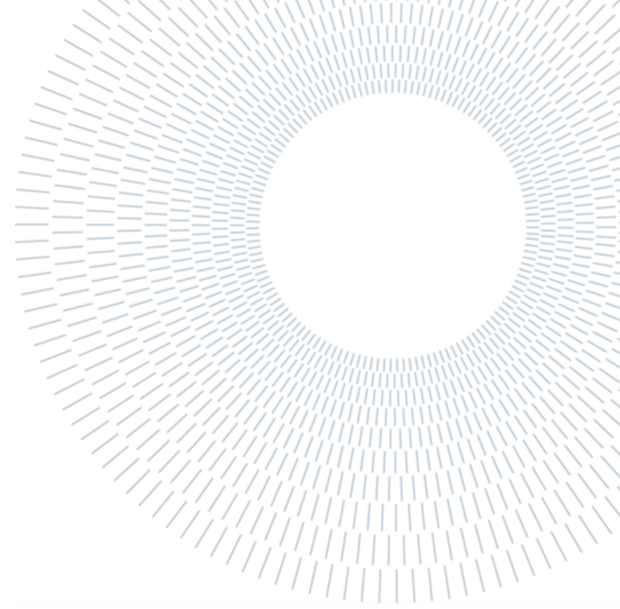




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EXECUTIVE SUMMARY OF THE THESIS

# Circular economy & new product development in the fashion industry: a multiple-case study analysis on the role of collaborations

MASTER OF SCIENCE'S DISSERTATION IN MANAGEMENT ENGINEERING

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## 1. Introduction

Nowadays, companies are being forced to pay more attention to sustainability as a result of global population growth, climate change, land and water shortages. Among them, the fashion industry is one of the most polluting and waste-producing industries, as it relies heavily on non-renewable resources, chemicals, and water, as well as trillions of plastic microfibers in its manufacturing process. The environmental impact is visible at various stages of supply chain, from sourcing of raw materials to end of life products. Sustainability and responsible production have become increasingly significant, entailing a shift in fashion companies' business models from linear to circular. Indeed, Circular Economy (CE) was developed to describe economic systems that minimize resource usage, as well as reduce energy waste and pollution, in order to achieve sustainable development.

There are different barriers for the implementation of CE practices inside fashion firms. It is

challenging to change customers' behavior and explain the need for a change. Moreover, the apparel sector's supply chain is quite complicated, with various players and interconnected processes. Despite these limitations, fashion firms have recently undertaken several initiatives to reduce, reuse, and recycle waste and to employ resources efficiently. Secondhand clothing and rental actions, as well as the treatment of textile waste and discarded resources, are becoming increasingly important.

In this context, sustainability requires the participation of a variety of players, such as suppliers, retailers, manufacturers, and fashion bureaus, as well as post-consumer actors, service providers, and independent experts. Collaboration can thus emerge as a tool in the transition from linear to circular business model.

Furthermore, the implementation of CE must take into account a number of factors in product development and production, and a new product design implies changes in the innovation process. The goal of this study is to establish a new framework that integrates the fundamental CE

practices with the new product development (NPD) process in the fashion sector, understanding how and why CE in a firm affects the innovation process. It also highlights all actors participating in this transition. The analysis has been conducted by considering different case studies in the fast fashion and luxury industries separately, to figure out whether and how the two groups' features have different effects on the adoption of CE practices.

## 2. Literature review and research purpose

The fashion industry has traditionally been associated with excessive consumption, and the present linear system uses a significant amount of resources, creating environmental damages. In this context, CE represents the main response to achieve sustainable development. It is designed to regenerate itself by employing organic or renewable materials that can be reused and re-entered into the biosphere at the end of their life cycle, as well as technical or non-renewable materials that can be moved cyclically from manufacture to consumption.

A linear system – take, manufacture, and dispose – is clearly resource-intensive, whereas CE allows current demands to be satisfied without jeopardizing future generations. Its adoption requires business model transformation, and Supply Chain Management (SCM) develops as a vital component for creating, capturing and transferring value to shift it from linear to circular. Circular SCM attempts to arrange business activities to shut, delay, intensify, narrow and dematerialize material and energy loops, therefore reducing resource input and waste and improving system performance and efficiency. Finally, in order to execute CE, collaboration is essential. According to Yang et al. (2018), *"making supply chains circular cannot be achieved by a specific company, as it requires collaboration between organization across supply chains and other stakeholders from similar and/or different sector"*[1]. Additionally, to achieve circularity, the NPD process requires changes that can be achieved through innovation. Circular practices applied in NPD may assist firms in obtaining environmental and economic benefits like optimizing raw material and energy utilization, reducing water use, improving waste management, while also

lowering production costs [2]. Collaborations play a key role also in this part. Indeed, rather than relying solely on their own expertise, businesses today should ask for external knowledge. That is the reason why the concept of Open Innovation has evolved, requiring collaboration between organizations that rely on one another to generate and extract value.

Based on a review of the literature, it has appeared that just a few investigations have looked into the conjunction of the NPD process and CE in depth. Furthermore, the transition from a linear to a circular business model is becoming increasingly important in the fashion industry, but there is little evidence of how fast fashion and luxury brands are dealing with this change and what role their partners play.

Addressing the main literature gaps, the purpose of this study is to find an answer to the following research questions:

**RQ1:** How and why companies transform their product development process to implement CE?

**RQ2:** Are collaborations enablers in the implementation of CE practices within the innovation process?

## 3. Theoretical framework

The initial theoretical framework has been built by combining several contributions within the literature. Regarding the NPD innovation process, the Stage-Gate model assessed by Franzò et al. [3] has been adopted. It is divided into three stages:

- 1) Idea generation - idea, preliminary assessment, and concept: the supply of raw materials as well as the product design are fundamental for the conception of circular products.
- 2) Product development - development, testing, trial: companies interact with the whole network of partners in the supply chain and the degree of circularity of products would be assessed and verified.
- 3) Commercialization - launch: it is the marketing phase where companies have to communicate the new circular characteristics to consumers.

On the other hand, when it comes to the CE, the Kalmykova model [4] has been taken into consideration, which covers the circular practices linked with the various stages of the value chain

(material sourcing, design, manufacturing, distribution and sales, consumption and use, and collection and disposal). The model has been therefore simplified since some practices presented

- are not specific with what is actually implemented by fashion companies;
- are similar with other practices;
- are unrelated to sustainable and circular principles;
- have a consumer rather than a business perspective.

The data obtained from the analysis of the case studies have allowed to combine the two models (Table 1) in a unique matrix in order to answer the research questions.

CE practices		New product development		
Material Sourcing	Diversity and Cross-sector linkages	Idea generation	Idea	
	Green Procurement		Preliminary assessment	
	Life Cycle Assessment		Concept	
	Functional Recycling		Development	
	Upcycling		Testing	
Design	Customization/made to order	Product development	Trial	
	Design for Disassembly/Recycling		Commercialization	Launch
	Eco Design			
	Reduction			
Manufacturing	Energy Efficiency			
Distribution & Sales	Optimized Packaging Design			
	Redistribute and Resell			
Consumption & Use	Eco-labelling			
	Product labelling			
	Virtualize			
Collection and Disposal	Incentivize Recycling			
	Logistics/Infrastructure			
	Take-back and Trade-in System			

Table 1. Theoretical models used to develop the final theoretical framework. At the end the practices should be associated with the NPD steps

In addition, collaborations have been taken into account when developing the framework. The intersections of the matrix represent where partnerships are located, showing the link between the NPD and the circular practices implemented by a firm.

## 4. Methodology

For this dissertation, it has been decided to continue with a multiple case study research. This has made it easier to comprehend the differences and similarities between cases by examining data in each circumstance and across situations. It has been useful for dealing with complicated organizational, managerial, and business issues that were difficult to investigate using quantitative methods. The qualitative method has provided for more flexibility in knowledge design, making it

better suited to modeling the difficulties of a multidisciplinary phenomenon like the CE. The embedded method has been chosen as case study design [5], since it separates the study into multiple components, each of which evaluates the scenario from a different perspective. The evidence has been then linked together to create a full picture of the outcome.

The theoretical replication approach has been used to pick the various case studies. In this context, the outcomes of the chosen scenarios may differ and/or disagree and so two or three sets of three or four cases have been selected. In order to attain adequacy in the research, intensity case studies have been chosen as sample strategies, which mean selecting scenarios having a lot of information. The fashion companies that implement CE procedures have been picked as a criterion for inclusion. As a result, GUESS, H&M, and Benetton have been chosen as fast fashion labels, while Burberry, Gucci, and Stella McCartney have been chosen as luxury brands.

Triangulating data sources have been used to gather the information needed for the study, obtaining precise data and robustness in the final results. Open-ended and semi-structured interviews, illustrative material (primarily sustainability reports) and on-site observations have been the most common data sources.

To display and process the information, it has been decided to use meta-matrices, in which rows contain multiple rows and columns contain multiple columns. These display data from various sources that are comparable. Meta-matrices are effective when the focus is on data triangulation.

## 5. Results

### 5.1. Qualitative data analysis

To create the final framework, data from the various case studies have been processed through matrixes. The investigation has highlighted the significance, influence on the NPD process, and potential collaborations of each practice. These have been divided into:

- Common practices - *diversity and cross-sector linkages, green procurement, optimized packaging design, eco-labelling, reduction, redistribution and resell* – that are common to most or all six cases. These practices create a pattern among fashion companies,

not differentiated by brand type. For this reason, they have been considered when constructing the final framework.

- Partially common practices – *eco design, product labelling, energy efficiency, life cycle assessment, take-back and trade-in system, design for disassembly/recycling* - that are implemented by fewer companies. Their consideration for the final framework has depended mainly on the relevance of the specific practice.
- Single-case practices – *customization/made to order, incentivize recycling, virtualize, logistics/infrastructure building* - that are implemented by individual firms. They have not been included in the final model since they are unique, carried out by distinct businesses, and, in most situations, not prompted by collaborations.

Idea Generation		
<i>Idea</i> Diversity and cross-sector linkages Customization	<i>Preliminary</i> Diversity and cross-sector linkages Green procurement Life cycle assessment Functional recycling Eco-labelling Upcycling	<i>Concept</i> Optimized packaging design Product labelling Customization Eco-labelling
Product Development		
<i>Development</i> Optimized packaging design Eco design Reduction Energy efficiency Design for disassembly/recycling	<i>Testing</i> Customization	<i>Trial</i>
Commercialization		
<i>Launch</i> Product labelling Eco-labelling Redistribution and resell		
Logistics/infrastructure Take-back and trade-in system Incentivize recycling Virtualize		

Table 2 CE practices associated with the different steps of NPD

After reviewing all of the practices used by the six cases, they have been assigned to the NPD phases (Table 2). Some practices have been associated to more than one stage as they are employed in a variety of scenarios throughout the NPD process, offering valuable information or resources.

### 5.2. Adoption of CE practice and collaborations

The analysis has indicated no significant variations in the ratio of practices adopted at various stages of NPD between the two clusters of investigated companies, i.e. fast fashion and luxury firms. The idea generation phase is the most impacted in both cases, followed by product development and finally commercialization. When looking at the

idea generation step in more depth, it can be observed that the impact on the idea phase is the same for the two units of analysis (14% of practices implemented), increasing in the preliminary assessment, with a slightly higher value for luxury companies (52% against 48% in fast fashion companies). For the concept phase, the situation is reverse, with 38% of practices implemented by fast fashion versus 33% for luxury brands. Regarding product development, the situation is identical, with all practices implemented in the development step, while the trial and testing phases have no impact in the transition to a circular business model. No comparisons have been made for commercialization, since the launch is the only phase considered.

The same results have been obtained for collaborations. For both clusters, forming partnerships is critical: luxury and fast fashion firms must collaborate on 85% and 75% of applied practices, respectively. The remaining part is mainly associated with activities like *product labelling*, which do not show any evident need for collaborations.

As a result, the same framework can be used for the two units of analysis.

## 6. Interpretation of findings

The new framework considers the main CE practices that have arisen from the six scenarios in the rows, which are linked to the value chain phases in the columns (Table 3). Indeed, qualitative analysis has enabled the identification of the most often used business practices, as well as the exclusion of those that are either not employed by businesses or unnecessary to the study's purpose. The framework also emphasizes collaboration, particularly the role it plays in fashion firms' transition from a linear to a CE, confirming what the literature review has revealed. Despite the fact that the differences between fast fashion and luxury companies are minimal, the final framework underlines some behaviors that necessitate collaboration in luxury companies but are not required in fast fashion companies, and vice versa.

	Idea generation			Product development			Commercialization
	Idea	Preliminary assessment	Concept	Development	Testing	Trial	Launch
<b>1. Material sourcing</b>							
Diversity and cross-sector linkages	X	X					
Green procurement		X					
Life Cycle Assessment		X					
<b>2. Design</b>							
Design for disassembly/recycling				X*			
Eco design				X			
Reduction				X			
<b>3. Manufacturing</b>							
Energy efficiency				X			
<b>4. Distribution and sales</b>							
Optimized packaging design			X	X			
Redistribute and Resell							X
<b>5. Consumption and use</b>							
Eco-labelling	X	X					X
Product labelling		X					X
<b>6. Collection and disposal</b>							
Take-back and trade-in systems							X*

\*specific to Fast Fashion brands

Table 3: Final framework

- in red → Need collaboration in both luxury and fast fashion brands
- in blue → Luxury brands need collaboration, while just part of fast fashion brands needs it
- in yellow → Fast fashion brands need collaboration, while just part of luxury brands needs it
- in green → No need of collaboration

In summary, the framework highlights:

- The main circular practices that fashion companies implement and how they affect the NPD process. In particular, the NPD changes with the introduction of CE, with activities concentrated mostly at the beginning.
- Collaborations along the value chain are crucial in order to transition to a circular business model, especially for certain sustainable practices.

## 7. Conclusions

The goal of this study has been to learn how CE affects the NPD process of fashion companies and the role of collaboration in the shift from a linear to a circular business model, analyzing several case studies in the fast fashion and luxury sectors. The transformation has a substantial impact on the idea generation phase of the innovation process, as suppliers and their ideas become a critical starting point for NPD, as well as a potential efficiency in material use, reuse, and recycle. Criteria such as supplier selection and LCA are all considered in the preliminary assessment phase. The practices are implemented early in the process by the majority of companies, in order to deliver circular properties from the beginning. However, the findings have shown that CE practices affect also

product development stages to allow the transition. Product realization evolves as new technologies and manufacturing techniques are introduced, all with the goal of reducing waste and negative environmental consequences. Finally, the marketing phase is critical for educating clients about the new circular strategy and influencing their behavior. CE affects not only sourcing and production but also marketing strategy.

To share values, technology, information, and knowledge, collaboration is necessary throughout the NPD process. Although the partners in each of the scenarios examined are different, it is necessary to consider them in order to start the transition process because the fashion industry regime is still too polluting but has a significant potential for growth through R&D.

The managerial implications include a re-evaluation of all technologies, raw materials, and KPIs that will ensure the manufacturing of a product with the requisite features to be termed a circular product, starting from the earliest stages of product development. Furthermore, managers should also include co-development strategies, considering the importance of collaborations with external stakeholders in order to implement circular practices within the NPD process.

In terms of its contribution to the literature, this study clarifies the linkages between issues that are frequently studied separately in the literature, such as CE and NPD, as well as the role that collaboration plays in the implementation of various practices. The key circular practices at each level of the NPD process are depicted in a framework, as well as the active role that collaborators play through information sharing, education provider, and stakeholder involvement. This dissertation presents some limitations, which primarily relate to the type of interviewees selected, the small number of cases for the fashion group, which does not provide a statistically significant sample to confirm the framework's general validity, and the qualitative data collection approach, which could be influenced by incomplete information and personal bias. Despite these drawbacks, the new framework provides the base for some potential future research. In particular, future studies could take into account different fashion companies of various sizes in order to understand possible hurdles they must overcome in order to become fully circular. Then, other polluting industries may be tested,

validating the framework in other context that require to pass to more circular economies. Finally, future researchers should investigate better the importance of collaborations, not only examining their importance and function in implementing CE within a company, but also how they finally effect the firm's long-term success.

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