huang et al., 2007; Kumar et al., 2022; Liu et al., 2023; Santolin et al., 2024).

The minimum criterion for being involved as an academic expert was having published at least three papers related to CE in peer-reviewed journals over the last four years, demonstrating technical competence in the field. Scholars were selected through convenience sampling within our professional network. On the other hand, practitioners were selected from among those involved in the first phase of the study and were required to hold a top management position in their textile SMEs and have more than ten years of experience. Finally, we sought to ensure a balanced number of experts from academia and practice. Experts’ profiles are shown in Table 2.

Table 2 – Profiles of the experts involved

Id	Occupation	Years of experience	Field
1	Director	28	Textile
2	Director	25	Textile
3	Director	34	Textile
4	Director	22	Textile
5	Director	31	Textile
6	Researcher	11	Sustainability
7	Researcher	5	Sustainability
8	Researcher	8	Sustainability
9	Researcher	16	Sustainability

After selecting the panel of nine experts, each expert assessed the degree to which each barrier influenced the others using a 0-4 scale, ranging from no influence to very high influence. To remain consistent with the BSC structure, only bottom-up relationships between adjacent perspectives were considered, while self-relations and top-down links were excluded (Acuña-Carvajal et al., 2019).

The experts’ evaluations were aggregated and processed to capture both direct and indirect influences among barriers. This allowed the identification of barriers that mainly act as drivers of the system and those that mainly emerge as effects. Weak relationships were filtered out through a threshold,

so that only the most relevant links were retained in the final influence map (Tzeng et al., 2007).

Finally, the barriers were positioned within their respective BSC perspectives to build a strategy map. In this structure, Learning and Growth and Internal Process barriers are interpreted as foundational causal barriers, while Customer and Financial barriers are understood mainly as downstream effects in the CE transition process. A step-by-step procedure for conducting the DEMATEL analysis is presented in Table A3 in the Appendix.

4. Results

Considering the five sampled companies, we identified twelve barriers to the CE transition in Sardinian textile SMEs, categorized according to the four BSC perspectives, as presented below. Subsequently, a strategy map of the CE barriers, generated by the DEMATEL analysis, is presented in Section 4.5.

4.1 Financial Barriers (F)

(F1) *Lack of tax incentives and financial subsidies for CE practices* – Without adequate financial support, companies attempting to implement CE practices struggle to remain competitive. Restructuring production processes, sourcing sustainable materials, and establishing closed-loop systems require significant investments. This highlights the need for policy interventions, such as tax incentives, financial subsidies, or other economic mechanisms, to enhance the financial competitiveness of CE practices and encourage more businesses to shift toward sustainable production models.

(F2) *Costs of complying with Local Regulations* – Environmental laws in the European Union are more restrictive, requiring higher investments in facility adaptations that are not mandatory in some other countries, particularly in the Global South. As a result, these adaptation costs have sometimes led to the closure of certain industrial services or the relocation of production to countries with less stringent environmental regulations. This shift increases pollution in those regions, raises carbon emissions due to longer transportation distances, and creates an unfair competitive market. Some of the companies interviewed reported closing specific production lines and outsourcing them to companies in the Global South.

(F3) *Limited funding for the CBMs transition* – All five companies studied are SMEs, which often operate under tight financial constraints. These firms typically have limited access to capital and face difficulties in securing external funding, making it challenging to invest in the innovations, technologies, and process changes necessary for a successful transition to CBMs.

(F4) *Difficult to increase turnover with more circular and exclusive products*

– The turnover of the companies has remained within certain limits, with significant difficulty in achieving consistent growth over time. The observed increases in turnover were not driven by circular product differentiation but rather by specific partnerships with new markets that did not require such differentiation.

4.2 Customers Barriers (C)

(C1) *Limited demand for CE differentiation in products* – All companies reported, to varying degrees, that finding new customers and effectively gaining market share through CE differentiation has been challenging. As a result, both business growth and progress toward CE implementation have been limited.

(C2) *Lack of certification or standardization to demonstrate CE differentiation to customers* – Without clear and recognized frameworks to validate their circular practices, the companies studied reported a struggle to communicate the added value of their efforts, limiting customer trust and market recognition. This barrier was pointed out as hindering the ability to leverage CE as a competitive advantage.

4.3 Internal Process Barriers (P)

(P1) *Technical limitations in using recycled materials due to their lower quality* – This barrier was declared as particularly critical for all the companies, given they produce customized and exclusive products, which require the highest possible quality standards. The lower performance, appearance, or consistency of recycled materials makes it difficult to meet these expectations, limiting their adoption in high-end or niche product lines.

(P2) *Limited willingness of stakeholders to collaborate in the value chain* – All the companies reported difficulties in finding circular partners within their supply chain, as many suppliers continue to operate under a linear economy model (take-make-dispose), which often remains more financially viable than adapting to a circular production paradigm.

(P3) *Lack of best practices that have already demonstrated viability* – All interviewed companies expressed feeling somewhat lost in the CE transition. Without clear, proven examples to follow, particularly within their specific industry context, they face uncertainty about which strategies are both effective and feasible. This lack of guidance significantly hinders decision-making and slows the implementation of circular initiatives.

4.4 Learning and Growth Barriers (A)

(A1) *Hesitant company culture* – Despite growing awareness of sustainability, there remains resistance or uncertainty within the studied companies when it comes to adopting new circular practices. This cautious mindset limits internal engagement and slows down the cultural shift needed to fully embrace CE principles.

(A2) *Lack of training and education* – The companies reported that employees often lack the necessary knowledge and skills to understand and implement circular practices effectively. This gap in capacity-building limits internal alignment and slows down the integration of CE principles into daily operations and decision-making.

(A3) *Lack of supportive regulations that provide advantages to companies implementing CE practices* – Without clear incentives or regulatory frameworks that reward circular initiatives, the studied companies struggle to justify the investment in CE practices. The absence of such support limits their ability to compete, grow, and innovate within a circular economy.

4.5 Strategy Map of the Identified Barriers

Considering the twelve barriers identified in the case studies, they were assessed by the DEMATEL procedure, following the steps described in Section 3. It resulted in the total relationship matrix T , shown in Table 3. Row and column sums were then computed to obtain the R and D values, as well as the prominence ($R_i + D_i$) and net cause ($D_i - R_i$), presented in Table 4. The threshold value α was calculated as 0,032. All elements in Table 3 exceeding this threshold, restricted to adjacent perspectives in a bottom-up approach, were highlighted in bold, thereby filtering out minor effects and retaining only significant causal relationships for the strategy map.

Table 3 – The total relationship matrix T

	A1	A2	A3	P1	P2	P3	C1	C2	F1	F2	F3	F4
A1	0,004	0,05	0	0	0,12	0,012	0,009	0,034	0,001	0,005	0,028	0,052
A2	0,08	0,004	0	0	0,011	0,05	0,001	0,007	0,0002	0,002	0,004	0,066
A3	0,19	0,18	0	0	0,19	0,05	0,125	0,128	0,108	0,053	0,126	0,163
P1	0	0	0	0	0	0	0,04	0,006	0,0002	0,003	0,007	0,088
P2	0	0	0	0	0,004	0,08	0,06	0,07	0,002	0,029	0,013	0,108
P3	0	0	0	0	0,05	0,004	0,009	0,08	0,002	0,005	0,005	0,126
C1	0	0	0	0	0	0	0,011	0,15	0,004	0,006	0,11	0,19
C2	0	0	0	0	0	0	0,08	0,011	0,025	0,006	0,014	0,06
F1	0	0	0	0	0	0	0	0	0	0,17	0,19	0,23
F2	0	0	0	0	0	0	0	0	0	0,004	0,12	0,13
F3	0	0	0	0	0	0	0	0	0	0,005	0,005	0,17
F4	0	0	0	0	0	0	0	0	0	0,03	0,029	0,008

Note: Bold values are equal to or higher than the threshold α .

In terms of net cause and net effect, the barriers within the Learning and Growth and Internal Process perspectives act as net causers, showing positive values. The former presents an average ($D_i - R_i$) of 0,44, while the latter shows an average of 0,07. Conversely, the Customer and Financial perspectives act as net effects, with negative averages of -0,07 and -0,35, respectively. These results reinforce the suitability of adopting the BSC framework as the structural basis for developing the map of barriers to CE transition in the Sardinian textile SMEs.

The final map of CE transition barriers in Sardinian textile SMEs, structured according to the BSC framework, is presented in Figure 1. The arrows represent the bottom-up causal links between barriers whose values exceeded the threshold, starting from foundational barriers (net causers) and progressing toward the effect barriers.

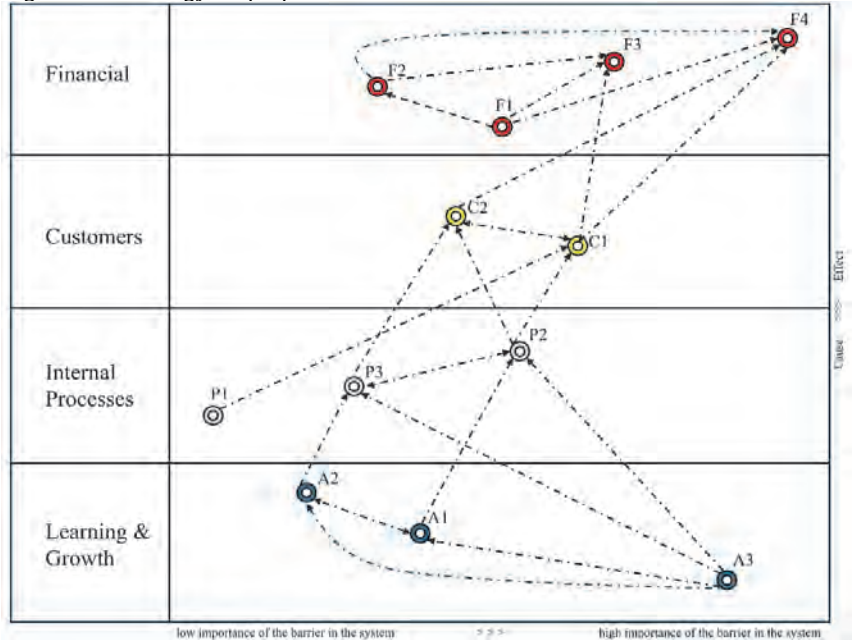
Table 4 – The overall prominence and net cause

	Di	Ri	Ri+Di	Di-Ri
A1	0,309	0,272	0,582	0,037
A2	0,221	0,229	0,45	-0,007
A3	1,315	0	1,315	1,315
P1	0,144	0	0,144	0,144
P2	0,366	0,371	0,738	-0,005
P3	0,286	0,201	0,488	0,085
C1	0,479	0,332	0,811	0,146
C2	0,193	0,493	0,687	-0,3
F1	0,592	0,142	0,734	0,45
F2	0,247	0,319	0,567	-0,072
F3	0,176	0,652	0,828	-0,476
F4	0,067	1,385	1,452	-1,318

As shown on the map, barriers with higher prominence (further to the right) indicate greater systemic importance. The top four are, in order: “Difficult to increase turnover with more circular and exclusive products”, “Lack of supportive regulations that provide advantages to companies implementing CE practices”, “Limited funding for the CBM transition”, and “Limited demand for CE differentiation in products”. These can be understood as the most critical barriers to overcome for enabling the CE transition of the studied SMEs. The top two, moreover, are also respectively the most influential

effect and the strongest cause within the entire system, reinforcing their exceptional importance as barriers to the CE transition. This underscores the systemic relevance of economic viability and policy support in enabling a cultural shift toward circular practices.

Figure 1 – Strategy map of the CE transition barriers in the Sardinian textile SMEs



5. Discussions

The main barriers align with previous studies (Hartley et al., 2022; Huang et al., 2021; Jia et al., 2020). However, due to the distinctive characteristics of the Sardinian textile industry, predominantly craft-based, artisanal, and oriented toward high-quality and customized production (Zuddas & Cocco, 2024), some barriers commonly reported in the literature were not observed. None of the firms perceived high production costs of circular products or limited consumer awareness as major obstacles. This may be because customers seeking exclusive or customized products often view CE attributes as a form of added value or differentiation (Gasulla Tortajada et al., 2024), although their willingness to pay persists only up to moderate levels of circularity (Boyer et al., 2021). Likewise, barriers typical of fast-fashion contexts

(e.g., low product quality and short lifecycles) were not identified, as Sardinian products are characterized by durability and craftsmanship. The Sardinian context can therefore be understood as a slow fashion system, where production is shaped by high quality, artisanal techniques, and limited volumes rather than fast-fashion logics (Centobelli et al., 2022). According to the interviewed firms, the island's geography and low population density further intensify logistics costs, making high-value products the only economically viable option and reinforcing this differentiated, quality-oriented production model. Therefore, the implications of our research may also be transferred, to some extent, to other similar slow fashion ecosystems around the world.

A key difference between our study and existing literature, and a novel contribution regarding CE barriers in the Sardinian textile SMEs, is the consistent emphasis across all companies on the difficulty of attracting new customers and expanding market share. This suggests that the customer segment willing to pay a premium for exclusivity and CE-related differentiation may be nearing saturation. As a result, firms face a trade-off (Santolin et al., 2026): on the one hand, they could reshape production costs (e.g., reducing the cost of materials and inputs) or adjust their business model strategies (e.g., adopting Product-as-a-Service (PaaS) initiatives) to reach new markets; on the other hand, these changes could alienate their core high-end clientele who value exclusivity. Pursuing the first alternative would require replacing natural fibers and artisanal production with synthetic materials and more mechanized processes, introducing elements of fast fashion into what is currently a slow-fashion production system. Such an approach would reduce product circularity and should therefore be avoided. A more viable pathway may involve the introduction of PaaS initiatives as a complementary mechanism for increasing revenue, particularly in Business-to-Business (B2B) contexts (Khitous et al., 2022). Because these products are already well known for their design for durability, PaaS solutions are compatible with the existing production model. A softer alternative would be to invest in branding and communication to strengthen product differentiation, though this requires financial resources constrained by the company's turnover.

Despite this identified differentiation, the remaining barriers align with prior literature, providing a solid basis for deeper analysis using DEMATEL and allowing a comparison of our results with existing studies. DEMATEL allowed us to explore cause-and-effect relationships among barriers through a bottom-up BSC perspective, generating a strategy map that illustrates their interactions. Such an approach remains largely absent in the literature, un-

underscoring the novelty of our results and offering a more comprehensive understanding of CE barrier enablement dynamics within the SMEs operating in the slow fashion.

The findings of this study advance the understanding of how CE barriers interact within textile SMEs, offering insights that extend and complement existing literature. To contextualize these findings within the broader body of research, it is important to note that we did not identify prior studies that assess the relationships among CE barriers using a consistent and structured approach. However, Hartley et al. (2022), in their analysis of the Dutch technical and interior textiles industries, observed that regulatory barriers influence technical barriers, which in turn shape organizational culture. This pattern partially aligns with our map, where regulatory barriers emerge as causal drivers that affect downstream barriers within the Internal Process and Learning and Growth perspectives. Such parallels reinforce the relevance of our approach and highlight the need to further explore cause-and-effect dynamics within CE transitions.

A key difference, however, lies in the positioning of cultural barriers. Hartley et al. (2022) conceptualized culture as both an outcome and a reinforcing factor that feeds back into other barriers, creating a loop. In contrast, our study positions cultural barriers strictly at the base of the map, within the Learning and Growth perspective. This reflects the fact that the BSC does not support feedback loops but instead requires a clear, directional flow from foundational elements toward higher-level outcomes. Considering our findings, we argue that cultural aspects function as causal barriers because the successful implementation of CE practices depends on fostering an organizational environment aligned with circular thinking.

6. Conclusions

This study identified twelve key barriers to CE transition in Sardinian textile SMEs and revealed how they interact across organizational levels through a BSC-DEMATEL approach. The analysis shows that “Difficult to increase turnover with more circular and exclusive products” and “Lack of supportive regulations that provide advantages to companies implementing CE practices” are the most prominent barriers, functioning respectively as the strongest effect and the strongest cause in the system. This highlights the crucial role of economic viability and policy support in enabling CE adoption.

The findings also reflect the specificity of the slow fashion, where durability and craftsmanship are already high, but market incentives for further circular differentiation remain weak. Although structurally aligned with CE principles, the studied SMEs face limited demand growth and financial constraints that restrict deeper circular transformations. For managers, the proposed framework helps integrate CE objectives into strategic decision-making. At the same time, for policymakers, it underscores the need for targeted regulatory and financial support to accelerate circular transitions in craft-based industries.

6.1 Theoretical, Managerial, and Policy Implications

Our research advances the current body of literature, which has primarily focused on identifying and categorizing textile-sector barriers into common clusters (Dace et al., 2024; Hartley et al., 2022; Huang et al., 2021; Maher et al., 2023), by providing a relational perspective essential for developing more actionable, context-specific strategies. Through the DEMATEL analysis, we mapped the cause-and-effect relationships among the twelve identified CE transition barriers in Sardinian textile SMEs and established a ranking of their relative importance. Notably, “Difficult to increase turnover with more circular and exclusive products” and “Lack of supportive regulations that provide advantages to companies implementing CE practices” emerged as the most prominent barriers, while also being respectively the most influential effect and the strongest cause within the entire system. This relational understanding offers a significant new contribution to literature and to policymakers.

Furthermore, the findings extend CE research by introducing a strategic management lens that connects organizational barriers with systemic outcomes. Whereas most prior studies conceptualize barriers as static and domain-specific (Bhandari et al., 2022; Farrukh & Sajjad, 2024; Jia et al., 2020), the BSC-based approach highlights their interdependencies and dynamic effects across learning, process, stakeholder, and financial domains. Relational understanding may provide a clearer basis for prioritizing interventions. This reframing helps bridge sustainability and performance management theories, showing that circular transitions depend not only on technological or regulatory conditions but also on the alignment of managerial capabilities, operational routines, and cultural aspects (Della Porta et al., 2023). Hence, our approach enhances CE applicability by translating abstract barriers into strategic dimensions that can be monitored and managed through established performance systems, adding new elements to the emer-

gent literature (Santolin et al., 2026). Consequently, it enables firms to integrate CE goals into their existing control structures, identify leverage points across organizational layers, and design targeted interventions that reinforce circular practices. This theoretical integration provides a more actionable pathway to operationalize CE strategies and to assess progress through coherent, multidimensional indicators.

Another significant theoretical contribution emerges from the focus on textile SMEs, particularly within the slow fashion context. This specificity has important implications for CE transition. In systems where products are already durable, artisanal, and produced in limited volumes, the added value of CE differentiation is less evident to consumers. Consequently, barriers such as “Difficult to increase turnover with more circular and exclusive products” and “Limited demand for CE differentiation in products” become more pronounced. For financially constrained firms, these barriers reduce the incentive to invest in additional CE practices, potentially slowing or limiting their transition. Our findings highlight a paradox: although slow fashion firms are structurally aligned with CE principles, weak market signals may hinder deeper circular transformations. This insight advances CE theory by showing how sectoral particularities influence both the types of barriers encountered and the strategic decisions firms make about the extent and pace of their CE transition.

Moreover, the most salient barriers are systemic in nature, suggesting that an ecosystem-based approach is essential to drive the CE transition. In particular, the most relevant barriers are linked to customer purchasing behavior, which can enable the shift toward CBMs but also depends on policy support. Policymakers can play a key role by providing incentives for both companies and customers, thereby encouraging a broader transition toward circularity.

6.2 Limitations and future research avenues

This research is limited by the relatively small number of participating SMEs (five) and experts (nine), whose specialized backgrounds, while valuable, may not fully represent the broader diversity of perspectives within the textile sector. Their expertise could be complemented by insights from additional specialists, such as supply chain actors, policymakers, or sustainability consultants. Future studies should address these limitations by expanding the sample and adopting complementary methodological approaches, such as large-scale surveys or mixed-method designs, to validate and generalize the causal relationships identified in this study.

Moreover, the study was conducted in the specific slow-fashion context

of Sardinia; therefore, any generalization to other contexts and geographical regions should be made with caution, avoiding the assumption that our findings are universal. This also opens avenues for future research comparing CE barriers across different scenarios and regions, intending to establish different barrier archetypes based on contextual factors.

Appendix

Table A1, Table A2, and Table A3 (www.sidrea.it/barriers-circular-economy-transition).

Acknowledgments

This research was supported by the ECOTESS project (ECONomia circolare nel settore TESSile della Sardegna: modelli di business circolari e applicazioni di nuove tecnologie) - Bando a Cascata del Partenariato Esteso “MICS – Made in Italy Circolare e Sostenibile”, code PE0000004, PNRR Next Generation.

References

- Abbate S., Centobelli P., Cerchione R., Nadeem S. P., & Riccio E. (2024). Sustainability trends and gaps in the textile, apparel and fashion industries. *Environment, Development and Sustainability*, 26(2), pp. 2837-2864. Doi: 10.1007/s10668-022-02887-2.
- Acuña-Carvajal F., Pinto-Tarazona L., López-Ospina H., Barros-Castro R., Quezada L., & Palacio K. (2019). An integrated method to plan, structure and validate a business strategy using fuzzy DEMATEL and the balanced scorecard. *Expert Systems with Applications*, 122, pp. 351-368. Doi: 10.1016/j.eswa.2019.01.030.
- Adamkiewicz J., Kočańska E., Adamkiewicz I., & Łukasik R. M. (2022). Greenwashing and sustainable fashion industry. *Current Opinion in Green and Sustainable Chemistry*, 38. Doi: 10.1016/j.cogsc.2022.100710.
- Alves L., Ferreira Cruz E., Lopes S. I., Faria P. M., & Rosado da Cruz A. M. (2022). Towards circular economy in the textiles and clothing value chain through blockchain technology and IoT: A review. *Waste Management and Research*, 40(1), Artigo 1. Doi: 10.1177/0734242X211052858.
- Asadi S., Nilashi M., Iranmanesh M., Hyun S. S., & Rezvani A. (2022). Effect of internet of things on manufacturing performance: A hybrid multi-criteria decision-making and neuro-fuzzy approach. *Technovation*, 118, 102426. Doi: 10.1016/j.technovation.2021.102426.
- Azungah T. (2018). Qualitative research: deductive and inductive approaches to data analysis. *Qualitative Research Journal*, 18, pp. 383-400. Doi: 10.1108/QRJ-D-18-00035.

- Balluchi F., Borgato B., Corsi K., & Fundoni M. (2024). L'integrazione degli obiettivi di sostenibilità nei processi di pianificazione strategica: Analisi empirica nel contesto italiano. *Management Control*, (2), pp. 65-88. Doi: 10.3280/MACO2024-002004.
- Bhandari N., Garza-Reyes J. A., Rocha-Lona L., Kumar A., Naz F., & Joshi R. (2022). Barriers to sustainable sourcing in the apparel and fashion luxury industry. *Sustainable Production and Consumption*, 31, pp. 220-235. Doi: 10.1016/j.spc.2022.02.007.
- Bin Hameed H., Strozzi F., Puliga G., Verdoliva G., Fronzetti Colladon A., & Muhammad Abbas S. (2026). Sourcing Risk in Supply Chains: A Systematic Literature Review. *Logistics*, 10(4), 88. Doi: 10.3390/logistics10040088.
- Boutkhoul O., Hanine M., Nabil M., Barakaz F. E. L., Lee E., Rustam F., & Ashraf I. (2021). Analysis and evaluation of barriers influencing blockchain implementation in moroccan sustainable supply chain management: An integrated IFAHP-DEMATEL framework. *Mathematics*, 9(14), Artigo 14. Doi: 10.3390/math9141601.
- Boyer R. H. W., Hunka A. D., Linder M., Whalen K. A., & Habibi S. (2021). Product Labels for the Circular Economy: Are Customers Willing to Pay for Circular? *Sustainable Production and Consumption*, 27, pp. 61-71. Doi: 10.1016/j.spc.2020.10.010.
- Bukhari M. A., Carrasco-Gallego R., & Ponce-Cueto E. (2018). Developing a national programme for textiles and clothing recovery. *Waste Management and Research*, 36(4), pp. 321-331. Doi: 10.1177/0734242x18759190.
- Centobelli P., Abbate S., Nadeem S. P., & Garza-Reyes J. A. (2022). Slowing the fast fashion industry: An all-round perspective. *Current Opinion in Green and Sustainable Chemistry*, 38, 100684. Doi: 10.1016/j.cogsc.2022.100684.
- Chen C.-L., Guo L.-H., Zhou M., Tsaor W.-J., Sun H., Zhan W., Deng Y.-Y., & Li C.-T. (2022). Blockchain-Based Anti-Counterfeiting Management System for Traceable Luxury Products. *Sustainability (Switzerland)*, 14(19), Artigo 19. Doi: 10.3390/su141912814.
- Dace E., Cascavilla A., Bianchi M., Chioatto E., Zecca E., Ladu L., & Yilan G. (2024). Barriers to transitioning to a circular bio-based economy: Findings from an industrial perspective. *Sustainable Production and Consumption*, 48, pp. 407-418. Doi: 10.1016/j.spc.2024.05.029.
- de Boissieu E., Kondrateva G., Baudier P., & Ammi C. (2021). The use of blockchain in the luxury industry: Supply chains and the traceability of goods. *Journal of Enterprise Information Management*, 34(5), Artigo 5. Doi: 10.1108/JEIM-11-2020-0471.
- De Camillis E., Izzo T., & Mancini D. (2025). Percorsi di decarbonizzazione e sistemi di controllo: Un modello di analisi per il settore energetico. *Management Control*, (2), pp. 179-204. Doi: 10.3280/MACO2025-002009.
- Della Porta A., De Luca F., & Aufiero C. (2023). "Radicare" la sostenibilità nella strategia attraverso i sistemi di management control: Un caso di studio relativo ad una PMI. *Management Control*, (2), pp. 43-68. Doi: 10.3280/MACO2023-002003.
- Diddi S., & Yan R.-N. (2019). Consumer perceptions related to clothing repair and community mending events: A circular economy perspective. *Sustainability (Switzerland)*, 11(19). Doi: 10.3390/su11195306.
- Dorrego Viera J. I., Santolin R. B., Lazzarotti V., & Urbinati A. (2024). Sustainability decision-making in times of crisis: An empirical study in Italy under the lens of the Russian-Ukraine war. *Corporate Social Responsibility and Environmental Management*. Doi: 10.1002/csr.2788.
- Dorrego-Viera J. I., Urbinati A., & Lazzarotti V. (2025). Transition towards circular economy: Exploiting open innovation for circular product development. *Journal of Innovation & Knowledge*, 10(2), 100668. Doi: 10.1016/j.jik.2025.100668.

- Dragomir V. D., & Dumitru M. (2022). Practical solutions for circular business models in the fashion industry. *Cleaner Logistics and Supply Chain*, 4. Doi: 10.1016/j.clscn.2022.100040.
- Eisenhardt K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14(4), pp. 532-550. Doi: 10.2307/258557.
- Eisenhardt K. M., & Graebner M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), pp. 25-32. Doi: 10.5465/AMJ.2007.24160888.
- Ellen MacArthur Foundation (2021). *Completing the picture: How the circular economy tackles climate change*. <https://ellenmacarthurfoundation.org/completing-the-picture>.
- European Commission (2022). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Strategy for Sustainable and Circular Textiles*. https://environment.ec.europa.eu/publications/textiles-strategy_en.
- European Parliament (2021). *New Circular Economy Action Plan (2020/2077(INI))*. Resolution of 10 February 2021. https://www.europarl.europa.eu/doceo/document/TA-9-2021-0040_EN.html.
- Farrukh A., & Sajjad A. (2024). Drivers for and barriers to circular economy transition in the textile industry: A developing economy perspective. *Sustainable Development*, 32(6), pp. 7309-7329. Doi: 10.1002/sd.3088.
- Fischer A., & Pascucci S. (2017). Institutional incentives in circular economy transition: The case of material use in the Dutch textile industry. *Journal of Cleaner Production*, 155, pp. 17-32. Doi: 10.1016/j.jclepro.2016.12.038.
- Gabus A., & Fontela E. (1972). *World Problems, An Invitation to Further Thought within the Framework of DEMATEL*. Battelle Geneva Research Centre, Geneva.
- Gasulla Tortajada E., Moreira A., Duarte P., & Silva S. (2024). Circular Economy and Sustainability in Luxury Fashion Consumer Behavior: A Review and Research Agenda. *International Journal of Consumer Studies*, 48(5). Doi: 10.1111/ijcs.13089.
- Gomes G. M., Moreira N., Iritani D. R., Amaral W. A., & Ometto A. R. (2023). Systemic Circular Innovation: barriers, windows of opportunity and an analysis of Brazil's apparel Scenario. *Fashion Practice*, 15(1), pp. 6-35. Doi: 10.1080/17569370.2021.1987645.
- Hartley K., Roosendaal J., & Kirchherr J. (2022). Barriers to the circular economy: The case of the Dutch technical and interior textiles industries. *Journal of Industrial Ecology*, 26(2), pp. 477-490. Doi: 10.1111/jiec.13196.
- Hasanbeigi A., & Price L. (2015). A technical review of emerging technologies for energy and water efficiency and pollution reduction in the textile industry. *Journal of Cleaner Production*, 95, pp. 30-44. Doi: 10.1016/j.jclepro.2015.02.079.
- House of Commons Environmental Audit Committee (2019). *Fixing Fashion: Clothing, Consumption and Sustainability*. <https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1952/report-summary.html>.
- Huang C.-Y., Shyu J. Z., & Tzeng G.-H. (2007). Reconfiguring the innovation policy portfolios for Taiwan's SIP Mall industry. *Technovation*, 27(12), pp. 744-765. Doi: 10.1016/j.technovation.2007.04.002.
- Huang Y.-F., Azevedo S. G., Lin T.-J., Cheng C.-S., & Lin C.-T. (2021). Exploring the decisive barriers to achieve circular economy: Strategies for the textile innovation in Taiwan. *Sustainable Production and Consumption*, 27, pp. 1406-1423. Doi: 10.1016/j.spc.2021.03.007.

- Jia F., Yin S., Chen L., & Chen X. (2020). The circular economy in the textile and apparel industry: A systematic literature review. *Journal of Cleaner Production*, 259, 120728. Doi: 10.1016/j.jclepro.2020.120728.
- Kaplan R. S., & Norton D. P. (1992). The Balanced Scorecard – Measures that Drive Performance. *Harvard Business Review*, Jan-Feb, pp. 71-79.
- Kaplan R. S., & Norton D. P. (2000). Having trouble with your strategy? Then map it. *Harvard business review*, 78(5), pp. 167-176, 202.
- Kaplan R. S., & Norton D. P. (2004). *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*. Harvard Business Press.
- Kazancoglu I., Kazancoglu Y., Kahraman A., Yarimoglu E., & Soni G. (2022). Investigating barriers to circular supply chain in the textile industry from Stakeholders' perspective. *International Journal of Logistics Research and Applications*, 25(4-5), pp. 521-548. Doi: 10.1080/13675567.2020.1846694.
- Kazancoglu I., Kazancoglu Y., Yarimoglu E., & Kahraman A. (2020). A conceptual framework for barriers of circular supply chains for sustainability in the textile industry. *Sustainable Development*, 28(5), pp. 1477-1492. Doi: 10.1002/sd.2100.
- Khan S. A., Mubarik M. S., & Paul S. K. (2022). Analyzing cause and effect relationships among drivers and barriers to circular economy implementation in the context of an emerging economy. *Journal of Cleaner Production*, 364, 132618. Doi: 10.1016/j.jclepro.2022.132618.
- Khitous F., Urbinati A., & Verleye K. (2022). Product-Service Systems: A customer engagement perspective in the fashion industry. *Journal of Cleaner Production*, 336. Doi: 10.1016/j.jclepro.2022.130394.
- Kumar S., Raut R. D., Agrawal N., Cheikhrouhou N., Sharma M., & Daim T. (2022). Integrated blockchain and internet of things in the food supply chain: Adoption barriers. *Technovation*, 118. Doi: 10.1016/j.technovation.2022.102589.
- Laitala K., Klepp I. G., Haugrønning V., Throne-Holst H., & Strandbakken P. (2021). Increasing repair of household appliances, mobile phones and clothing: Experiences from consumers and the repair industry. *Journal of Cleaner Production*, 282. Doi: 10.1016/j.jclepro.2020.125349.
- Leal Filho W., Ellams D., Han S., Tyler D., Boiten V. J., Paco A., Moora H., & Balogun A.-L. (2019). A review of the socio-economic advantages of textile recycling. *Journal of Cleaner Production*, 218, pp. 10-20. Doi: 10.1016/j.jclepro.2019.01.210.
- Liu X., Liu Y., Li H., & Wen D. (2023). Identification and analysis of barriers to the effectiveness of ISO 45001 certification in Chinese certified organisations: A DEMATEL-ISM approach. *J. of Cleaner Production*, 383. Doi: 10.1016/j.jclepro.2022.135447.
- López-Ospina H., Pardo D., Rojas A., Barros-Castro R., Palacio K., & Quezada L. (2022). A revisited fuzzy DEMATEL and optimization method for strategy map design under the BSC framework: Selection of objectives and relationships. *Soft Computing*, 26(14), pp. 6619-6644. Doi: 10.1007/s00500-022-07042-7.
- Madonna S., Cestari G., & Giuliani F. (2024). L'integrazione della sostenibilità ambientale nei sistemi di controllo e gestione delle imprese: Evidenze dal settore energetico italiano. *Management Control*, (1), pp. 39-61. Doi: 10.3280/MACO2024-001003.
- Maher R., Yarnold J., & Pushpamali N. N. C. (2023). Circular economy 4 business: A program and framework for small-to-medium enterprises (SMEs) with three case studies. *Journal of Cleaner Production*, 412. Doi: 10.1016/j.jclepro.2023.137114.
- Mizrachi M. P., & Tal A. (2022). Regulation for Promoting Sustainable, Fair and Circular Fashion. *Sustainability (Switzerland)*, 14(1). Doi: 10.3390/su14010502.

- Niero M., Negrelli A. J., Hoffmeyer S. B., Olsen S. I., & Birkved M. (2016). Closing the loop for aluminum cans: Life Cycle Assessment of progression in Cradle-to-Cradle certification levels. *Journal of Cleaner Production*, 126, pp. 352-362. Doi: 10.1016/j.jclepro.2016.02.122.
- OECD (2018). *Environmental Policy Toolkit for SME Greening in EU Eastern Partnership Countries*. OECD Green Growth Studies, OECD Publishing, Paris. Doi: 10.1787/9789264293199-en.
- Rayhan Md. G. S., Masum Md., & Karuppiyah K. (2025). A Fuzzy Multi-Criteria Decision-Making Approach to Evaluate Circular Economy Barriers in the Textile and Apparel Industry. *Circular Economy & Sustainability*. Doi: 10.1007/s43615-025-00661-w.
- Riso V., Cantele S., & Thanh Arianna Truong L. (2026). La gestione delle informazioni di sostenibilità nella catena di fornitura: Un caso studio nel settore agroalimentare. *Management Control*, (3), pp. 89-109. Doi: 10.3280/MACO2025-003005.
- Rizos V., Behrens A., van der Gaast W., Hofman E., Ioannou A., Kafyeke T., Flamos A., Rinaldi R., Papadelis S., Hirschnitz-Garbers M., & Topi C. (2016). Implementation of circular economy business models by small and medium-sized enterprises (SMEs): Barriers and enablers. *Sustainability (Switzerland)*, 8(11). Doi: 10.3390/su8111212.
- Saha K., Dey P. K., & Papagiannaki E. (2021). Implementing circular economy in the textile and clothing industry. *Business Strategy and the Environment*, 30(4), pp. 1497-1530. Doi: 10.1002/bse.2670.
- Sandin G., & Peters G. M. (2018). Environmental impact of textile reuse and recycling – A review. *Journal of Cleaner Production*, 184, pp. 353-365. Doi: 10.1016/j.jclepro.2018.02.266.
- Santolin R. B., Hameed H. B., Urbinati A., & Lazzarotti V. (2023). Exploiting circular economy enablers for SMEs to advance towards a more sustainable development: An empirical study in the post COVID-19 era. *Resources, Conservation & Recycling Advances*, 19, 200164. Doi: 10.1016/j.rcradv.2023.200164.
- Santolin R.B., Lazzarotti V. & Urbinati A. (2026). Transition of Manufacturing Companies towards the Circular Economy: The Role of the Balanced Scorecard Approach. *Circular Economy and Sustainability*. 6(12). Doi: 10.1007/s43615-026-00752-2.
- Santolin R. B., Urbinati A., & Lazzarotti V. (2024). How can managerial practices for Circular Business Models contribute to achieving carbon neutrality? A taxonomy of their preventive and corrective role. *Journal of Cleaner Production*, 477, 143831. Doi: 10.1016/j.jclepro.2024.143831.
- Santolin R. B., & Nonemacher T. B. (2024). Barreiras para implementação de Modelos de Negócio de Economia Circular na Indústria Manufatureira Brasileira. *Revista Gestão & Sustentabilidade*, 5, e14165. Doi: 10.36661/2596-142X.2023v5n1.14165.
- Sardinia Region (2021). *Sardegna2030: La strategia della regione Sardegna per lo Sviluppo Sostenibile*. Deliberazione della giunta regionale n. 39/56 del 8 ottobre 2021; <https://delibere.regione.sardegna.it/delibera/57095>.
- Schepers D. H. (2010). Challenges to Legitimacy at the Forest Stewardship Council. *Journal of Business Ethics*, 92(2), pp. 279-290. Doi: 10.1007/s10551-009-0154-5.
- Schmutz M., & Som C. (2022). Identifying the potential for circularity of industrial textile waste generated within Swiss companies. *Resources, Conservation and Recycling*, 182, 106132. Doi: 10.1016/j.resconrec.2021.106132.
- Seawright J., & Gerring J. (2008). Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options. *Political Research Quarterly*, 61(2), pp. 294-308. Doi: 10.1177/1065912907313077.

- Shirvanimoghaddam K., Motamed B., Ramakrishna S., & Naebe M. (2020). Death by waste: Fashion and textile circular economy case. *Science of the Total Environment*, 718. Doi: 10.1016/j.scitotenv.2020.137317.
- Sinha E. (2022). Identifying enablers and outcomes of circular economy for sustainable development: A systematic literature review. *Business Strategy and Development*. Doi: 10.1002/bsd2.195.
- Tellis W. (1997). Application of a Case Study Methodology. *The Qualitative Report*, 3(3), pp. 1-19. Doi: 10.46743/2160-3715/1997.2015.
- Tzeng G.-H., Chiang C.-H., & Li C.-W. (2007). Evaluating intertwined effects in e-learning programs: A novel hybrid MCDM model based on factor analysis and DEMATEL. *Expert Systems with Applications*, 32(4), pp. 1028-1044. Doi: 10.1016/j.eswa.2006.02.004.
- Urbinati A., Chiaroni D., & Chiesa V. (2017). Towards a new taxonomy of circular economy business models. *Journal of Cleaner Production*, 168, pp. 487-498. Doi: 10.1016/j.jclepro.2017.09.047.
- Urbinati A., Franzò S., & Chiaroni D. (2021). Enablers and Barriers for Circular Business Models: An empirical analysis in the Italian automotive industry. *Sustainable Production and Consumption*, 27, pp. 551-566. Doi: 10.1016/j.spc.2021.01.022.
- Wei Y., Liu Y., Siraj A., Xu J., Taneja S., & Wang N. (2024b). A strategic framework for sustainable quality management in the waste textile recycling industry within the context of the circular economy. *Business Strategy and the Environment*, 33(8), pp. 9214-9232. Doi: 10.1002/bse.3965.
- Wells V., Athwal N., Nervino E., & Carrigan M. (2021). How legitimate are the environmental sustainability claims of luxury conglomerates?. *Journal of Fashion Marketing and Management*, 25(4), Artigo 4. Doi: 10.1108/JFMM-09-2020-0214.
- Wu W.-W., & Lee Y.-T. (2007). Developing global managers' competencies using the fuzzy DEMATEL method. *Expert Systems with Applications*, 32(2), pp. 499-507. Doi: 10.1016/j.eswa.2005.12.005.
- Yin R. K. (2003). *Case Study Research: Design and Methods*. SAGE.
- Zuddas C., & Cocco A. (2024). TCEs, IPRs protection and business inclusivity: The Sardinian example. Em *Research Handbook on Intellectual Property Rights and Inclusivity* (pp. 249-265). Doi: 10.4337/9781803927268.00022.