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RESEARCH ARTICLE

RCO100, 100% recycled cotton denim: A case study on circular-oriented innovation in the textiles and apparel sector

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Abstract

The prevailing linear model of the textiles and apparel (T&A) sector results in unsustainable impacts on planetary boundaries. Transitioning to a circular model requires large-scale innovation facilitated by unprecedented levels of pre-competitive collaboration.

This study investigates the determinants of successful Circular Oriented Innovation (COI) through a qualitative case study of RCO100—a collaborative circular ecosystem that enabled the production of denim from 100% recycled cotton. Combining desk research, stakeholder interviews, and fieldwork, the research identifies critical success determinants: collaboration motives, iterative innovation processes, complementary resources and competencies, shared purpose, trust-based collaboration and leadership skills.

Findings highlight the interplay between organisational, technical, and relational dimensions in enabling circular ecosystems. A key new insight is the importance of human (or soft) dimensions in determining successful outcomes for COI. This research contributes to emerging scholarship on circular ecosystems by providing a nuanced understanding of COI success determinants. The results inform businesses, policymakers and CE facilitators seeking to scale circularity within legacy sectors.

Keywords Circular Economy · Circular Oriented Innovation · Circular ecosystem · Textiles Recycling

Glossary of terms:

- **Yarn Spinning.** The yarn processing step is where enough twist is inserted into a slither of parallel fibres to give integrity and strength to a fibrous strand.
- **Mechanical Recycling.** The process by which textiles are cut, shredded, and opened into fibres that are usable for diverse applications.
- **Post-Consumer Textiles Waste (PCTW).** Textiles disposed of after consumption and use by citizens or end-users of commercial or industrial institutions and processed by a specialised textile sorter.
- **Post-Industrial Waste.** Textile waste generated from industrial processes is generally clean and of consistent fibre composition and is, therefore, easier to use as feedstock for new textiles.
- **Textiles and Apparel Sector (T&A).** The production of fibres, yarns, and textiles. The production and sale of garments is also referred to as the garment/fashion/apparel industry.
- **Textile-to-Textiles Recycling.** The process of recovering fibre, yarn or fabric and reprocessing the material into new textile products of high value.

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1. Introduction

The prevailing linear model of the textiles and apparel (T&A) sector results in unsustainable impacts on planetary boundaries (Loetscher et al., 2017; Pucker, 2023), including an estimated 8.1% of climate impacts (Quantis, 2018), of which 52% occur in the production phase (Beton et al., 2014). Problematic consumption and pollution of freshwater are increasing concerns, with textile production consuming 215 trillion litres annually and dyeing and finishing contributing to approximately 20% of global water pollution (Beton et al., 2014; Parhizgar, 2022). End-of-life mismanagement further exacerbates negative impacts. Within one year, an estimated half of new garments are discarded, of which 73% are disposed of in landfills or incinerators (EMF, 2017).

To protect the environment and its inhabitants, the textiles and apparel (T&A) sector must transition to a circular system in which textiles should never end up as waste (Syrett et al., 2023). In a circular system products are designed to be durable, recyclable, and made from safe, renewable, and recycled inputs (EMF, 2020).. Such a transition to circularity necessitates large-scale innovation facilitated by unprecedented levels of pre-competitive collaboration (Loetscher et al., 2017; Moorhouse, 2022; Reike et al., 2022).

A substantial body of academic research in the field of circular innovation encompasses distinct domains. Circular business model innovation (CBMI) involves ‘changes to what a firm offers, and to whom, how a firm creates and delivers the offering, and how it captures value’. Within the broader concept of circular ecosystem innovation (CEI) independent actors jointly create value via new technologies or value propositions (Konietzko, Bocken, & Hultink, 2020).

Circular-oriented innovation (COI) is an emergent area of research that examines combinations of product design, business models, and value network configuration to implement circular economy strategies (Brown, Daniels et al., 2020b). The concept of circular product design encompasses several strategies, including closing resource loops (Bocken et al., 2016). To transition to a circular system for T&A, accelerating technical innovation in industrial processes is essential (Loetscher et al., 2017; Roos et al., 2019).

The research objective for this case study is to understand how COI can be utilised by incumbent businesses to create a circular system, which prompted the research question: What are the determinants of success when incumbent businesses engage in COI?

2. Case Description

This case study examines a cluster of technological innovations, trademarked as RCO100, that solved limitations in fibre quality, yarn strength and durability associated with textiles made from mechanically recycled cotton fibres (Tekşen, 2019). This COI resulted in the successful commercial production of denim made entirely from recycled cotton fibres. In 2023, Kipaş Textiles produced approximately eight million metres of RCO100 denim. Notably, RCO100 remains the only 100% recycled cotton yarn certified under the Global Recycled Standard, a mark of transparency and quality (Textile Exchange, n.d.).

A lifecycle assessment of denim produced in Turkey using grid electricity found that denim made from mechanically recycled cotton reduced global warming potential (GWP 100 years) and water usage by 50% compared to denim produced with virgin cotton (Fidan et al., 2020). In the production of denim jeans, between 10% and 15% of the fabric is discarded as cutting waste. This relatively homogeneous waste is typically used for downcycling purposes, representing a missed opportunity to retain fibre value (Akı et al., 2020).

The unit of analysis for this study is the COI, which culminated in the RCO100 mechanical recycling system and the production of denim textiles from resultant 100% recycled cotton fibres. Initially made from cotton industrial waste, RCO100 denims were further developed to incorporate fibres recycled from post-consumer waste textiles (PCWT). The case spans from 2016, when technical research began, to 2023, when the RCO100 system became commercially available.

The RCO100 recycling system is the intellectual property of Säntis Textiles, developed in collaboration with Kipaş. Uniquely, this system yields cotton fibre lengths of 26 mm, 4-8 mm longer and more uniform in diameter than those produced by alternative recycling systems (Bramel, 2023; Radhakrishnan & Senthil Kumar, 2018). Kipaş also developed complementary patented technology for spinning recycled fibres

resulting in improved yarn strength (Tandoğan, 2022). The apparel retailer PVH Europe instigated this COI and provided sustained support, including supplying PCTW feedstock and a market for the final product. These focal businesses leveraged their technical expertise and capacities to innovate, implementing circular strategies to create an ecosystem for recycled denim.

By examining success determinants (SDs) in this rare instance of a successfully scaled COI in the T&A sector, insights gained may become instrumental for other incumbent firms or organisations seeking to scale innovations that contribute to realising a circular economy. A single case study can provide a valuable opportunity to test a framework derived from extant literature and establish a logic that may be applicable to other situations (Yin, 2012).

3. Methodology

The research was conducted in three phases, as shown in Figure 1. Phase one was a review of the background literature, from which initial COI SDs were identified. In phase two, desk-based research provided an understanding of the case and its context. The third phase consisted of primary interviews and a field visit to Kipaş in Kahramanmaraş, Turkey.

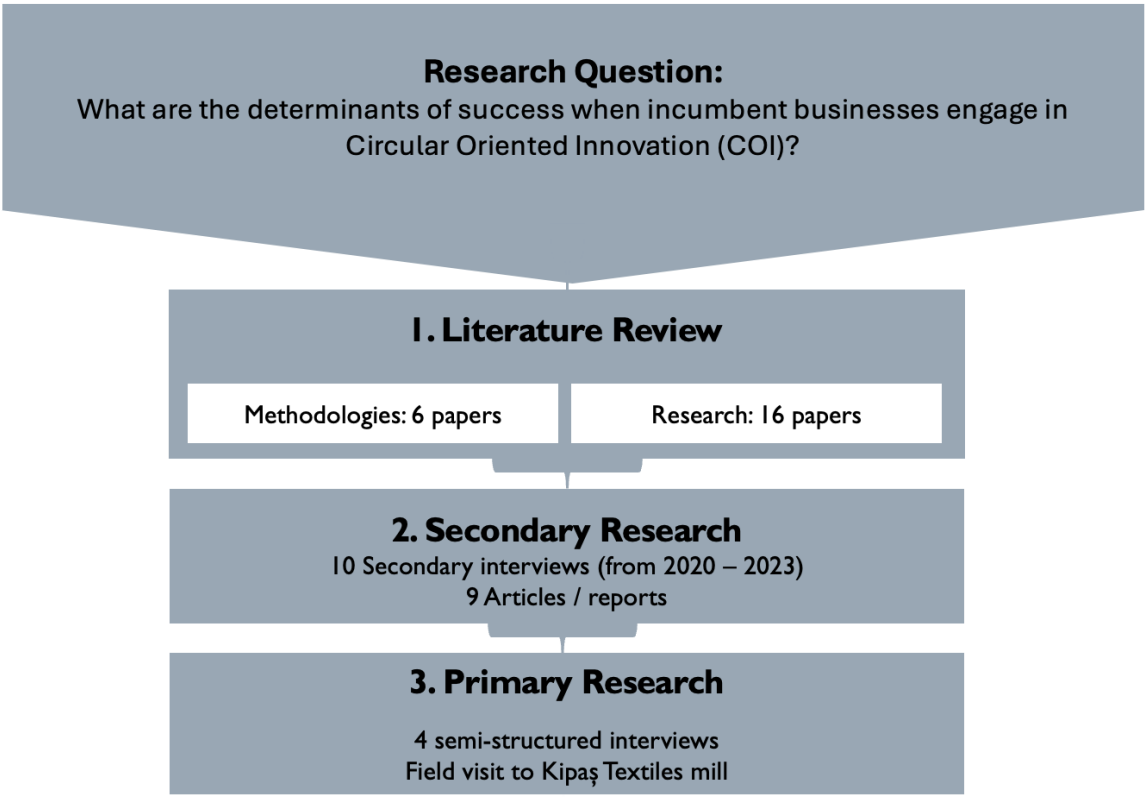

Fig 1. Research Methodology

3.1. Research Approach

This study adopted an interpretive approach to identify themes and transferable insights for theory development. The analysis employed a hybrid coding method, combining deductive codes derived from the literature framework with inductive codes emerging from the case data. This approach enabled the extraction of findings to formulate generalisable propositions and refine theoretical understanding (Bryman & Bell, 2015).

3.2. Data Collection and Analysis

The 10 selected secondary interviews with key actors from the businesses involved provide insights into the interviewees' leadership style, sustainability collaboration motives and their experience of the case COI. Additionally, nine archival CSR reports and articles were included to provide contextual data, together offering rich temporal data across the case duration.

Primary interviewees were selected for their close involvement in the case and their leadership and decision-making roles across the three focal businesses. Interviews were conducted in person, via video conference, or in writing when this aided fluency in English, following a semi-structured format that commenced with questions derived from the framework (see Appendix). This flexible approach facilitated the surfacing of additional themes and insights. Audio interviews were recorded and transcribed. Additionally, a field visit provided contextual understanding and relationship building. Appendix B contains all data source details.

Following data familiarisation, interviews were coded using Atlas.ti software with a hybrid approach: initial SDs codes derived deductively from the literature (see Table 1), while additional codes emerged inductively from the case data (Bryman & Bell, 2015). Data from primary interviews, secondary interviews, and archival documents was triangulated to strengthen validity (Yazan, 2015).

Codes were reviewed and clustered into themes, with insufficiently supported codes disregarded. Thematic analysis explored patterns and divergences between the framework and empirical data. While participant quotations support the findings, the interpretation reflects the researcher's own analysis, shaped by engagement with the data and relevant literature.

4. Literature Background

The Circular Economy (CE) replaces the linear concept of end-of-life with reducing, or alternatively reusing, recycling, and recovering materials in the processes of production, distribution, and consumption (Kirchherr et al., 2017). The Ellen MacArthur Foundation's influential 2017 vision for a new textile economy called for system-level change through unprecedented commitment, collaboration, and innovation. Specifically, innovation was called for in technologies that improve the economics and quality of recycling, and the development of safe new materials and processes that reduce resource use (EMF, 2017).

Transitioning to a CE requires incumbent firms to move beyond incremental innovation (R. Henderson, 2021; Johnson, 2022). COI could assist in unlocking systemic innovation that is more explorative and spans diverse complementary innovations, ultimately altering the architecture of systems of production and consumption (Brown, Bocken, et al., 2020a; R. M. Henderson & Clark, 1990).

Inherently collaborative, COI connects upstream and downstream actors to create circular ecosystems (Bigliardi & Filippelli, 2021; Tura et al., 2018). Brown, Daniels et al. (2020b, p2) define collaboration as, 'intentional interactions that include the sharing of information, resources, activities and capabilities between two or more organisations, directed towards the achievement of a common goal or purpose that could not be achieved individually'. COI research indicates the need for earlier, more intense, and wider collaborations (Brown et al., 2019).

4.1. What are the success determinants of COI?

While the CE has gained mainstream recognition, a substantial gap persists between ambition and implementation (Fraser et al., 2024). Engaging in COI is one lever for incumbent businesses to bridge that gap. However, the determinants of successful outcomes in this context remain insufficiently understood, potentially contributing to limited progress in realising the CE transition.

A Google Scholar search using the terms 'circular oriented Innovation', 'circular ecosystem innovation' and 'circular open innovation' yielded 87 papers. Given COI's nascent research status, this was deemed comprehensive. Papers were screened for relevance, resulting in 16 papers that were selected for detailed analysis. Four key papers were then selected based on research quality and theoretical depth: Brown et al. (2019) investigated conditions and motives for collaborative COI, Brown et al. (2020 a&b) researched optimal processes for COI and lastly, the principles of circular ecosystem innovation as identified by

Konietzko et al. (2020). These papers collectively provided rounded insights into key elements of COI success including motivational factors, operational processes and guiding principles. Success determinants were derived by synthesizing insights across these dimensions to create a framework (Table 1) for evaluating the RCO100 case and informing the primary interviews.

Table 1. COI Success Determinants

Authors		Brown et.al., 2019	Brown, Bocken et.al., 2020a	Brown, Daniels et.al., 2020b	Konietzko et. al., 2020
Motives	Organisational circularity goals (value creation)	●	●	●	
	Intrinsic motivation	●	●	●	
Partnerships	Partners aligned on a shared vision / purpose	●	●	●	●
	Knowledge sharing, co-development, collaboration know-how	●	●	●	●
	Trust and commitment		●	●	●
	Viable and scalable value capture model	●	●	●	●
	Agreements that incentivise fair value capture	●	●	●	●
	The 'right' partners (cultural compatibility and technical competencies)	●	●	●	●
	Completmentary COI competencies and resources	●		●	●
	Shared risk / risk tolerance		●	●	
	An optimal governance structure		●	●	
COI Process	Champion COI	●		●	
	Experimentation and iterative learning	●	●		●
	Early wins / proof of concept	●	●		
	Defined partner selection process	●		●	●

4.1.1. Motives Brown et al., (2019) researched motives for engaging in COI. They found a combination of intrinsic and extrinsic motives as optimal for both individuals and businesses: 'COI is commonly instigated either by an identified problem that generates a sense of responsibility or by an existing proof of CE that inspires actors to develop a CE vision and engage with COI' (Brown et al., 2019).

Individuals' intrinsic motives can stem from a sense of purpose, enjoyment of working with others who have a similar mindset, or the pursuit of knowledge. An organisation may want to accomplish circularity goals or develop innovation capabilities and competencies. Extrinsic motivators can include legislative compliance, securing competitive advantage, and specifically for individuals, status, recognition, and reward (Brown et al., 2019).

4.1.2. Partnerships Defining a clear COI vision before instigating a partnership helps both to identify and attract the right partners. The vision also provides an ongoing source of guidance and motivation, ensuring that partners pursue the same goal (Brown, Daniels, et al., 2020b; Brown et al., 2019; Konietzko, Bocken, Hultink, et al., 2020).

Partners with complementary COI capabilities, competencies and resources are a critical SD. CE-oriented competencies are the 'set of combined knowledge, skills and attitudes that enable achievement of successful task performance and problem-solving in accordance with CE principles' (Bertassini et al., 2021). CE-oriented capabilities are 'the ability to reconfigure, redirect, transform, shape and integrate existing core competencies with external resources, circular strategies and complementary assets to meet

the challenges of the CE' (Bertassini et al., 2021). Resources include finance infrastructure, process development, and technology (Hina et al., 2022; Tura et al., 2018)

COI projects can be effectively managed by establishing a governance structure and implementing partnership agreements. If a governance structure is directed by the instigating company, hierarchical control is maintained. Alternatively, a flatter governance structure centred on a consortium can make projects more difficult to manage but facilitates alignment, trust, and knowledge sharing (Brown, Bocken, et al., 2020a). A formal governance structure and agreements are recommended for partnerships involving competitors, greater risks, or core intellectual property (Brown, Bocken, et al., 2020a; Brown et al., 2019).

Formal agreements should define the value capture mechanisms of partners (such as intellectual property) and ensure a fair value capture, focusing on collective outcomes (Konietzko, Bocken, & Hultink, 2020). COI's longer-term perspective and purpose-driven nature require companies to incorporate non-financial mechanisms to better understand systemic impacts, which may mean looking beyond a conventional business case (Bogers et al., 2019).

4.1.3. COI Process

COI is not a linear process. Collaborators must be able to manage uncertainty and engage in experimentation, iterative learning, and eventually piloting and scaling up over an extended period (Brown, Daniels et al., 2020) which highlights the importance of the partner selection process. A formal selection process may be advisable when no or limited existing relationships are suitable or when there is a need to include competitors and cross-sector collaborators (Brown, Bocken et al., 2020; Konietzko, Bocken & Hultink, 2020). This has the advantage of supporting repeatability and standardisation. Selection criteria should be weighted towards the softer characteristics of organisational culture, including openness to change and COI (Brown, Daniels, et al., 2020b).

The COI process is greatly facilitated by having CE champions within partner businesses. COI champions provide leadership, engage others in the circular vision, propose collaborative strategies, unite stakeholders, and guide COI activities (Brown, Daniels et al., 2020b; Brown et al., 2019).

COI literature informing this research is clustered in the Netherlands, where government policy is supportive of CE initiatives. Brown et al. (2019) note it is important to test the accuracy of their findings in relation to specific product categories, sectors, and types of CE challenges.

5. Data Analysis and Interpretation

Table 2 presents the research results with primary and secondary interview codes are organised by theme and frequency of occurrence. Representative quotes from primary interviews illustrate the codes. Appendix B provides additional details for interviewees quoted in the discussion.

Table 2. Revised COI Success Determinants

	Code Occurance	Illustrative Quotes
Resources and Competencies	**134**	
Techncial R&D competencies		"Project partners were able to share know-how on matters requiring expertise. Researchers open to innovation at the R&D Centers within the companies were included in the project."
Infrastructure and finance		
Innovation		
Co-creative culture		"If something had to change on the machine, the guys from Kipas would go immediately. They can look at the issues, they can fix them, and they learn. And this makes us incredibly fast."
Continuous learning		
Leadership	**102**	
Collaborative leadership		"We wanted to share our learnings and our practices to make a change for everyone."
Purpose driven visionary leadership		
Persistence / determination		"We know that we have to be persistent, consistent, and then we see after three, four seasons, prices reduce, higher productivity, less second choice."
Intuitive (acts on partial information)		
Long term focus		
Process	**78**	
Experimentation and iterative improvement		"We are in a journey, we are experimenting and we have to build a reverse supply chain and bring these different stakeholders together. It was a conversation all the time. How do we do that?"
Capacity building		
Establish a co-creative learning environment		
Engage in innovation oriented learning		
Motive to Collaborate	**50**	
Sustainability leadership / sustainability champion		"Our partnership has played an essential role in enabling us to accelerate the production of [RCO100]. We hope we can serve as an example for the textile, and apparel industry, highlighting the expanded possibilities of alternative models that prioritise collaboration over working in isolation"
Partnerships accelerate progress (interdisciplinarity)		
Business case / market opportunity		
Partnerships	**49**	
Positive interpersonal relationships		"In any success story. It's not the companies or brands, it's people meeting together and pushing to the same direction."
Trust and aligned values		
Pre-competitive collaboration		"You connect people who never talked before each other, and it's sometimes extremely difficult because different business model, different expectations."
Clear agreements / shared risk		
Medium to high risk appetite		
< 15 codings		
15-30 codings		
31- 45 codings		
> 45 codings		

This case study sought to identify the relative importance of factors that determine the success of COI. The findings confirm that intensive collaboration is the overarching determinant, which cuts across all themes. The next insight is that the right resources and competencies are critical to successful COI. Whilst this may be self-evident, identifying SDs within this provides a guide for businesses embarking on COI.

A new insight is that relational skills are under-represented in the COI discourse and may be key to unlocking the scale of COI needed to create a CE. While Brown et al. (2019) identified entrepreneurial CE champions as a condition for COI, this research broadens and emphasises this point. A synthesis of the findings is shown in Figure 2, which depicts the elements of successful COI; each of these is discussed in the following sections.

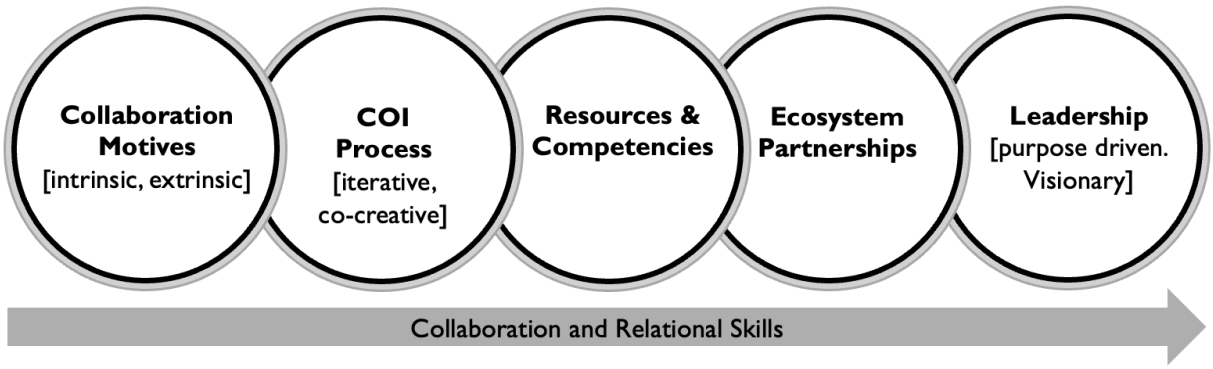

Fig 2. Identified COI Success Determinants

5.1. Resources and Competencies

Resource determinants include production capacity, physical infrastructure, and the financial and human resources to engage in COI. All participants considered the complementary resources and competencies of the partners as critical to success. Pascucci et al. (2024) confirmed this finding in concluding that COI relies on cross-functional and cross-sectoral knowledge processes including knowledge co-creation and inter or transdisciplinary knowledge.

A culture of continuous learning also supported the development and integration of competencies, many of which were not COI-specific but proved critical when aligned across the partnership. For example, technical competencies and R&D expertise. As one participant noted: 'Kipaş has a really strong R&D department, and they also helped a lot in the process of trialling everything '(P1).

5.2. Leadership

Collaborative, purpose-driven leadership was instrumental. Executive leaders were champions of sustainability and understood the role of circularity in delivering sustainable outcomes. P3 noted, 'This level of sharing for the greater good is new for us as well. Sometimes it feels uncomfortable that [the CEO] is driving us to share this information. He is the sustainability leader.' Conversely, when support at the executive level was weakened, COI was seen as a lesser priority, and progress stalled.

Leaders were also comfortable making intuitive decisions based on limited information. One CEO described the intuitive sense that a business partnership or strategy would prove successful as a 'click' (Tagouri, 2020), which facilitated quick decision-making and a risk tolerance. Risk tolerance - a firm's willingness to seize uncertain opportunities in the business landscape (Lumpkin & Dess, 1996), is a critical dimension of entrepreneurial orientation, particularly given the risks inherent in COI (Alcalde-Calonge et al, 2024). Firm with an entrepreneurial orientation are risk-taking, proactive and innovative (Miller, 1983), traits shown to promote circular innovation directly (Castro-Lopez et al., (2024)

Executive leaders instigated COI, allocated financial and human resources, and championed COI within and beyond their businesses, making the case that COI is both a critical lever for systems change and a long-term business opportunity.

Persistence and determination were also evident: 'And step by step, what I did is when I saw that we could scale it. I made a business case with the CSR department and even with the CEO. I really want to drive circularity to the next level' (P2). Persistence persuaded people to support the COI internally and facilitated finding solutions to numerous technical challenges. 'The whole team was 100% behind it from day one and worked day and night under difficult circumstances, even after the earthquake' (Oldershaw, 2023).

5.3. COI Process

The case data aligns with the determinants identified in the literature, except existing relationships removed the need for a defined partner selection process. Creating the right conditions for conducting COI experiments is important. Experimentation can solve technical challenges, refine solutions, and identify unintended impacts (Brown et al., 2019). Experiments should lead to a proof of concept and, ideally, early wins that enable all partners to recognise the benefits quickly (Bocken et al., 2018; Boons & Lüdeke-Freund, 2012; Konietzko, Bocken, & Hultink, 2020)

Kipaş spinning sufficiently strong yarns from mill waste recycled in a prototype RCO100 machine provided proof-of-concept. Iterative improvements to the recycling and spinning processes followed. Trials for post-consumer fibre content required additional adaptations and a new reverse logistics partnership. 'We [recycled] industrial waste at the beginning, and we introduced post-consumer recycled waste step by step, and we played with different percentages. So, we were really part of the R&D team, it was a permanent communication with how we can push the needle' (P2).

Flexibility was evident throughout, with strategies and targets evolving as the COI progressed and the partners engaged in capacity building; for example, 'You engage with different parts of the industry, you create your own targets, and you keep evolving them', and 'I wrote the roadmap. This is what we're going to do, this is the target we have for the next five years - and measuring every six months where we are regarding the targets and step-by-step engaging different [partners], to keep us on course' (P2).

5.4. Motives to Collaborate

The case data confirms that a combination of intrinsic and extrinsic motives was effective. All participants were motivated by an awareness of sustainability challenges, with one noting that in pursuing circularity prized 'reputation and respect for the future are prioritised rather than making money.' (P4). This ethos extends beyond the case ecosystem to collaborate and share knowledge to create systemic change, epitomised by 'I want to be part of the transformation of the whole industry, to work out how we can shape it in a new way. I'm here to engage the top players in the industry to [conduct business] in the right way for workers and the environment' (A1). Leaders (or champions) motivate others either through making a business case or developing organisational awareness of broader benefits (P2, P3).

Commercial and circularity motives could be seen as complementary: 'I realised that building CR into our sourcing strategy and business processes and holding ourselves accountable would be vital to remaining commercially successful' (PVH Corp, 2016). Customers (brands) rather than legislation drove external pressure for Kipaş and Säntis to engage in COI (P4).

5.5. Partnerships

Brown et al. (2020a) found that partners must align on a shared purpose, vision, and joint goals and have a shared understanding of key concepts. This was confirmed: 'We need to be strong and have a clear vision but also build together and involve others whose expertise can shape things' (P2). Each focal business leveraged its existing networks, seeking partners with similar values that aligned with circularity.

Positive interpersonal relationships and trust built through demonstrated competence and integrity were also important (Konietzko, Bocken, & Hultink, 2020). Brown, Daniels, et al. (2020b) found that inter-organisational trust can be achieved through formal commitment, length and frequency of positive experience, institutional security, and legitimised self-interest. This aligns with Alcalde-Calonge et al.'s (2024) research which shows that social capital - interpersonal relationships within a firm and with its external partners – is core to predicting high adoption levels of CE practices, when coupled with adaptive capacity and an entrepreneurial culture.

Trust is a prerequisite for knowledge sharing, which can be in conflict with competitive advantage. Developing shared knowledge bases supports a shared vision and ensures optimal use of the organisation's respective knowledge (Brown, Daniels, et al., 2020b). Also, in alignment with the framework, a medium-to-high risk appetite and mechanisms to share risk fairly were also identified.

Existing relationships negated the need of formal agreements early in the case COI. However, IP contribution created inherent tensions between collaboration and competition, emerging as an area that requires clear agreements given the importance to partners' value creation models. These dynamics are

corroborated in Capponi et al. (2025), who identify tensions between protecting IP vs diffusing circular innovation within COI ecosystems.

6. Research Limitations

This case study explores a single instance of circular-oriented innovation. Success determinants may vary depending on the context and type of innovation. As such, findings may not be directly generalisable across the T&A sector or broader industry. Future studies could test these insights in different organisational or regional settings to strengthen applicability.

Some secondary interview data were descriptive in nature and not directly aligned with the research question. This limitation was addressed through triangulation with primary interviews and a field visit, which offered more targeted insights.

As a qualitative study, the research also reflects the researcher's interpretation of the data. While efforts were made to minimise bias through methodological rigour and data triangulation, the influence of the researcher's positionality and professional background may have shaped the framing and analysis.

7. Conclusions and Recommendations

This case study tested a framework for successful COI in the T&A sector. While the case confirms the SDs identified in the literature, their relative importance differs, and additional insights emerged from the research.

The findings suggest that business leaders should approach COI as a strategic opportunity, allocate resources accordingly, and collaborate with partners that offer complementary competencies and capacities. Collaboration between actors across the full value chain is critical to COI, particularly between brands and their suppliers. The right mix of complementary resources and competencies within the COI ecosystem was also critical to success, with technical and R&D expertise paramount.

The most significant new insight derived from the case is the central role of relational skills in determining successful COI outcomes. While this logically stems from the collaborative nature of COI, it remains underexplored in the literature. This may indicate that foundational determinants of COI are not yet fully understood, and that this gap could be contributing to slow progress in circular economy (CE) adoption.

Based on these findings, the study proposes the following hypothesis for future research: **The development and application of leadership, collaborative, and relational skills are critical determinants of successful COI.**

COI is an important lever for the systems-level change needed to reduce the unsustainable impacts the current linear T&A sector has on planetary boundaries. This study provides valuable insights for businesses, academics, and CE facilitators seeking to create circular systems not only within textiles, but across other resource-intensive sectors.

7.1. Recommendations for CE Facilitators and Policy Makers

Forums that bring potential partners together in a pre-competitive context facilitate COI. In orchestrating these, equal consideration should be paid to partnerships' hard and soft characteristics. For example, bridging cultural gaps, establishing trust, exploring motives, and identifying champions or leaders with the necessary relational skills in addition to resources and competencies.

Policy makers can enable this ecosystem by clarifying the legal boundaries of pre-competitive collaboration, particularly in relation to anti-trust legislation, and by providing accessible frameworks or model agreements to help manage shared intellectual property and ensure equitable value creation. Policy interventions could also incentivise collaboration through public–private partnerships that align innovation outcomes with circular economy goals.

Given that technical innovation is inherent in COI within the T&A sector, facilitators and policymakers should also work to identify and address systemic competency gaps. This may be achieved through

targeted education and workforce development programmes, as well as support for partnerships with academic and research institutions to accelerate knowledge transfer and capacity building.

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Declarations

Competing interests The author is employed by an apparel business which is a customer of Kipaş Textiles denim division.

References

Akı, S. U., Candan, C., Nergis, B., & Önder, N. S. (2020). *Understanding Denim Recycling: A Quantitative Study with Lifecycle Assessment Methodology*. www.intechopen.com

Alcalde-Calonge, A., Ruiz-Palomino, P., & Sáez-Martínez, F. J. (2024). Fostering circular economy in small and medium-sized enterprises: The role of social capital, adaptive capacity, entrepreneurial orientation and a pro-sustainable environment. *Business Strategy and the Environment*. https://doi.org/10.1002/bse.3948

Bertassini, A. C., Ometto, A. R., Severengiz, S., & Gerolamo, M. C. (2021). Circular economy and sustainability: The role of organizational behaviour in the transition journey. *Business Strategy and the Environment*, *30*(7), 3160–3193. https://doi.org/10.1002/bse.2796

Beton, A., Dias, D., Farrant, L., Gibon, T., Le Guern, Y., Desaxce, M., Perwueltz, A., Boufateh, I., Wolf, O., Kougoulis, J., Cordella, M., & Dodd, N. (2014). *Environmental Improvement Potential of textiles (IMPRO Textiles)*. https://doi.org/10.2791/52624

Bigliardi, B., & Filippelli, S. (2021). *Investigating Circular Business Model Innovation through Keywords Analysis*. https://doi.org/10.3390/su13095036

Bocken, N. M. P., de Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, *33*(5), 308–320. https://doi.org/10.1080/21681015.2016.1172124

Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). *Experimenting with a circular business model: Lessons from eight cases*. https://doi.org/10.1016/j.eist.2018.02.001

Bogers, M., Chesbrough, H., & Strand, R. (2019). Sustainable open innovation to address a grand challenge : Lessons from Carlsberg and the Green Fiber Bottle. *British Food Journal*

Boons, F., & Lüdeke-Freund, F. (2012). *Business models for sustainable innovation: state-of-the-art and steps towards a research agenda Keywords: Sustainable innovation Sustainable business model Business model for sustainability Literature review Research agenda*. https://doi.org/10.1016/j.jclepro.2012.07.007

Bramel, S. (2023). ITMA, the epitome of work in progress. *Inside Denim*, 14. https://insidedenim.com/Features/166694

Brown, P., Bocken, N., & Balkenende, R. (2019). Why do companies pursue collaborative circular oriented innovation? *Sustainability (Switzerland)*, *11*(3). https://doi.org/10.3390/su11030635

Brown, P., Bocken, N., & Balkenende, R. (2020). *How Do Companies Collaborate for Circular Oriented Innovation?* https://doi.org/10.3390/su12041648

Brown, P., Daniels, C. Von, Bocken, N. M. P., & Balkenende, A. R. (2020). *A process model for collaboration in circular oriented innovation*. https://doi.org/10.1016/j.jclepro.2020.125499

Bryman, A., & Bell, E. (2015). *Business Research Methods* (Fourth). Oxford University Press

Capponi, G., Castaldi, C., & Piscicelli, L. (2025). Beyond business as usual? How organisations navigate tensions between CE and intellectual property rights. *Industry and Innovation*, *32*(1). https://doi.org/10.1080/13662716.2024.2449262

Castro-Lopez, A., Entrialgo, M., Liao, C. T., & Santos-Vijande, M. L. (2025). Towards circular economy through innovation: the role of entrepreneurial orientation and human resource management. *International Entrepreneurship and Management Journal*, *21*(1). https://doi.org/10.1007/s11365-024-01032-x

Creswell, J. W. (2013). *Qualitative Inquiry & Research Design, Choosing Among Five Approaches* (L. Habib, Ed.; Third). Sage Publication, Inc

EMF. (2017). *A New Textiles Economy: Redesigning Fashion's Future*. https://ellenmacarthurfoundation.org/a-new-textiles-economy

EMF. (2020). *Vision of a Circular Economy for Fashion*. https://emf.thirdlight.com/link/nbwff6ugh01m-y15u3p/@/preview/1?o

Fraser, M., Conde, A., & Haigh, L. (2024). *Circularity Gap Report 2024*. https://www.circularity-gap.world/2024#download

Henderson, R. (2021). Innovation in the 21st century: Architectural change, purpose, and the challenges of our time. *Management Science*, *67*(9), 5479–5488. https://doi.org/10.1287/mnsc.2020.3746

Henderson, R. M., & Clark, K. B. (1990). Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. *Administrative Science Quarterly*, *35*(1), 9. https://doi.org/10.2307/2393549

Hina, M., Chauhan, C., Kaur, P., Kraus, S., & Dhir, A. (2022). Drivers and barriers of circular economy business models: Where we are now, and where we are heading. *Journal of Cleaner Production*, *333*. https://doi.org/10.1016/j.jclepro.2021.130049

Johnson, E. (2022). Closing competency gaps for circularity: Exploring partner dynamics for circular-oriented innovation. *Sustainable Production and Consumption*, *34*, 130–147. https://doi.org/10.1016/j.spc.2022.08.029

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation & Recycling*, *127*, 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Konietzko, J., Bocken, N., & Hultink, E. J. (2020). Circular ecosystem innovation: An initial set of principles. *Journal of Cleaner Production*, *253*. https://doi.org/10.1016/j.jclepro.2019.119942

Konietzko, J., Bocken, N., Hultink, E. J., Hultink@tudelft, H. J., & Nl, E. J. H. (2020). *A Tool to Analyze, Ideate and Develop Circular Innovation Ecosystems*. https://doi.org/10.3390/su12010417

Loetscher, S., Sommerau, C., Switzerland, W., Kreis, B., Ch, M., Häuser, L., Lichnofsky, J., Haake, J., Oettli, D., Wille, S., Gyssler, C., Maechler, T., Graf, M., Gassmann, F., Tobler, M., Liedke, A., Germany, W., Johansson, K., Sweden, W., … Jeffries, B. (2017). *Changing fashion: The clothing and textile industry at the brink of radical transformation*

Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the Entrepreneurial Orientation Construct and Linking It to Performance. *The Academy of Management Review*, *21*(1), 135–172. https://doi.org/10.2307/258632

Miller, D., (1983). The Correlates of Entrepreneurship in Three Types of Firms. *Management Science 29(7):770-791*. https://doi.org/10.1287/mnsc.29.7.770

Moorhouse, D. (2022). Circular economy in fashion and textiles. *International Journal of Sustainable Fashion & Textiles*, *1*(2), 169–173. https://doi.org/10.1386/sft_0009_2

Myers, M. D. (2013). *Qualitative Research in Business and Management: Vol. 2nd Edition* (2nd ed.). Sage

Oldershaw, O. (2023). Säntis Textiles - RCO100 - With Temasn - ITMA June 2023 Swinsol Kipas Interviews & Specs. In *YouTube*. Edrme. YouTube. https://www.youtube.com/watch?v=M_Bw4oaoi30

Parhizgar, F. (2022). *The Water Risks and Opportunities Facing Apparel and Textiles Clsters*. https://wwfint.awsassets.panda.org/downloads/avant_garde___the_water_risks_and_opportunities_facing_textile_and_apparel_clusters.pdf

Pascucci, S., Ooi, Y.M., Husted, K., (2024). Designing the Internal Organization for Circular Economy Innovation: A Knowledge Governance and Microfoundations Approach, *Journal of Innovation Management,12(2), 142-170*. https://doi.org/10.24840/2183-0606_012.002

Pucker, K. (2023). A Circle That Isn't Easily Squared. *Stanford Social Innovation Review*, *Summer*. www.ssir.org

PVH Corp. (2016). *CR Report 2016*. https://www.pvh.com/-/media/Files/pvh/responsibility/PVH-CR-Report-2016.pdf

Quantis. (2018). *Measuring Fashion 2018: Environmental Impact of the Global Apparel and Footwear Industries*

Radhakrishnan, S., & Senthil Kumar, V. A. (2018). *Recycled Cotton from Denim Cut Waste* (pp. 53–82). https://doi.org/10.1007/978-981-10-8515-4_3

Reike, D., Hekkert, M. P., & Negro, S. O. (2022). *Understanding circular economy transitions: The case of circular textiles*. https://doi.org/10.1002/bse.3114

Robson, C. (2011). *Real World Research* (Third). Wiley

Roos, S., Larsson, M., & Jönsson, C. (2019). *Supply Chain Guidelines: Vision and Ecodesign Action List*. www.ri.se

Stahal, W. R. (2019). *The Circular Economy: A users Guide*. Routledge

Syrett, H., Lammas, F., Designer, S. L., Daniel, S., Illustrator, S., & Rewell, J. (2023). *The GFA Monitor 2023*

Tagouri, N. (2020). Making High Risk Decisions Like a CEO, with Daniel Grieder. In *The Process*. At Your Service Media. https://podcasts.apple.com/gb/podcast/the-process-of-making-high-risk-decisions-like/id1657893922?i=1000588694512

Tandoğan, G. (2022). *A yarn obtained from textiles waste with improved strength and durability properties* (Patent 2022/016479). https://www.turkpatent.gov.tr

Tekşen, A. S. (2019). *Fabric made from 100% recycled cotton yarn* (Patent 2019/22859). https://www.turkpatent.gov.tr

Textile Exchange. (n.d.). *Recycled Claim Standard (RCS) + Global Recycled Standard (GRS)*. Retrieved December 22, 2023, from https://textileexchange.org/recycled-claim-global-recycled-standard/

Tura, N., Hanski, J., Ahola, T., Ståhle, M., Piiparinen, S., & Valkokari, P. (2018). *Unlocking circular business: A framework of barriers and drivers*. https://doi.org/10.1016/j.jclepro.2018.11.202

Yazan, B. (2015). The Qualitative Report Three Approaches to Case Study Methods in Education: Yin, Merriam, and Stake. *Teaching and Learning*, *20*(2), 134–152. http://nsuworks.nova.edu/tqr/vol20/iss2/12

Yin, R. K. (2012). *Applications of Case Study Research* (Vol. 3). Sage Publications.

Appendices

Appendix A.

Primary Interview Core Questions (shortened, sample)

Motivations
When this collaboration began, had your business set circularity or sustainability goals?
What motivated you to be involved in the development of RCO100?
Did you foresee any benefits for yourself, your business or the sector if RCO100 was successful?
What was the initial vision for this project and did this change over time?
COI Process
How would you describe the benefits and challenges your organisation experienced throughout the COI process?
Was there a primary champion for RCO100?
Were there any 'early wins'?
Partnerships
On what criteria did were RCO100 partners chosen?
How would you describe the 'cultural fit' between your business and that of the partner businesses?
What agreements governed collaboration?
What capababilities and resources did each partner bring to this COI?
What level and type of risk(s) your business take and how was risk shared?
Success determinants
What determined the success of this collaborative circular innovation?
What skills, capabilities or knowledge were required?
What are the most significant learnings you would take from this COI?
Impacts
How do you measure the impact of this COI?

Appendix B.

Data Sources

Table 1. Primary Interviews

Partcipant number	Role	Business	Expertise	Country Base
P1	Managing Director	Säntis Textiles	RCO100 development, Marketing	Singapore, Switzerland
P2	Former Vice President of Denim	PVH Europe	Denim, Marketing, Circularity	Netherlands
P3	General Manager	Kipaş Holding	Textiles Enineering, Recycling	Turkey
P4	R&D Manager	Kipaş Holding	Textiles Engineering, Recycling, Sustainability	Turkey

Table 2. Secondary Interviews

In Text Reference	Interviewee	Role	Business	Reference
S1	Daniel Greider	CEO	PVH Europe	Tagouri, N. (2020, June 24). *Making High Risk Decisions Like a CEO* [video]. YouTube. https://www.youtube.com/watch?v=F52MoWj3kOg&t=4s
S2	Halit Gumulser	CEO	Kipaş Holding	Kılıçkan, T (Host). (2023, March 30). *Episode 403: Türkiye-Syria Earthquake with Kipas Denim's Halit Gümüşer* [Podcast]. In *Bluecast by Tencel / Carved in Blue*. https://www.buzzsprout.com/1639444/12517846-blue-cast-ep-403-turkey-syria-earthquake-with-kipas-denim-s-halit-gumuser
S3	Cem Erdogrul	Managing Director	Temsan Air	Oldershaw, O. (2023, May). *Santis Textiles - RCO100 - With Temasn - ITMA June 2023 Swinsol Kipas Interviews & Specs* .YouTube. https://www.youtube.com/watch?v=M_Bw4oaoi30
S4	Halit Gumulser	CEO	Kipaş Holding	
S5	Annabelle Hutter	Managing Director	Säntis Textiles	
S6	Stefan Hutter	CEO	Säntis Textiles	
S7	Cem Erdogrul	Managing Director	Temsan Air	Baykut, I. (2023, August). Recycling is Essential in the Sector for Sustainable Textile Production. *Ekoful*, 18–23. https://ekofull.com/product/ekofull-agustos-2/
S8	Halit Gumulser	CEO	Kipaş Holding	
S9	Annabelle Hutter	Managing Director	Säntis Textiles	Kılıçkan, T (Host). (2023, March 30). Säntis Textiles - RCO100 [Podcast]. In *Bluecast by Tencel / Carved in Blue*. https://www.buzzsprout.com/1639444/13475769-blue-cast-ep-409-santis-textiles-rco100
S10	Halit Gumulser	CEO	Kipaş Holding	Bramel, S. (2023, October 17). It is Vital to Invest in New Ideas. *Inside Denim*, 14. https://insidedenim.com/Features/166694

Table 3. Reports and Articles

In Text Reference	Reference
R1	PVH Corp. (2016). *CR Report 2016*. https://www.pvh.com/-/media/Files/pvh/responsibility/PVH-CR-Report-2016.pdf
R2	PVH Corp. (2017). *CR Report 2017*. https://www.pvh.com/-/media/Files/pvh/responsibility/PVH-CR-Report-2017.pdf
R3	PVH Corp. (2018). *CR Report 2018*. https://www.pvh.com/-/media/Files/pvh/responsibility/PVH-CR-Report-2018.pdf
R4	PVH Corp. (2019). *CR Report 2019*. https://www.pvh.com/-/media/Files/pvh/responsibility/PVH-CR-Report-2019.pdf
A1	Editor (2020, September 1st). Tommy Hilfiger Defines Circularity and Inclusivity Targets. *Inside Denim*. https://insidedenim.com/News/155527
A2	Editor (2023, October 31st). ITMA, the epitome of work in progress. *Inside Denim*. https://insidedenim.com/Features/166694
A3	Ergogrul, C (2023, August). Temsan is a World Brand. Ekofu/ Issue 10. https://ekofull.com/agustos/mobile/index.html
A4	George, S (2019, January 23rd). Tommy Hilfiger unveils 'world's first' 100% recycled luxury jeans . *Edie*. https://www.edie.net/tommy-hilfiger-unveils-worlds-first-100-recycled-luxury-jeans/