

REMANUFACTURING TOWARDS A CIRCULAR ECONOMY — THE PRACTITIONERS' PERSPECTIVE

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Abstract

Background

The fashion industry has for several years been driven by fast cycles of cheap industrial mass production and unsustainable consumption. At the same time the burden on the environment has been significant. New business models to prevent the environmental impact have therefore been developed, and circular business models have gained interest.

Remanufacturing as one of the central activities within circular business model is not a new concept for the fashion and apparel industry, but there is a lack of focus of how to prioritise and develop the concept.

Purpose

The focus of the study is to understand the relative importance of the challenges and the enabling conditions that influence the adoption of remanufacturing as transition towards a circular economy within the fashion and apparel industry. The purpose is also to show the practitioners’ perspective on a relatively new phenomenon within the fashion and apparel industry, which can clarify how to further prioritise and direct the development of the concept. Furthermore, it is also expected to identify and investigate what might be the main challenges and the enabling conditions within remanufacturing.

Methodology

This research is conducted through a mixed method with a deductive approach where knowledge about generic challenges and the enabling conditions within remanufacturing was collected from a systematic literature review, as a modification of a Delphi method. An utilisation of online questionnaires led to verify relative importance of challenges and the enabling conditions for an adoption of remanufacturing as a transition towards a circular economy within the fashion and apparel industry. The result from the online questionnaire was analysed through finding consensus among the collected data.

Findings

The result shows that the most important perspective for an adoption of remanufacturing was related to business model-, costs- and consumer perspective. Specifically, the challenge with how to change the business model seemed to be essential, and the lack of financial benefits and influencing the consumer behaviour was received to be of great importance. Identified enablers were collaborations and communication. There was no agreement among the most important challenges and the enabling conditions. However, the operations- and core- perspective were considered important by many. Significant consensus was found between the practitioners and their opinion about what influences an adoption of remanufacturing as a transition towards a circular economy.

Practical implications

The practitioners' verification and opinions of challenges and the enabling conditions can serve as support for managers in an adoption of remanufacturing, and provide guidance regarding what is essential to consider for an transition towards a circular economy.

Originality/value

This study highlights and identifies what motivates and makes the adoption of remanufacturing attractive, as a way to transition towards a circular economy, in particular it provides support and guidance regarding how strategies can be developed and where to focus further development.

Keywords: Remanufacturing, Circular business models, Challenges, The enabling conditions, Supply chain management, Practitioners perspective, Sustainability

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1 INTRODUCTION

1.1 Background

The fashion industry stands in front of an opportunity to operate differently while still gaining profit and growth, and also benefiting the society and world economy. Today the textile-industry mainly relies on non-renewable resources and it is also one of the largest consumer markets in the world (Li et al. 2015; Pulse of the Fashion Industry, 2017). The industry has for several years been driven by fast cycles of cheap industrial mass production and unstable consumption (Ninimäkki & Hassi, 2011). Thanks to the growing middle classes in Asia and Africa the market is expected to reach more than three times more sales by 2050 than today (Ellen MacArthur Foundation, 2017). A large market does not only bring profit, but also a heavy burden on the environment. The environmental impact is because of the current linear business models, and the fact that the fashion industry is ranked as one of the most polluting industries in the world (Boström & Micheletti, 2016). Besides the pollution, the products manufactured within the fashion industry are not used to its full potential, only 36 % is utilized (Ellen McArthur Foundation, 2015). On top of this, not all of the garments reach the customers since companies are having unsellable stocks due to production error, damage and poor handling. However, the low product utilisation does not only put pressure on the environment, but also the margins for the company. Thus, reducing the environmental impact is the greatest solution to prolong and prevent clothes from ending up in landfill (Dissanayake & Sinha, 2015). Alongside with this, current linear business models, also stated as take, make, dispose are not structured to reduce the impact and will not last in the long run. Additionally, it leaves economic opportunities untapped. Hence is it necessary to rethink existing business models (Ellen McArthur Foundation, 2015).

Business leaders and governments admit that alternative business models to ‘take-make-dispose’-models are needed (Ellen McArthur Foundation, 2015). Likewise, there is a growing interest of novel business models, even though most models are driven by economic factors, the outcome is re-storage and regeneration of natural capital. There is many reasons to why there is such demand for new models; the constant rise of raw material prices welcomes a the solution of how to recover material from end-of-use stage (Planing, 2015; Webster, 2017). Secondly, new technologies and innovations like 3D printing and AI, enable implementation of new business models (McKinsey & Company, 2017). Thirdly, the increasing interest

around sustainability among young people pushes companies towards more sustainable approaches (Ekström, Hjelmgren & Salomonson, 2015; Cone Communication, 2015). Fourthly, we are moving towards a phase where shared economy is used in more and more industries, e.g. business models as sharing homes, cars, kick-bikes and also clothes. As well as the circular business model that is one model that gains more interest, due to the potential of decreasing the environmental impact it also brings more profit to the individual company and the world as a whole (Ellen McArthur Foundation, 2015; McKinsey & Company, 2017). The model originates from circular economy (CE), which is defined as a system where human society is preventing new material extraction of non-renewable resources through closed material loops on micro, meso and macro levels (Prieto-Sandoval, Jaca & Ormazabal, 2018). Products in a circular economy are designed for enabling reuse, including disassembly and refurbishment, or recycling (Ellen MacArthur Foundation, 2015).

A circular business model intends to find a strategy that can achieve a complete cycling of material (Lahti, Wincent & Parida, 2018). This can be reached through cycling activities, such as recycling, remanufacturing, reuse and or the relative activities like refurbishment, renovation and repair (Linder & Williander, 2017). In other words, a transition towards a circular business model can enhance and lead the fashion economy towards better outcome (Ellen MacArthur foundation; 2017), and it is mentioned as the most innovative strategy for closing the resource loop (Jensen Prendeville, Bocken & Peck, 2019). However, alongside with this growing interest of circular business models, the return of material flow is crucial for establishing a circular model (Franco, 2018). In addition, it is essential to have products with long-life design to be able to extend the life of products and close material loops for circularity. Thus, capitalising circular strategies depends on a company's ability to take economic value that is left in products after use, and offer it in new products (Linder & Williander 2017).

Remanufacturing is a central aspect within circular business models and it is a strategy to extend the life of products after use to as high value and time as possible (Ellen MacArthur Foundation, 2013). The extension of product life is done through a combination of innovations in both practices and business models (Lahti et al. 2017). Furthermore, remanufacturing can increase utilisation of products by reusing them directly or by using product parts within the remanufacturing or the manufacturing process (Linder & Williander, 2015). Additionally, remanufacturing is shown to be environmentally preferable over other end-

of-use treatments, reliant of the original product is retained, and economic and environmental value preserved (Sundin, 2004). Hence, remanufacturing has recently received more attention when it comes to a transition towards a circular economy, but it is an underdeveloped area within the fashion and apparel industry (Sinha, Muthu & Dissanayake, 2016).

Remanufacturing is a niche activity within the fashion industry and there are only some examples available (Sinha et al. 2016). Patagonia, Houdini, Nudie Jeans, Filippa K and RemakeSthlm, to just mention a few. These companies have established circular strategies in their business models, but not all of them manage remanufacturing activities (Jansson, 2017; Krarup, Kiørboe & Sramkova, 2015; Nudie Jeans, 2018; Earley, 2016; Nilsson, 2016). Common for all these companies are quality and durable clothes or fabrics, which enable the use of the products for a longer time. In fact, there are many fashion brands that have introduced remanufactured products to the market, but generally as a single production line or on an experimental level (Choi, 2017; Sinha et al. 2016; Pulse of Fashion, 2017). This can be explained by challenges and the limitations that complicate the potential scope to achieve economical growth for the products (Franco, 2017). Still, there are only small to medium enterprises on the market that works with more established processes, even though, the reality is expected to be different. There is raw material shortage and it is a high environmental impact with current systems, therefore the field needs more attention within the fashion and apparel industry (Dissanyake & Sinha, 2015; Webster, 2017). The lack of activities can be explained by the lack of tax advantages for remanufactured products, and the price on new materials are still much cheaper than recovered materials (Oghazi & Mostaghel, 2018). This confirms that existing structures does inhibit the companies to rethink their activities and the potential of going circular.

1.2 Problem and gap

Remanufacturing within the fashion and apparel industry need more attention in terms of what challenges and enables the adoption of this model. Currently there are limited implementations of the concept in the fashion and apparel industry, although other industries have adopted the concept to reach a circular economy (Krystofik, Luccitti, Parnell & Thurston, 2018; Gurita, Fröhling & Bongaerts, 2018; Low & Ng, 2018). Some of the reasons to why the fashion and apparel industry is behind are following. Regarding Oghazi and

Mostaghel, (2018), the primary challenge with remanufacturing is to capture value in the revenue model. This can be explained by the fact that remanufacturing needs to undertake several unnecessary activities (Kurilova- Palisaitiene, Sundin & Poksinska, (2018). In addition, limited availability of material and lack of large volumes results in a challenge to keep design standards within the remanufacturing production, especially for the fashion and apparel industry (Sinha et al. 2016). Another issue is the difficulties with the take back of products, where manufacturers struggle with estimating the timing and quantity of products as a result of lack of established systems (Franco, 2018). This also results in higher operation costs and uncertainty in the production. In addition, the access to volumes of fabric that can enable large scale is difficult to reach (Sinha et al. 2016). Dissanyake and Sinha (2015) imply also that disassembly is an issue, as it is labour intense and time-consuming. Moreover, Stål and Corvellec (2018) show that there are limited approaches to circularity within the Swedish fashion and apparel. The companies are waiting for challenges such as technology difficulties and change of consumer behaviour to be solved before they dare to take the step. This can explain by the point made by Dissanyake and Sinha (2015), retailers are not prepared for having remanufactured clothes in store, as it is non- standard fashion and carries a higher price. Thus, there are several aspects that are underdeveloped in the terms of facilitating remanufacturing as a transition towards a more circular economy in the fashion and apparel industry. More attention is needed to shed light and guide a smoother transition towards a circular economy (Franco, 2018). Through develop consensus between practitioners within the fashion and apparel industry it can enable the adoption of remanufacturing as a transition towards a circular economy.

The topic is not new but the fashion and apparel industry is lacking a clear focus of how to prioritise and develop a remanufacturing process. Synergies to drive the innovation of remanufacturing are in that sense important. These synergies may result in collaboration among more stakeholders within the supply chain, such as designers, retailers, manufacturer and commercial waste collectors (Dissanyake & Sinha, 2015). Giving more attention to remanufacturing through a practitioners perspective may enhance the awareness of how to manage, develop and integrate remanufacturing in the business model towards a circular economy. Other literature also argues for the need of further studies that can explain what the challenges are to explain the relative slow movement (Lahti et al. 2018). This leads this study to focus on challenges and the enabling conditions. There are several challenges and the enabling conditions highlighted in the literatures but there is a lack of understanding how

these generic remanufacturing problems have specific implications and requires specific scientific disposition when applied to the fashion apparel industry. One way to give the field more attention within the industry could be to explore and rank challenges and the enabling conditions for an adoption of remanufacturing as a transition towards a circular economy. A ranking can give a better understanding and provide guidance to the development of the concept within the fashion and apparel industry. In addition, these challenges and the enabling conditions can inspire the practitioners and motivate where to start when implementing remanufacturing. Furthermore, the importance of ranking is because these factors can be shared and prioritised in further development of using remanufacturing to reach a circular economy.

1.3 Purpose and research question

The purpose of this study is to identify and indicate of the relative importance of challenges and the enabling conditions that influences the adoption of remanufacturing as a transition towards a circular economy within the fashion and apparel industry. During the last decade have several fashion and apparel companies establish sustainable strategies in their businesses. However, remanufacturing is still a limited activity in the industry and the aim with this study is to investigate what might be main challenges and the enabling conditions within the activity. Shedding light on a relative new phenomenon among practitioners can give more clarification of how to prioritise and focus on further development of the concept. It is therefore important to highlight the challenges that remanufacturing poses to grow the interest of the topic and enable new business models to be implemented. This leads to the first research question:

RQ1: What key factors have the most influence when it comes to an adoption of remanufacturing towards a circular economy?

RQ2: What essential challenges and the enabling conditions are the most important from the practitioners' perspective?

Through identification, ranking and further discussions of challenges and the enabling conditions within remanufacturing from the practitioners perspective, it is possible to understand their relative importance and how they can inhibit or enhance the development.

The two research questions are correlated and to answers them, a modified Delphi approach is used with professionals from the fashion and apparel industry. Several key factors inhibit and enable the fashion and apparel industry adopt remanufacturing as a transition towards a circular economy. Related information from other industries are therefore explored, prioritised and ranked by reaching consensus through multiple modified Delphi rounds to provide guidance to the development of the concept. The practitioners' perspectives highlight the relative importance of the generic theories possible applied on the fashion and apparel industry.

1.4 Delimitations

To ensure the quality and credibility of the study it has been important to make some delimitation. This study seeks to identify the practitioners' view, which will be addressed, compared and analysed with existing generic literature on challenges and the enabling conditions in remanufacturing as a transition towards a circular economy. The result will shed light on challenges and the enabling conditions but also give insight in how they can be categorised.

There is limited availability of practitioners with experience of remanufacturing, as the concept is an underdeveloped area within the fashion and apparel industry and there is still only piloting projects or single production lines existing on the market (Choi, 2017). The focus has instead been to gather practitioners with experience of transition to more sustainable practices, to collect an appropriate number of participants for the selected method. Along side with this, there are participants with experience of remanufacturing in the study, but the activity has not been compulsory.

The collected literature to develop this study has been collected from a generic literature about remanufacturing within circular economy, due to limited availability in the field of fashion and apparel. There exist several studies about remanufacturing in general but the focus for this study have been in connection to transitions towards a circular business model. The aim for this study was not to have a theoretical lens in depth but to get an overview of challenges and the enabling conditions when it comes to remanufacturing. Native of the study is to identify challenges and the enabling conditions in remanufacturing on industry-level, system-level and process-level to prepare the industry on which part of remanufacturing to

look deeper into. Therefore, the literature is collected through a systematic literature review on a more general perspective on remanufacturing. To be able to answering the research questions it has been compulsory to only include literature that have the both aspects included.

2 STATE OF ART

In order to understand challenges and the enabling conditions when adopting remanufacturing as a circular business model, this section will present key concepts about transition towards a circular economy. The concept of the Circular economy is first presented followed by Circular business model. General concepts of remanufacturing are then following, including a presentation of requirements for an implementation. Finally, remanufacturing in the fashion industry is outlined.

2.1 Circular economy and circular business model

The aim with a circular economy is to only rely on renewable energy, prevent tracks and toxic chemicals and minimise waste through the design (Webster, 2017). A few principals guide the idea of the concept: *Design out of waste*, meaning to design products that fit within the biological and technical material cycles; *Build resilience through diversity*, which refer to having a diverse system with many connections and scales; *Work towards using energy from renewable resources*; *Think in systems*, which highlight the need of wider perspective and integrations throughout the whole value chain; and *Think in cascade*, meaning create value through cascading waste into new products, applications or businesses (Webster, 2017). The materials for products are reclaimed from end-of-use products rather than new resources (Linder & Williander, 2015). To be able to reach a circular economy have several concepts around circular business models recently been developed. Lahti et al. (2018) propose a covering definition for a circular business model as follows;

“...to explain how an established firm uses innovations to create, deliver, and capture value through the implementation of circular economy principles, whereby the business rational are realigned between the network of actors/stakeholders to meet environmental, social, and economic benefits.” (Lahti et al. 2018 p. 3).

Regardless of its benefits, the principles of how to transition towards a circular business model have not received enough attention (Lewandowski, 2016; Franco, 2017), and how to transition from a linear to a circular business model needs to be explored.

2.2 Transition from a linear to a circular economy

To distinguish circular business model from a linear model, Bocken, de Pauw, Bakker and van der Grinter (2016) highlight three different strategies of resource loops; slowing, closing and narrowing resource loops. The last mentioned loop could possibly be used for a linear business model and do not take any concern about the speed of resources usage. Meanwhile, the other two, slowing resource loops and closing resource loops, concern circular activities and include a focus on prolonged use and reuse of products, and reuse of materials through recycling.

Essential for a transition from a linear to a circular economy is that new business models need to be developed with extra added value in combination with lowering the environmental impact (Scheepens, Vogtländer & Brezet, 2016). To be able to transit towards a circular economy existing economy require ideas about how to recover material flows in current international supply chains. It is a complex system of actors, with suppliers at various levels, recycling and returning facilitators, which all need to be integrated and handled (Planing, 2015). Furthermore, Planing (2015) highlight four fundamental building blocks involved in the transition towards a circular economy, presented below. In this study the focus will be mainly on the fourth block in combination with challenges.

- (1) materials and product design
- (2) new business models
- (3) global reverse networks
- (4) the enabling conditions

To implement a circular business model on a large scale, there is some circumstances that can enable the transition. Lieder and Rashid (2016) highlight some of the key factors that are required, namely: Commitment from higher management in the industry; social awareness, as the customers are essential in a circular economy; more publicity and support from different

industry, which raise the awareness; and a change of people's mind in order to focus on performance rather than on new or second hand products (ibid). Thus, a transition towards a circular economy can connect to the supply chain but also the product design. Therefore, design and business model strategies should be implemented in combination to give a clear vision and focus on circularity in order to transition towards a circular business model (Bocken et al. 2016). Thus, the products require a suitable design for a circular economy, with multiple usage phases where all involved departments need to have knowledge about the activity (Lieder & Rashid, 2016). Lastly, in a transition towards a circular economy it is important to integrate new business models that include physical transformation of products through activities such as remanufacturing (Planing, 2015).

2.3 Remanufacturing and practices in the fashion and apparel industry

Remanufacturing is a closed- loop industrial process and a circular business model based on remanufacturing captures value from products and extends the products life as well as reduces the environmental impact (Linder & Williander, 2017). Remanufacturing is a key element of a product life cycle strategy and an enabler for circular economy, as it enables products to multiple life cycles and upgrades (Singh & Ordoñez, 2016). Design of the collection system is the most essential factor as the supply chain of discarded material need to be suitable for remanufacturing (Bocken et al. 2016). Remanufacturing preserves and enables product life extensions of original products, and therefore it has a great potential of contributing to the adoption of circular economy (Lahti et al. 2016).

The remanufacturing process involves a return flow of products that are already used or produced but obsolescent. The products are then upgraded and brought back to the sales, either equal to their original state or in an upgraded condition (Krystofik et al. 2018). In the fashion industry activities, such as pattern creation, cutting and sewing are included in the process of remanufacturing and also refurbishment (Dissanayake & Sinha, 2015). It differs from traditional remanufacturing as a dress can be remanufactured into a shirt, and does not necessarily need to keep its original shape. To understand challenges and the enabling conditions within remanufacturing in the fashion and apparel industry, it is essential to shed light on the differences of activities in remanufacturing and conventional manufacturing. Sinha et al. (2016) outlines them as following. First, design is a strategic advantage for

remanufacturing, as well as for conventional companies. Design enables a remanufacturing company to declare their design vision and individuality, but also to generate products in short time frames. In conventional manufacturing, the design is used to express their modernity (Sinha et al. 2016). Second, cutting is manual within the remanufacturing process, which is a results of higher cutting costs than for conventional manufacturing. Third, assembly also differs from conventional manufacturing, as several decisions are desirable during the process due to frequent variations and colours. Fourth, the modular manufacturing is preferable for remanufacturing, where a small group of highly cross-trained operators are working. Contrary, in a conventional process it is more common that each operator performs only one operation. Finally, the quality control for remanufacturing is done throughout the production, meanwhile in the conventional manufacturing it is done by a number of machine operators (Sinha et al. 2016).

As found in the literature, remanufacturing requires additional practices and business activities to keep the central role in the circular economy and circular business models (Jensen et al. 2019). A combination of integrated business activities, such as design, supply chain, collaborations, technology etc. is required to be able to build an integrated strategy for remanufacturing (Jensen et al. 2019). For this study the investigation is connected to a gaining insights for a new business model associated to remanufactured fashion clothes, which are collected mostly from post-industrial but also post-consumer waste. Post- industrial waste refers to clothes that do not meet their requirements and becomes waste. Post- consumer waste refers to clothes used by consumers and those are no longer attractive to them and become a waste.

3 METHODOLOGY

In this section the design is presented and discussed with the overall research approach. First, the research design is presented followed by a specific clarification of the data collection methods, how the data was analysed and how to make sure quality criteria was achieved.

3.1 Research design

The choice of methods is motivated by the intention of gaining knowledge and investigating the relative importance about the challenges followed by the enabling conditions to be able to adopt remanufacturing as a way to transition towards a circular economy. This complex topic requires diverse knowledge from people who faces the operational challenges and who understand the need for change (Prieto-Sandoval, Ormazabal Jaca & Viles, 2018), and especially within the fashion and apparel industry where it misses well-established processes. Thus, a Delphi method can answer the research question properly, and with its flexible design with follow-up interviews does it also permit the collection of richer data and understanding of the topic that is about to be explored (Okolio & Pawolowski, 2004).

The Delphi method is a consensus development technique that is typically applicable in topics with limited evidence (Avella, 2016). In other words, a Delphi method shows different opinions, views and positions about the future (Melander, Dubois, Hedvall & Lind, 2019). According to Hsu and Sandford (2007) the Delphi method is useful when it is possible to gather information from professionals embedded around the topic and who can contribute with knowledge from a practical perspective. In this case, the opinion comes from different practitioners in the textile industry located in Sweden to understand what motivates them to adopt remanufacturing to transitions towards a circular economy. The aim with the technique is to reach consensus about the issue among the participants (Okolio & Pawolowski, 2004). Besides these advantages and flexibility of the Delphi method, there is also some considerations that need to be taken into account (Avella, 2016; Okoli & Pawlowski, 2004); the creation of the interview structure, the collection of participants, anonymity to each other (Loo, 2003; Okoli Pawlowski, 2004) and the data analysis of the results (Hsu & Sandford 2007). These considerations help the researcher to avoid bias (Avella, 2016).

A Delphi method has been used for over 60 years to aggregate expert opinions about future development on a complex problem (von der Gratch, 2012). The method serves several rounds of questionnaires where a selected expert group's opinion is collected. Compared to traditional surveys, the aim with the Delphi questionnaires is to gather opinions from participants with knowledge about the field rather than from a random selection (Hansson, Kenney & McKenna, 2000). Along side with this, a Delphi method is also preferred before a

group based process as the participants are anonymous for each other and effects of dominant individuals can be avoided and more reliable data can be collected (Dalkey, 1972).

A modification of the Delphi method has been chosen for this study based on the topic and the specific research questions. A traditional Delphi method starts with an open-ended questionnaire, but a structured interview developed from an extensive review of literature is both a common and accepted modification of the process (Hsu & Sandford, 2007). As there is time limitation but also limited knowledge about the topic within the fashion and apparel industry, a modification of the first round was appropriate to have all the participants start at the same base (Murray & Hammons, 1995, Loo, 2003). The basic information about the topic was therefore gathered from a systematic literature review, which allows new data to emerge from the literature and is appropriate for this exploratory study in the field of remanufacturing. Through using a systematic literature review it is possible to gain information and best practices from other industries (ibid). It also allows bringing basic information concerning the topic that are useful for understanding which challenges and the enabling conditions that influences and impacting an adoption of remanufacturing towards a circular economy within the fashion and apparel industry. The purpose of this study is to identify and indicate of the relative importance of challenges and the enabling conditions that influences the adoption of remanufacturing as a transition towards a circular economy within the fashion and apparel industry. For this purpose, a deductive approach was followed where knowledge was collected from a systematic literature review, as a modification of the first round in the Delphi method. Furthermore, the study is of exploratory state of art, with the systematic literature as a base, which is tested on the practitioners through the Delphi rounds, with commentary inputs from the participants to support and explain the result. Followed by the ranking to evaluate and give insights in what is inhibiting and motivating the fashion and apparel industry an adoption of remanufacturing.

The approach of a mixed method was also applied, as it is recommended to complement the quantitative data collection with qualitative data (Loo, 2003). The Delphi method can be applied in contexts with both quantitative and qualitative techniques, as well as an interaction of the both (Avella, 2016). The mixed method of data also allows a broader perspective of the phenomena and the possibility to identify patterns that would not be possible with only one method (Bryman & Bell, 2015).

In this study first, as a base for the Delphi method, a systematic literature review was conducted to identify challenges and the conditions when it comes to transition towards a circular business model with remanufacturing as strategy. Propositions was developed as an outcome of the systematic literature review to receive a further understanding of which key factors that are the most essential when it comes to an adoption of remanufacturing in the fashion and apparel industry. Additionally, a modified Delphi method, more specific a questionnaire survey, was applied with the developed propositions with following up questions and commentary inputs. Ranking of the key factors by the practitioners was then applied to gain insights and understanding f where to start when it comes to development of remanufacturing within the fashion and apparel industry. In the following sections both methods are discussed.

3.2 Systematic literature review

The following section presents the systematic literature review as modification of the first round in the Delphi method. The first round in the Delphi method serves as a base of information about the field. Furthermore, the method for the content analysis of the systematic literature is thereafter described followed by how propositions was developed as an outcome of the systematic literature review. This method lies as an instrument to be able to develop the followed Delphi rounds, where questionnaires have been essential, which will be described in the next coming section.

The first step for the study was to make a systematic literature review to be able to analyse (Tranfield, Denyer & Smart, 2003) and identify the potential conditions that challenges and enables fashion companies to transition towards circular economies. The study has followed a common process for a systematic review by, following explicit criteria of which articles that should be included and excluded and which keywords and search terms to be used (Govindan & Hasanagic, 2018, Tranfield, Denyer & Smart, 2003, Bryman & Bell, 2015). To ensure the quality of the review, only peer-reviewed articles have been collected (Govindan & Hasanagic, 2018). Additionally, a researcher assistant in the field was scanning the collected literature (Bryman & Bell, 2015) to be able to “carry out a comprehensive unbiased search” (Tranfield, Denyer & Smart, 2003 p. 215). The process included an exploratory content

analysis to understand and summarise existing literature within the field, create concepts and develop theory.

The systematic literature review is appropriate for addressing remanufacturing in Circular economy as it has limited empirical data and existing literature, especially in the fashion field (Oghazi & Mostaghel, 2018). Therefore, the field of focus is remanufacturing and what enables and challenges a transition towards a circular economy. Since the scope of topic is an emerging field, there was no need to set a specific time limitation to narrow down the collection of articles (see table 1). In this study ABI/INFORM has been the primary database, while databases, such as Science direct and Scopus has been secondary to improve the reliability of the collected data (ibid).

Table 1. Limitations for the systematic review

Limitations	Explanation
Field	Remanufacturing in circular business model
Search area	Title, abstract, keywords
Time	Non time limitations
Document type	Article
Source type	Peer-reviewed article
Language	English

The used keywords were chosen to identify and make sure appropriate literature was collected. *Remanufacturing* and *circular business model* were used in combination. Remanufacturing only recently has gained attention for being a successful strategy to reach a circular business model, even if the concept started to appear as early as during the II world war (Vogtlander, Scheepens, Bocken, & Peck, 2017). Hence, this search phrase combination was used to exclude articles without any environmental or circular perspective. The initial finding was a total of 129 articles. The second step was to review the articles on an abstract level, where it was essential that the focus of the article was remanufacturing in connection with circular business model. This step resulted in a collection of 28 articles. The goal within the systematic review was also to generate a concluding outcome of the literature presented as

propositions used for the online questionnaires. This step was relevant to be able to identify and get an overview of challenges and the enabling conditions within remanufacturing.

The selection of keywords followed Masi and Godsell (2017) criteria for exclusion and inclusion by a full text screening of several peer reviewed articles in the field. Remanufacturing and circular business models were in the focus when reviewing the articles. It was also necessary to include articles related to challenges, the enabling conditions, implementation, and management to get an overview on how fashion companies can adopt remanufacturing. Inclusion criteria was therefore developed to categorise which article to bring further in the process. Only one exclusion criteria was used due to limited number of articles with a remanufacturing focus (see table 2). Articles that did not focus on the specific field but did contribute with potential information for conceptualising methods or tools, where then considered to be used for motivating the topic or concept.

Table 2. Criteria for selection of articles

Inclusion criteria	Motivation
Articles must focus on remanufacturing	It will not be enough if remanufacturing only is mentioned, as many use the topic when describing circular economy or CBM without having it as focus.
Articles must focus on challenges and what the enable conditions are within remanufacturing	Challenges and the enabling conditions are important aspects in the decision making for adopting a CBM.
Articles focusing on implementation of circular business models	Implementation is sufficient in the field of focus, remanufacturing to transition towards a circular economy.
Articles must be written in English	The main language in circular economy is English and it will be adapted.
Article must be from a peer reviewed journal	To receive the best quality and reliability in the research.
Exclusion criteria	Motivation
Articles focusing on automation within remanufacturing systems	Automation systems in the field of textile today is limited. Therefore it is better to focus on the traditional remanufacturing to give some surrealism to the field of focus.

The result from the systematic literature review identified different aspects for the discussion of challenges and the enabling conditions within the field of remanufacturing. The most relevant literature contributed with guidance and entries to the list of aspects related to the topic. Further literature gave additional aspects and motivation for the topic and also some entries for the discussion of how to adopt the practices into the fashion industry. Several articles in the review (7) were published in the *Journal of Cleaner Production* issues between 2009-2019. Additional articles included in the systematic review were published in; *Business strategy and environment* (2), *Journal of remanufacturing* (2) and *Resources, conservation and recycling* (1). The collected sample for the systematic review was 12 articles, published between 2009 and 2019.

3.2.1 Content Analysis

A content analysis was conducted to summarise and gain insights about the existing literature in the field (Govindan & Hasanagic, 2018). The process followed the four main steps presented by Mayering (2000), namely: material collection, descriptive analysis, category selection, and material evaluation. Material collection involves collection of material to analyse. Descriptive analysis of the field of focus, in this study challenges and the enabling conditions within remanufacturing and transition towards a circular economy. Category selection contains aspects that guide the analysis, which was assessed before the review through a deductive approach (Seuring & Gold, 2012). This method is preferable when there are various and unstructured data (ibid).

The 12 identified articles from the systematic literature review were first categorised after aim/purpose, focus and method to receive a clear overview of their focus. From this selection was each of the articles categorised into Kurilova et al.'s (2018) three-level model. This approach was followed and recreated due to Kurilova et al.'s (2018) study only aimed to tackle remanufacturing challenges from a lean perspective and not from a more general one. Before the textile industry is able to look at lean improvements within remanufacturing, it is necessary to first highlight a generic perspective to contribute with information about where to start, which is the aim for this study. Kurilova et al.'s (2018) method also misses a focus towards the enabling conditions. Therefore, Kurilova et al.'s (2018) three-level-model has been recreated and modified to fit this study where the literature that has been used includes

both remanufacturing and circular business models. The model consist of following levels, namely: industry-level that classifies as legislation, consumer preferences and technological challenges, system-level, which originates from product life-cycle-stakeholders, and process-level that relates to challenges within developing efficient operations. As noted during this process not all of Kurilova et al.'s (2018) under-categories did fit to this study of focus, which entailed a revision. Seven out of the 14 under-categories were used. In addition, two more under-categories were developed to the industry-level.

The nine under-categories were used for the content analysis. The findings and discussion or statements from each article were summarised and the categorisation into of each of the categories. The statement and discussion that has been put forward was based on the challenges and the enabling conditions identified within remanufacturing and a transition towards a circular economy. The categories that are used for this study are presented in the list with levels of challenges and the enabling conditions and are further discussed in the result, 4.1.

Levels of challenges and the enabling conditions

Industry-level

- Customer preferences
- Policy and legislation

System-level

- Business model
- Marketing strategy
- Information and knowledge/ Information, supply and demand
- Design for remanufacturing

Process-Level

- Core
- Operations
- Costs

From the systematic literature review propositions were developed as an outcome of the key points presented under each category. These propositions are further discussed in the section below and lays as a base in the online questionnaire in the Delphi method.

3.3 Modified Delphi

In this section the modified Delphi method is explained, outlined and presented. First an overview of the method is discussed, thereafter the method for developing the propositions are outlined. The process of the collection of practitioners is then presented, followed by a description of the process for the online questionnaire. Furthermore, the methods for analysing the data collection are discussed. A standard deviation and interquartile range analysis were developed to get understanding of the collected data from the online questionnaires, followed by Kendall's W for measurement of the practitioners round with ranking. Lastly a mix of qualitative and quantitative method was combined to receive a more complete picture of the studied area.

Other researchers have also used the Delphi method to identify key issues and challenges with moving from one business model to a new business model (Melynk, Lummus, Vokurka, Bursm, & Sandor, 2009). The modification of the Delphi method excludes the first round of unstructured questions considered from the typically design of a modified Delphi (Avella, 2016), and was exchanged with the information from the systematic review. This type of process allows the practitioners to immediately focus on the intention of the study and also makes sure that all participants start from the same base (Murray & Hammons, 1995, Loo, 2003). As the aim with the Delphi method is to develop a consensus of the collected data, this method is preferable to reach consensus directly (Avella, 2016). Questionnaires remains central in the Delphi method and to reach full consensus, the creation of the questionnaires has followed a structural Delphi process. From the recently mentioned systematic literature review several propositions about challenges and the enabling conditions have been outlined followed by Melander et al. (2019) methodology approach. They modified the Delphi process by reviewing literature within the field, developed propositions, had external view on the propositions, developed the questionnaire, piloting the questionnaire, sent out two rounds of questionnaires and then the final evaluation. The process of the modified Delphi method for this study is presented in figure 1 and is discussed in the following section where an

additional step is added, namely ranking. Ranking is essential for this study to be able to investigate the relative importance of challenges and the enabling conditions of remanufacturing in the fashion and apparel industry. The results from the ranking can potentially give an overview of where to go deeper in terms of developing remanufacturing.

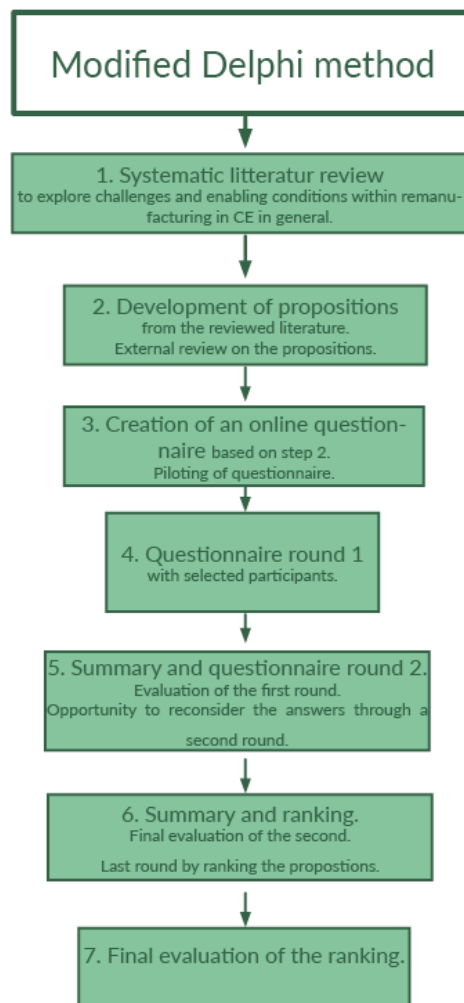


Figure 1. Steps of the modified Delphi method of this study

3.3.1 Propositions

The first round presented to the participants in the Delphi method process is changed to a structured questionnaire based on propositions. This type of modification is common for a Delphi method (Murray & Hammons, 1995, Hsu & Sandford, 2007). The systematic literature

review has been the tool for creating the questionnaire for the Delphi method, and propositions were developed as an outcome from the systematic literature review through a deductive approach. More specific, key points that challenge and enable fashion companies to adopt remanufacturing to be able to transit to a circular business model. The deductive approach allows the propositions to be carried out from previous literature (Merli, Preziosi & Acampora, 2018). Through developing the questionnaires based on these propositions, it is possible to test if the existing theory from other particular cases is adaptable to the particular case (Bryman & Bell, 2015). Therefore, this approach is preferable as the studies in the field of remanufacturing within circular economy are limited in the fashion and apparel industry.

The focus has been on challenges and the enabling conditions within remanufacturing when constructing the propositions. There are several factors at different levels that inhibit and enable the development of remanufacturing and a transition towards a circular economy. In this study, the existing generic theory on remanufacturing within circular economy has been identified and categorised after a modification of Kurlilova et al.'s (2018) three-level model of challenges of remanufacturing. This was done through a deductive approach when using already existing categories from previous literature. The propositions have been developed as a concluding proposition from the discussion brought up from the systematic literature review about remanufacturing within circular business models. The aim with the propositions was to use them as a base for the questionnaires where they are presented with three questions connected to them (see appendix).

There were 18 propositions developed, reviewed and discussed with an external research assistant with expert knowledge in the field. This individual has a junior role at the University, and was able to give a different perspective on the propositions and guide the propositions in the right directions towards the fashion and apparel industry. This process was done to improve the structure and to make sure the propositions were a proper conclusion from the discussion and to get a better understanding (Melander et al. 2019). Comments on the propositions were mostly based on clarifying definitions like; incentives to remanufacturing, production and cost benefits. Furthermore, the research assistant's comments were applied on the propositions, which were rewritten to generate better clarification and validation. The developed propositions are presented in table 3 below and the result from the discussion based on the systematic literature is presented in chapter 4.

Table 3. A summarise of all the developed propositions

Proposition with headings	
<p>Challenges</p> <p>Industry-level</p> <p>Consumer perspective</p> <p>P1 The consumer attitudes and preferences are challenging when working with remanufactured products.</p>	<p>The enabling conditions</p> <p>Industry-level</p> <p>Consumer perspective</p> <p>P10 To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives.</p>
<p>Political perspective</p> <p>P2 The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models.</p>	<p>Political perspective</p> <p>P11 To facilitate adoption of and transition towards a remanufacturing business models, through regulations, such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers.</p>
<p>System-level</p> <p>Business model perspective</p> <p>P3 Visualising the economic value created through remanufacturing activities is challenging due to more complex revenue models.</p>	<p>System-level</p> <p>Business model perspective</p> <p>P12 Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume.</p>
<p>Marketing strategy perspective</p> <p>P4 The fluctuation of consumer demand and awareness for sustainable products makes it challenging to market remanufactured products</p>	<p>Marketing strategy perspective</p> <p>P13 Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products.</p>
<p>Information and knowledge perspective</p> <p>P5 Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of remanufacturing business models.</p>	<p>Supply and demand perspective</p> <p>P14 Adoption of data collection and analysis systems facilitate the prediction of supply of "end-of-use materials" and meet customer demand.</p>
<p>Design for remanufacturing perspective</p>	<p>Design for remanufacturing perspective</p>

P6	Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position.	P15	Optimisation of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products.
Process-level		Process-level	
Core perspective		Core perspective	
P7	Missing product regulations regarding, standards and quality challenge the development of remanufacturing activities.	P16	A solid flow of reliable end-of-use material would enhance the interest of adopting remanufacturing activities for manufacturers and brands.
Operation perspective		Operation perspective	
P8	Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing.	P17	Technology is crucial for establishing the remanufacturing processes establish, and to create efficient information and material flows between the stakeholders.
Cost perspective		Cost perspective	
P9	Higher operational costs related to an increase in manual work challenge the scaling up of remanufacturing.	P18	High operational costs around remanufacturing can be decreased by optimising the process, and through establishing collaboration that can enhance the benefits with remanufacturing

3.3.2 Sampling

To collect qualified participants a professional panel has been selected through a process based on Okoli and Pawlowski, (2004) selection criteria. The participants contributes with information about what they think challenges and enables the fashion and apparel industry to adopt remanufacturing towards a circular economy. Sweden can be considered as the origin for the collection of participants for this study. Sweden, together with other Nordic countries, has namely been working actively with circular business models for the last years. Information about the subject has been broadcasted through conferences and public seminars (e.g Nordic publishing, 2019; Rönnerberg, 2018; Cord, 2017; Global Fashion Agenda, n.d). Sweden is also one of the leading countries that actively invest in environmental solutions through the circular economy. The country has adopted several environmental policies, which led Sweden to a first place in EU-28 Eco-innovation scoreboard in 2017 (Jansson Swenning & Eriksson Berggren, n.d). A list with members from the Swedish textile trade and employers' association, TEKÖ lays as ground for the selection (TEKÖ 2019). Their list consists of 238 companies that have been registered there. The register includes information about the company, such as website, phone and email but completed information about the

revenue and operational activities was missing. Hence additional information about the companies were added through allabolag.se and the company website. The revenue only indicated how big the companies were and was not an excluding criterion, as different perspective from small to large companies are important when trying to understand a underdeveloped area, such as how to implement and scale up a remanufacturing (Govindan & Hasangic, 2018). Nevertheless, most of the fashion and apparel brands from Sweden are SMEs (TEKO, 2018) and will therefore be in majority in this study. The first selection was based on the fact that the companies were fabric- manufacturer or fashion or apparel brand. Then the companies were included if they communicated their sustainability work on their website. If the companies did not reach these criteria, they were excluded for this sampling and was not contacted. In this step 217 companies were excluded.



Figure 2. Process of sample collection

To have an appropriate number of varied participants, also other companies or individuals outside the initial selection were added (Loo, 2003). These companies did not feature in first selection process, as TEKO is an optional association to be a part of and do not represent organisations from all different types of businesses. The first selection did not cover the initial aim of having a diverse perceptives based on the type of organisation, background and size. Therefore, this additional group were handpicked and added to the panel. These companies or individuals were selected based on their expertise within the field to complement and potentially bring additional perspective on the study. They came from; The Renewal Shop project within Science park of Borås (5 companies), researchers within the field (4), retailers with circular business models (2) and large fast fashion companies (3). All the selected companies were from the field of fashion/sports/apparel sector in Sweden and covered areas like, sustainability, purchase, R&D and retail. Less than the half of the group did not have experience of remanufacturing but they did have experience of a sustainable shift within the fashion and apparel industry. The reason of the varied collection of participants was due to the aim to generate knowledge sharing between different practitioners to shed light on remanufacturing within the industry and gain knowledge from different perspectives, which is

important for the development of the concept. Names of professionals were then collected from the different companies and different departments. To collect a wide range of practitioners this step was important to include several perspectives and to receive balance between different perspectives (Loo, 2003; Cole, Donohoe, & Stellefson, 2013). The initial sample from this step was 35 participants.

The goal was to collect a variety of practitioners, as a Delphi panel do not have a limited numbers of participants and depends more on the complexity of the field and diversity of the group (Loo, 2003; Murray & Hammos, 1995;). Regarding Okoli and Pawlowski (2004), a Delphi study requires at least about 10-18 participants to reach consensus among experts. For this study the initial selection was 35 participants with 31 companies that were manufacturer, brands and retailers and additional 4 participants who were researchers within sustainability and circular economy. All were contacted through emails in order to motivate them to be a part of the study. It resulted in 23 participants with two participants from the same company. A summary of the type of companies followed by profession of the participants is shown in table 4-5.

Table 4. Company type and size of final selection

	Fashion	6
	Manufacturing	4
Company type	Outdoor	9
	Premium second hand store	2
	Research institution	2
	<10	6
Company size (Headcount)	<50	7
	<250	9
	250<	1

Table 5. Professions of the final selection of participants

Positions of the practitioners	Assistant buyer	1
	CEO	2
	Founder	1
	Manager	1
	Other	2
	Pattern maker	1
	Product developer	3
	Product manager	1
	Production Manager	3
	Professor	1
	Project leader	2
	Sustainability manager	5

The majority of the companies came from the outdoor industry and can be explained by their focus to lower the impact on the environment where the customers are active. The other companies had a similar philosophy, to ensure that their impact on the environment is as low as possible, regardless if they were a fast fashion/fashion company, manufacturer or a second hand store. Additionally, there were participants from two research institutions, who are actively working on sustainable and circular approaches for the fashion industry. Of the companies 26% were micro enterprises with less than 10 employees. Small and medium size companies stood for 69% and one large company was standing for 4 %. The practitioners came from several different departments with a broad profession range from CEO, Founder, Product developer, Product manager, Productions manager, Professor, Project leader and Sustainability manager.

According to Okoli and Pawlowski (2004) the participants were anonymous to each other in addition to the participants from the same company. The participants were not anonymous to the researcher to be able to receive clarification and further qualitative data. The response rate was 60% and appropriate for a Delphi study according to the literature (ibid), where the goal was rather to reach consensus among experts than a quantitative result. Hence, the Delphi method consists of several rounds that can take up to more than three months (Murray & Hammons, 1995). Therefore, the risk of participants' losing focus and time was possible, but

it was prevented by controlled feedback with detailed results from the rounds with both comments and the general result from the group.

3.3.3 Online questionnaires

The next step in the study was to develop the online questionnaire. The questions in the questionnaire were built from the developed propositions in table 3 from the systematic literature review and are to be found in the appendix. However, before sending out the first survey, piloting was a crucial step to reach face and content validity, reliability and feasibility (Gill, Leslie, Grech, & Latour, 2013). The piloting round was produced to clarify and make sure the questionnaire was proper for externals. It was completed through having two externals outside the study to verify the questionnaire. One of them with knowledge in the field and the other one with limited knowledge. Additional clarification was done after their comments. The questionnaire was then presented for the practitioners through an online survey (Step 4 in figure 1). Therefore, the choice of an online survey was motivated by its benefits compared to a traditional survey, such as high data collection rate, ease and speed of administration, direct communication with the participants and a fast feedback loop (Gill et al. 2013). Furthermore, the survey was developed through a SurveyMonkey and was following the method by Melander et al. (2019). All participants got informed that their information and names would be collected and saved up to one year by Re:textile, Science Park Borås, and any disagreement would be taken seriously. The introduction of the survey included information about the purpose of the study and was formulated as, identifying challenges and the enabling conditions to adopt remanufacturing towards a transition towards a circular economy for the fashion and apparel industry. Thereafter, instructions on how to answer the questions, which was presented as propositions, were outlined. It was compulsory to answer all the questions but with the possibility to answer “no opinion” (to view the questionnaire see appendix). For each of the propositions the practitioners had to answer on:

- Probability of proposition, 0-100 % (How probable do you find this proposition?)
- Impact on the industry, 1-5 Likert scale
- Desirability of outcome 1-5 Likert scale (How desirable do you find this proposition to be/level of attention needed?)

This way of collecting answers from the participants is also used by other researcher to collect data for future development (Roßmann, Canzaniello, von der Gracht & Hartmann, 2018; Melander et al. 2019). Through using these three answers it was possible to gain different perspectives on the propositions. By using probability it was possible to investigate if the practitioners find the propositions to be relevant for the fashion and apparel industry. By using impact it was possible to investigate which of the propositions that had a great impact on the industry and can motivate further research. Finally, by using desirability it was possible to investigate if the propositions or its outcome was desirable for the practitioners, which allows a broader perspective of the practitioners' interest. Additionally, the practitioners were also invited to comment on the propositions to support their answer on the proposition. They were also informed about the professions of the whole group of practitioners and their anonymity when they were answering the questions.

The collection of data from the practitioners was done through three rounds (see figure 1). The first round was to investigate if the practitioners agreed with the suggested propositions of challenges and the enabling conditions within remanufacturing for the fashion and apparel industry. To ensure the participants understood the questions in a similar way, additional phone calls was made under the first round, due to the potential of differences in English skills among the participants. Furthermore, the second round included controlled feedback with responses of the collective compared with the individual's answer. For the characteristics of all Delphi studies, the facilitator decides upon the type of feedback and its provision (con der Gracht, 2012). In this case, the controlled feedback was including a summary in a diagram of the general result on all of the propositions in comparison with all the individuals' own result. This to give a clear picture of how the other was thinking but also to give incitement to further thoughts about the topic. Comments by the practitioners were also provided in the result, which allows the practitioners to understand each other's reasoning and to support the result (Melander et al. 2019; Hsu & Sandford, 2007). The practitioners were then asked to answer the survey once again, with same questions. As the Delphi method allows the practitioners to change their mind through the rounds, no questions were removed. Comments were also allowed for this round. The third round was offering the same controlled feedback as the first round, but also an indication if the opinions diverged or merged. Additionally, this round asked the practitioners to rank the list of propositions from the most important to the last. The aim with the ranking was to allow the practitioners reflect on which of the propositions they thought were most important, in the context of adopting remanufacturing to

transition towards a circular economy for the fashion and apparel industry. The result from this step allows the fashion and apparel industry to gain insights of where to start when it comes to develop the remanufacturing process. Alongside with this, this step was also conducted in order to preclude me as researcher to control the limiting alternatives (Avella, 2016). Also, reach consensus through further clarification and judgment of the practitioners on the specific propositions (Murray & Hammons, 1995). Finally, the result was compiled and sent to the practitioners to get commentary input to support why the results among the practitioners was diverging. This step was of importance to investigate the generic perspective on which of the challenges and the enabling conditions that are most important when adopting remanufacturing as a transition towards a circular economy.

The controlled feedback of the responses included mean ranks for the probability of the proposition, the impact on the industry and the desirable outcome. Furthermore, the controlled feedback also included in more detail, a calculated standard deviation on all answers to measure the variation of the practitioners' opinions between the two first surveys (Melander et al. 2019; Gnatzy, Warth, Von Der Gracht & Darkow, 2011). An interquartile range (IQR) was then also applied on the result to investigate the consensus between to two first rounds, which is a preferred measurement for consensus development in Delphi studies (Gnatzy et al. 2011). For the third survey and controlled feedback was also a Kendall's W applied to measure the consensus of the ranking.

3.3.4 Standard deviation and interquartile range analyse and Kendall's W

The measurements of the first and second round of the online questionnaires are following the methodology by Melander et al. (2019). The probability, impact and desirability for each of the propositions were defined through a mean value of all participants to receive an idea of the relevance of the proposition. Comments from each of the propositions were then grouped and presented under each proposition to explain the reason behind the result. The total number of comments gives insights about the practitioners' interest on the subject and the proposition (Melander et al. 2019). A standard deviation (SD) was then used on the probability in order to test if the opinions were changed in the second round of questionnaires (Gnatzy et al. 2011). Using the standard deviation as method made it possible to show if the opinions by the practitioners are merging after having other opinions presented to them (Melander et al.

2019). The standard deviations demonstrated the increase and decrease of diverse opinions between the practitioners.

To measure the probability (P), impact (I) and the desirability (D) an interquartile range (IQR) was used. It is suggested a value less than 25 to represent agreement between the practitioners (Gnatzy et al. 2011; Melander et al. 2019). In this study both a 0-100% scale and a 5-point Likert scale were used, with the value less than 25% to be a consensus among the practitioners. The value for IQR was less than 25 for the P and less than 1.25 when calculating I, and D, where the Likert scale was used (25% of 5 is 1.25).

To measure the ranking from the third round of the online questionnaire, the methodology by Schmidt (1997) was followed. Schmidt (1997) uses a nonparametric statistic Kendall's W, which is preferable as it emphasises whether any agreement has been reached among the practitioners (Schmidt, 1997). The result of Kendall's W goes between 0 to 1, where 1 indicate that all practitioners agree, 0,5 shows a moderate agreement and 0,3 and lower indicates of a lower degree of agreement. The intention with this step was to identify the relative order of challenges and the enabling conditions in relation to remanufacturing. According to the mean ranks the values with the lowest value are the most important and the opposite around for the propositions that received a high value (Schmidt, 1997).

3.3.5 Integration of qualitative and quantitative data

The findings from the systematic literature review, online questionnaire and comments from the practitioners were used in order to guide the conclusion of the result to reach a rich understanding of what challenges and enables an adoption of remanufacturing towards a transition towards a circular economy.

3.4 Quality Criteria

As this study has a combination of both quantitative and qualitative method, the quality criteria will need to be met for both methods. The Delphi method approach has followed the outline by Melander et al. (2019), which provided structured guidelines on how to create the study rather than random decisions. Further, construct validity was established through a

combination of methods where a systematic literature review was used (Ellram 1996). This was done in order to avoid bias and to get a more stable and reliable result from multiple indicators of data (ibid). Specific databases, inclusion and exclusion criteria was followed to secure the external validity (Govindan & Hasanagic, 2018; Tranfield et al. 2013). This was followed by a content analysis procedure to enhance the reliability and validity of results (Govindan & Hasanagic, 2018). Propositions were developed as an outcome of the systematic literature as a base for the questionnaire, and to avoid bias a research assistant within the field was reviewing the formulation on the final proposition (Avella, 2016; Bryman & Bell, 2015). Necessary changes were done before sending out the first round to enhance the reliability. Moreover, reliability was considered when using multiple data analysis methods to code the data and reach consensus (Ellram 1996). The quality of the study has increased thanks to a close collaboration with a research assistant, who has improved the study several times during the process (Bryman & Bell, 2015).

The selection of participants has followed the approach by Okoli and Pawlowski (2004), which follows a structured and well-planned process. The participants were anonymous from each other to provide a more accurate picture of the subject than from a collective face-to-face discussion by a group (Avella, 2016). Two participants were from the same company and were not anonymous to each other, and their opinions were beneficial to get a second perspective from the same company. As remanufacturing is a novel field and there are few practices available in the fashion and apparel industry (Sinha et al, 2016), every participant was contacted through email with additional information about what was asked for in the questionnaires. In addition, to ensure construct validity phone calls and additional information sharing was conducted for clarification of any misunderstandings or issues to validate data where it was desired (Ellram 1996). This also to enhance the credibility of the result, as the aim was to understand what the practitioners would think of as a challenge and or the enabling condition. Additionally, the reliability of a Delphi method is criticised because the judgement of the questions can differ substantially between the participants (Loo, 2003). Although, this study has determined key criteria with non-random samples based on getting different perspectives and views on the topic, it can be a risk. However, different perspective allows exploring divergent ideas from different stakeholders within the industry and can bring additional insights within the topic (Melander et al. 2019). Alongside with this, controlled feedback was provided to the practitioners through the process to ensure the reliability (Avella, 2016). Still, there is a potential that the practitioners move in comments toward the

others because of group pressure but through the controlled feedback and anonymity, it can be controlled and prevented. To remember is the aim with the Delphi method to reach consensus between the participants and the effect of feedback can be seen in degree of change of opinion. Although there is a risk of this, the aim for this study has been to influence different practitioners through sharing thoughts between each other anonymous. Through using this method insights were given about the topic that may not have been possible through other non-anonymous methods.

Furthermore, referring to the measurements provided by Melander et al. (2019) and Smith (1997) was the data measurements presented to the practitioners after each round, with the level of consensus reach through Interquartile range and Kendall's W. Dissent views on the propositions were then clarified through an additional opinion from the participants to receive a further understanding on the disagreement (Cole et al. 2013).

3.4.1 Ethics

The ethical problems that potentially can occur are mostly depended on carelessness by the researcher (Bryman & Bell, 2015). To avoid these circumstances all the participants in the study have been informed about their anonymity and the use of their personal information before participating. All participants have therefore agreed in writing to participate in the study.

4 FINDINGS FROM THE SYSTEMATIC LITERATURE REVIEW

Under this section are the findings presented based on the systematic literature review. First, a short description about the findings is presented with a summarised. It is followed by the results from the systematic literature review that are categorised into the modification of Kurilova et al.'s three level models, where propositions is outlined as a conclusion of all categories as an outcome of the key points of the discussions.

4.1 Results from the systematic literature review

The findings from the systematic literature review are done through a deductive approach. It presents identified challenges and the enabling conditions that are relevant for the discussion of what challenges and enables the adoption and development of remanufacturing towards a transition to a circular economy. These findings is necessary to further be able to investigate the questions; *What key factors have the most influence when it comes to an adoption of remanufacturing towards a circular economy? What essential challenges and the enabling conditions are the most important from the practitioners' perspective?* The challenges that are presented are unique and not due to lack of enablers. Each category has been based upon Kurilova et al.s' (2018) approach, but has several literature connected from a more generic perspective. The propositions are developed as a conclusion from the outcome of the systematic literature review and are intended for the fashion industry, even though it is not mentioned in the stated proposition. Key points from systematic literature review are summarised in table 5 below.

Table 6. A summarise of key points from the systematic literature review

Remanufacturing challenges	Key points of the discussion	Source
Industry-level		
Consumer perspective	Consumer attitude. Consumer needs and wants.	Fischer & Pascucci (2017), Veleva & Bodkin (2018), Hazen et al. (2017), Gurita et al. (2018), Linder & Williander (2017)
Political perspective	Lack of interest. Lack of tax reduction. Lack of standards in operation.	Veleva & Bodkin (2018), Vogtlander et al. (2017), Singh & Ordoñez (2016)
System-level		
Business model	Design of new revenue model. Validation of a new model.	Linder & Williander (2017), Jensen et al. (2018)
Marketing strategy	Weak selling approaches. Lack of customer demand.	Kurilova et al. (2018), Jensen et al. (2019), Vogtlander et al. (2016), Veleva & Bodkin (2018)
Information and knowledge	Lack of awareness about environmental and social impacts of waste generation.	Kurliva- Palisaitiene et al. (2018), Veleva & Bodkin (2018)
Design for remanufacturing	Challenges to design new offerings. Making the products attractive enough.	Singh & Ordoñez (2016), Bakker et al. (2014)

Process-Level

Core	Having core as new as possible. Lack of core information. Core availability. Technical capacity.	Kurilova-Palisaitiene et al. (2018), Krystofik et al. (2018), Gurita et al. (2018)
Operations	Challenges with scaling up. Lack of knowledge and expertise.	Kurilova-Palisaitiene et al. (2018), Veleva & Bodkin (2018)
Costs	Production costs. Labour costs.	Kurilova-Palisaitiene et al. (2018), Vogtlander et al (2017), Veleva & Bodkin (2018), Krystofik et al. (2018), Östlin et al. (2009)

The enabling conditions for remanufacturing

	Key points of the discussion	Source
Industry-level		
Consumer perspective	Price differentials. What is influencing the customer?	Hazen et al. (2017), Bakker et al. (2014)
Political perspective	Policies. Taxes. Companies need to influence the policymakers.	Jensen et al. (2019), Veleva & Bodkin (2018), Vogtlander et al. (2016)
System-level		
Business model	Integration of several business activities. Go from selling volumes to selling products.	Jensen et al. (2019), Veleva & Bodkin (2018), Bakker et al. (2014)
Marketing strategy	Benefits for the consumer. Customer service. Enhance the image of remanufactured products.	Vogtlander et al. (2017), Veleva & Bodkin (2018), Hazen et al. (2017)
Information, supply and demand	Moving the ownership in the supplychain. Detailed information about the products. More knowledge.	Fischer & Pascucci (2017), Krystofik et al. (2018), Östlin et al. (2009)
Design for remanufacturing	Involve the consumer. Replacement of parts.	Sing & Ordoñez (2016), Bakker et al. (2014), Linder & Williander (2017), Jensen et al. (2019)

Process-Level

Core	Left-over material from the industry. Moving material between branches. Ownership of the product.	Fischer & Pascucci (2017), Sing & Ordoñez (2016), Vogtlander et al. (2017)
Operations	Networks. Collaborations. Lead times and technology.	Veleva & Bodkin (2018), Kurilova-Palisaitiene et al. (2018), Östlin et al. (2009)
Costs	Comparing costs. Aspects around costs.	Veleva & Bodkin (2018), Östlin et al. (2009), Jensen et al. (2018)

4.1.1 Industry-level challenges

Consumer perspective

The consumer perspective is crucial when implementing a new business model and becomes even more delicate when it comes to implementing remanufacturing (Hazen et al. 2017). The consumer attitude to remanufactured products is a challenge for companies observes Gurita et al. (2018). Additionally, Veleva and Bodkin (2018) describe that most consumers do not care about a more sustainable option, as there is a lack of motivation for them. On the other hand, Linder and Williander (2017) mean that there are also issues with fashion vulnerability beyond changing consumer attitude, such as technology, function and economy that needs to be taken in consideration.

P1: The consumer attitudes and preferences are challenging when working with remanufactured products.

Political perspective

A critical issue is how to make remanufacturing interesting among different parties. Veleva and Bodkin (2018) describe that there is a lack of interest among large companies. It seems to be the most critical key barrier for scaling up circular activities such as product reuse, remanufacturing or waste repurposing (Veleva & Bodkin, 2018). Today is there a lack of tax reduction that would facilitate the implementation of remanufacturing, and there is also a lack of clear standards or operating principles (Vogtlander et al. 2017). The result of mentioned circumstances could possibly inhibit a firm's further work with the implementation of circular activities (Singh & Ordoñez, 2016).

P2: The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models.

4.1.2 System-level challenges

Business model perspective

One concern with remanufacturing is the design of a new revenue model. In a linear business model the costs only have to be predicted one time, while in a circular business models it is necessary to predict the initial sales but also the circulation of the offering (Linder & Williander, 2017). Linder and Williander (2017) further argue that a circular business model validation is difficult to achieve. It need more time and hence, later sales to cover the costs that occur due to e.g stock, additional material for remanufacturing or reuse. Jensen et al. (2018) imply that companies have not evaluated the market enough and need to work with other stakeholders, including customers, to reach a suitable financial model. Consequently, remanufactured products observe to have some barriers when it comes to costs.

P3: Visualising the economic value created through remanufacturing activities is challenging due to more complex revenue models.

Marketing strategy perspective

Marketing strategies become central for remanufactured products, as there is a risen concern of the weak and uncompetitive selling approaches of remanufactured products (Kurilova et al. 2018). In another perspective Jensen et al. (2019) mean that there is a challenge with preventing that circular activity, such as remanufacturing leads to more consumption and products. Vogtlander et al. (2016) also point out that there are limited sales arguments that include sustainability in remanufactured products. This can possibly be explained by Veleva and Bodkins' (2018) argument, that there is a lack of customer demand of sustainable products or more essential, awareness.

P4: The fluctuation of consumer demand and awareness for sustainable products makes it challenging to market remanufactured products.

Information and knowledge perspective

Information sharing and knowledge about circularity within companies are rather rare (Kurliva- Palisaitiene et al. 2018). To reach fully potential with remanufacturing this is

crucial. For example, Veleva and Bodkin (2018) identify that there is a lack of awareness about the environmental and social impacts of waste generation and disposal in several branches. Although this seems to be a general perception for the whole society, it is surprising that branches have not reached any further. Therefore through enhancing these missing indicators, it can possibly increase the pressure on large companies to minimise their waste (Veleva & Bodkin, 2018).

P5: Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of remanufacturing business models.

Design for remanufacturing perspective

It is a challenge to design new offerings within remanufacturing, as it is difficult to standardise something that comes from different cores (fabrics), and conditions (Singh & Ordoñez, 2016). The challenge is to design in an industry where the brands compete with new design and innovation on a volatile market, where the norm is fast replacement of cycles (Bakker, Wand, Hulsman & den Hollander, 2014). Sing and Ordoñez, (2016) states that the challenges for the designer is to figure out how to make the product attractive enough, to compensate for the prejudice about less qualitative and unwanted products from discarded material.

P6: Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position.

4.1.3 Process-level challenges

Core perspective

Core perspective refers to the fabric or material used in remanufacturing and several authors have highlighted the challenges with the core. One challenge is to have every single core as new in the remanufacturing process, combined with long lead-time with unstable and unpredictable operations (Kurilova-Palisaitiene et al. 2018). Further, Kurilova-Palisaitiene et al. (2018) also describe that there are lack of core information regarding type, model, and

conditions that challenge the remanufacturer. Krystofik et al. (2018) highlight the challenges with core availability, demand timing and the technical capacity to convert cores into products that meet current market demands. On top on that, Gurita et al. (2018) imply that due to the quality and function, it is not sure the products have remanufacturing potential. This demonstrates that there are several activities around the core that challenge the development of remanufacturing.

P7: Missing product regulations regarding, standards and quality challenge the development of remanufacturing activities.

Operation perspective

Challenges within operations are also getting attention and Kurilova-Palisaitiene et al. (2018) indicates that process-level challenges such as operations reach a greater extent than system-level, such as business model, marketing strategy, etc. Entrepreneurs face the challenge of financing a scaling up of their operations, as well as there are several suppliers who lack the knowledge and expertise about remanufacturing (Veleva & Bodkin, 2018). There seems to be a lack of knowledge and expertise to be able to have large- scale remanufacturing that can meet the market and competition.

P8: Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing.

Cost perspective

As well as challenges with operations there are several authors that highlight the challenges with costs around remanufacturing. Kurilova-Palisaitiene et al. (2018) highlight the fact that the production of remanufacturing is highly dependent on manual work. Furthermore, Vogtlander et al (2017) mean that the labour costs are relative high compared to mass production. Veleva and Bodkin (2018) mean also that production costs are high. And Krystofik et al. (2018) implies that the costs can even increase in those cases where the remanufactured products need additional material. These several aspects make the pricing of remanufactured products difficult to set (Östlin Sundin & Björkman, 2009) and also indicate of challenges with scaling possibilities.

P9: Higher operational costs related to an increase in manual work challenge the scaling up of remanufacturing.

4.1.4 The enabling conditions on industry-level

Consumer perspective

The importance of having the customer preferences met is more or less most essential for products and offerings. Hazen et al. (2017) mean to be able to push the customer towards remanufactured products; companies need to understand the relative price differentials, as well as their role in environmental initiatives. Bakker et al. (2014) argue that the designer have to understand what are influences the consumer and their acceptance of new ownership models, which also fit within the argument for remanufacturing. The companies need to communicate these initiatives to their customers and realise that they have a potential to influence to a more sustainable purchase.

P10: To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives.

Political perspective

A transition towards more sufficiency oriented business model through remanufacturing requires strategies, policies that question currently consumerism, and planned obsolescence that drives industry behaviour (Jensen et al. 2019). Veleva & Bodkin (2018) argue that policymakers can advance the development of circular practices by *enacting effective regulations; provide incitement to companies engaged; providing financial support; and raising awareness about the issue* (Veleva & Bodkin, 2018 pp. 21). Vogtlander et al. (2016) also imply that the taxes on labour and increased costs on “virgin” material can enhance the development of remanufactured products. However, government incentives are out of companies control, and Hazen et al. (2017) point out that the companies need to act to influence such policy that have a positive impact on the society as whole.

P11: To facilitate adoption of and transition towards a remanufacturing business models, through regulations, such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers.

4.1.5 The enabling conditions on system-level

Business model perspective

As noted, there are several solutions suggested for establishing circularity through remanufacturing in the business model. Jensen et al. (2019) mean that an integration of several business activities is needed for remanufacturing to be successful. Both environmental impacts, as well as social factors are essential to be able to gain profit. Veleva and Bodkin (2018) argue for rethinking business strategies to go from selling volumes to selling products. Bakker et al. (2014) also mean that different products need different strategies and so also for remanufacturing. It depends on the product, quality, market and dynamics. Furthermore, sustainable value can be reach through a triple-bottom-line, where Jensen et al. (2019) mean that remanufacturing can be viewed as a model with focus on increased sales, brand awareness, new sales opportunities, decreases environmental impact and create jobs.

P12: Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume.

Marketing strategy perspective

To be able to reach the customers with remanufacturing suggest the literature some different approaches. Vogtlander et al. (2017) highlight an important aspect; remanufactured products should have a personal benefit for the customer, rather than the environment. Veleva and Bodkin (2018) highlight another; customer service and great flexibility are important to consider for companies and their value proposition. This is more or less an extension of Hazen et al.s' (2017) argue, that companies that seek to sell remanufactured products should try to shape customers attitudes towards it. Vogtlander et al. (2017) perceives to have the same thoughts and mean that an enhanced image on social media also possibly build a strong

brand and product. With other words is the benefit and emotional value crucial for the customer, where marketer needs to shape the customers towards sustainability.

P13: Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products.

Information, supply and demand perspective

To receive better material and environmental performance, Fischer and Pascucci (2017) highlight a suggestion of moving the ownership to the supply chain. This can then result in a combined circularity of product flow, and become an economic capability (Krystofik et al. 2018). Östlin et al. (2009) mean that information about the products condition and utilisation, combined with detailed information about the duration and point of return, will allow the remanufacturer to predict the supply and will ease combination of supply and demand. Furthermore, Kurilova-Palisaitiene et al. (2018) mean that the remanufacturer also needs to provide the employees with knowledge of what customers are buying. Data collection and detailed information about the material and products perceives to enable the production, supply and demand of remanufactured products.

P14: Adoption of data collection and analysis systems facilitate the prediction of supply of “end-of-use materials” and meet customer demand.

Design for remanufacturing perspective

Products that are remanufactured are possibly not preferred over new products because they are produced from discarded or waste material. Sing and Ordoñez (2016) imply that the designers need to figure out how to make remanufactured products attractive enough to compensate for the desire of buying a new product. Bakker et al. (2014) suggest that designers should allow the customers be involved in the process to gain insights for the products life extension. Linder and Williander (2017) suggest also long lasting design to reduce the potential of obsolesce. Fischer and Pascucci (2017) mean that increased quality will extend the life for garments, and products will possibly cycling a bit longer. Furthermore, to ensure that the design requirements are as durable and reliable as possible, Jensen et al. (2019)

suggest to only replacing as few parts as possibly during the remanufacturing process. It will then be essential to have the designers to think of which parts that should last and which that easily can be replaced to reach a sustainable product as possible (Bakker et al. 2014). The design procedure perceives to have lots of potential but some modification in the process is needed.

P15: Optimisation of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products.

4.1.6 The enabling conditions on process-level

Core perspective

The enabling conditions regarding core of material have different suggestions. Fischer and Pascucci (2017) mean that material have a potential of moving between different industries and branches and does not necessarily need to only stay within one. The focus of firms will than shift from a position within the supply chain to a position in material cycles. It makes potential for generating large-scale effects mean Fischer and Pascucci (2017). Singh and Ordoñez (2016) imply that end-of-life quality is easier to identify when the waste comes from the industry than the customers. Left over material from the industry is mostly material from production and should prevent the issue of uncertainties. Additionally, Vogtlander et al. (2017) mean if the ownership of the product is at the manufacturer, with build in warranties and insurance from the beginning, would that enhance the quality of cores that reach the remanufacturer.

P16: A solid flow of reliable end-of-use material would enhance the interest of adopting remanufacturing activities for manufacturers and brands.

Operation perspective

Operation can be developed and improved by several perspectives but collaborations between stakeholders are identified to be one of the most vital. Creating de-centralised but coordinated networks of entrepreneurs, corporations and other stakeholder is one solution to the challenge of scaling up localised production and consumption (Veleva & Bodkin, 2018). Kurilova-

Palisaitiene et al. (2018) mean that supplier relationships are essential for every remanufacturer company, and can improve the whole process of remanufacturing as it allows feedback loops. Östlin et al. (2009) also indicate that a relationship perspective can bring important insights and make the remanufacturing more effective, as it will be more visible of a win-win situation. Besides from collaborations, Kurilova-Palisaitiene et al. (2018) argue for implementing lean improvements to reduce unnecessary activities within remanufacturing and shorten lead times to prevent time-consuming stops within the process. The argument to highlight lean improvement and collaborative networks is because; Veleva and Bodkin (2018) mean that technology both can enable relationships and the effectiveness to optimise production (cutting, assembly, logistics, storage costs, shipping and information to the customers).

P17: Technology is crucial for establishing the remanufacturing processes establish, and to create efficient information and material flows between the stakeholders.

Cost perspective

There are interesting thoughts about the costs around remanufacturing. Veleva and Bodkin (2018) mean that through comparing the cost for sending products to landfill and remanufacturing, can it be clarified if it is possible to obtain some financial benefits from the waste, which includes resale of products. Östlin et al. (2009) indicate also that companies usually gets the core for free, which mean that companies only need to reconsider transport and material handling costs. Jensen et al. (2018) summarise the drivers of investing in remanufacturing that should not be ignored when discussing costs;

...potential to reduce its raw material costs; revenues from remanufactured products; new markets; the need for material security in the long term; positive brand value and the ability to position itself advantageously in the industry and diversify its overall business activity. (Jensen et al. 2018 p. 14)

In other words should the costs regarding higher operational costs within remanufacturing be reconsidered, since the benefits surpass. Furthermore, referring to previous sections, there are additional solutions and strategies to undertake remanufacturing that also can lower the costs.

P18: High operational costs around remanufacturing can be decreased by optimising the process, and through establishing collaboration that can enhance the benefits with remanufacturing.

5 RESULT FROM THE ONLINE QUESTIONNAIRE AND RANKING

Under this section are the result presented based on the modified Delphi methodology, where the data collection from the practitioners are presented to be able to answering the research questions properly. First, the results from the questionnaire are presented along with the comments from the practitioners to support the result after both round 1 and 2. Lastly, the results from the ranking and commentary inputs from the practitioners are presented lastly.

5.1 Online questionnaire Delphi

The online questionnaires resulted in both quantitative and qualitative information about challenges and the enabling conditions for remanufacturing within the fashion and apparel industry. The two questionnaires were carried out with proposition, which were treating nine challenges and nine enabling conditions. These propositions were uncategorised as the aim for the Delphi method was to reach consensus among the practitioners. The response rate during each round is presented in table 7. The two first rounds were an online questionnaire while the third round was a ranking round. It was initial 23 practitioners that agreed on participating in the study, only 15 made it through the first round. For the second round, two practitioners were dropped out due to the time limitations and lack of commitment, even though feedback and reminders were given. For the third and ranking round, one of the practitioners did drop out due to incomplete fulfilment of the formal.

Table 7. Response rate of participants

	Questionnaire		Ranking
	Round 1	Round 2	Round 3
Participants	15	13	12
Response rate	65%	57%	52%

The results from the two first rounds on the probability, impact and desirability shows which of the propositions the practitioners agreed on and which of the propositions they had a diverse opinions. These rounds investigated what key factors that has the most influence when it comes to an adoption of remanufacturing towards a circular economy. The full results is presented in table 8 and further discussed in the following text, followed by the comments made by the practitioners.

To reach consensus between the practitioners was and IQR set to 25 % for the probability, with a range up to 100%. First round shown that there was an agreement on five of the propositions and the IQR and the SD showed some spread on the opinions on several propositions. Thus, after the controlled feedback and the second round of questionnaire the IQR showed an agreement on ten of the propositions, P3, P4, P6, P7, P9, P12, P15, P16, P17 and P18. In other words, the practitioners' opinion were changed and merged after the second round. The SD also showed that there was in general a more common opinion between the practitioners after the second round. There was only one of the propositions where the practitioners went from agreement to disagreement, P10.

The IQR was set to 1,25, on a 5-point Likert scale, to be consensus among the practitioners, referring to the impact on the industry and desirability of the outcome. After the first round showed the result an agreement on ten of propositions on the impact (P1, P2, P3, P4, P6, P8, P9, P15, P17 & P18) and on six of the propositions on the desirability (P2, P3, P6, P7, P9 & P15). Through letting the practitioner's do the online questionnaire a second round, the result that was given indicated if their opinions was changing after taking part of the others opinions. Thus, after the second round and controlled feedback, additional five propositions did reach consensus on both the impact (P7, P10, P12, P13 & P16) and the desirability (P1, P10, P16, P17 & P18). Overall, the practitioners had a common view on the impact on the industry and the desirability. Only three propositions shown that the practitioners' opinion was diverging on the impact (P5, P11 & P14) and seven propositions on the desirability (P4, P5, P8, P11, P12, P13 & P14).

The comments that were made on the proposition showed the practitioners' interest in the subject and supports and explain the final result, all propositions beside one received comments. These findings bring insights in what challenges and the enabling conditions that are important from the practitioners' perspective. The majority of all comments were received

during the first round and was shared with the controlled feedback for the second round of questionnaire. Furthermore, the propositions that had a decrease in SD after the second round was 13, which showed that the practitioners' opinion has converged. In six of the propositions did the SD increase, which on the other hand demonstrate a diverse of opinions between the practitioners. The variation of the practitioners' opinions can be explained by the controlled feedback after the first round.

Table 8. Results from the online questionnaire round 1 and 2

Results from the questionnaires

Participants Round 1 (15) Round 2 (13)

Industry-level Challenges

Consumer perspective

P1 The consumer attitudes and preferences are challenging when working with remanufactured products.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
29	65	20,1	3,6	1	3,87	2	30	64,15	21,7	3,85	0	3,62	1

Number of respondents with comments R 1:8 R 2:1

Political perspective

P2 The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
47	65	30,6	4,2	1	4,13	1	28	65,46	21,5	4,23	1	3,85	1

Number of respondents with comments R 1:6 R 2:0

System-level challenges

Business model perspective

P3 Visualising the economic value created through remanufacturing activities is challenging due to more complex revenue models.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
25,5	81	20,61	4,27	1	4,27	1	24	78,85	19,8	4,31	1	4,38	1

Number of respondents with comments R 1:4 R 2:0

Marketing strategy perspective

P4 The fluctuation of consumer demand and awareness for sustainable products makes it challenging to market remanufactured products.

Round 1							Round 2						
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IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
21	49	20,9	3,27	1	3,47	2	17	53,63	22,2	3,38	1	3,69	2

Number of respondents with comments R 1:0 R 2:0

Information and knowledge perspective

P5 Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of remanufacturing business models.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
45,5	64	29,38	3,53	3	3,93	2	37	57,38	23,6	3,31	2	3,62	3

Number of respondents with comments R 1:6 R 2:0

Design for remanufacturing perspective

P6 Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
36	54	25,0	3,67	0,5	3,47	0	25	48,92	20,8	3,54	1	3,85	0

Number of respondents with comments R 1:7 R 2:1

Process-level Challenges

Core perspective

P7 Missing product regulations regarding, standards and quality challenge the development of remanufacturing activities.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
23,5	71	18,7	3,67	1,5	3,47	1	20	69,23	14,2	3,85	0	3,62	1

Number of respondents with comments R 1:6 R 2:1

Operation perspective

P8 Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
33	70	27,1	3,47	1	3,47	1,5	34	62,62	25,1	4	0	3,77	2

Number of respondents with comments R 1:6 R 2:0

Cost perspective

P9 Higher operational costs related to an increase in manual work challenge the scaling up of remanufacturing.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	

28	84	19,8	4,33	1	4,33	1	10	86,15	17,5	4,31	1	4,08	1
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Number of respondents with comments R 1:6 R 2:0

The enabling conditions on industry-level

Consumer perspective

P10 To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
23	80	19,8	3,9	2	4,0	2	28	76,15	21,3	4,46	1	4,31	1

Number of respondents with comments R 1:6 R 2:0

Political perspective

P11 To facilitate adoption of and transition towards a remanufacturing business models, through regulations, such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
30,5	69	27,6	4,0	1,5	3,8	2	34	64,85	26,7	3,92	2	3,62	2

Number of respondents with comments R 1:4 R 2:0

The enabling conditions on system-level

Business model perspective

P12 Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
38	68	26	3,6	2	4,2	1,5	19	66,85	21	3,69	1	4,15	2

Number of respondents with comments R 1:7 R 2:0

Marketing strategy perspective

P13 Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products.

Round 1							Round 2						
IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR	IQR	Prob. Mean	SD	Impact (mean)	IQR	Desira. (mean)	IQR
27	74	16,6	3,6	1,5	4,0	2	27	73,77	20,7	4,08	1	4	2

Number of respondents with comments R 1:3 R 2:0

Supply and demand perspective

P14 Adoption of data collection and analysis systems facilitate the prediction of supply of "end-of-use materials" and meet customer demand.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
29	59	25,4	3,6	1,5	3,6	1,5	33	55,08	25,9	3,77	2	3,62	2

Number of respondents with comments R 1:2 R 2:0

Design for remanufacturing perspective

P15 Optimisation of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
21,5	61	24,3	3,5	1	3,8	1	15	64,69	21,7	3,92	0	3,85	1

Number of respondents with comments R 1:4 R 2:0

The enabling conditions on process-level

Core perspective

P16 A solid flow of reliable end-of-use material would enhance the interest of adopting remanufacturing activities for manufacturers and brands.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
28	77	17,7	4,1	1,5	4,1	1,5	21	76,2	18,6	4,15	1	4,15	1

Number of respondents with comments R 1:7 R 2:0

Operation perspective

P17 Technology is crucial for establishing the remanufacturing processes establish, and to create efficient information and material flows between the stakeholders.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
19	77	19,4	3,7	1	3,7	2	14	79,31	15,2	4,15	1	4,15	1

Number of respondents with comments R 1:3 R 2:0

Cost perspective

P18 High operational costs around remanufacturing can be decreased by optimising the process, and through establishing collaboration that can enhance the benefits with remanufacturing.

Round 1							Round 2						
IQR	Prob.	SD	Impact	IQR	Desira.	IQR	IQR	Prob.	SD	Impact	IQR	Desira.	IQR
	Mean		(mean)		(mean)			Mean		(mean)		(mean)	
28,5	72	21,4	4,2	1	4	2	14	74,08	14,5	4,31	1	4,31	1

Number of respondents with comments R 1:3 R 2:0

5.2 Comments on the propositions

The two rounds in the modified Delphi study shows a majority of consensus between the practitioners about what challenges and enables the adoption of remanufacturing in the

fashion and apparel industry. Although the practitioners have an almost common view on the impact and desirability, the aim was to gain diverse views on the subject from different perspectives within the industry. This to also understand which challenges and the enabling conditions that influenced them the most and which they thought was important. To understand the outcome of the result the practitioners was able to comment on all propositions they were answering. In that way, it was possible to gain various views on the subject to explain the importance of challenges and the enabling conditions. Of the total 18 propositions it was 17 that received comments after the both rounds. The propositions are introducing the comments from the practitioners, which are presented through the text below.

5.2.1 Industry-level challenges

Consumer challenges

The consumer attitudes and preferences are a challenge when working with remanufactured products. There is a challenge to work with “virgin material” and it will not be easier for remanufacturing, mean one practitioner. As the consumer attitude is changing and trending, their behaviour is a critical aspect when it comes to long time changes and investments for companies. On the other hand, it is perceived to be a high tolerance for remanufactured products at the moment, but only trendy elite is attracted and actually educated in the matter, which also consume after their knowledge, argue one practitioner. In addition, it would not be difficult to engage the customer to buy re:designed products, if they were common on the market and if they looked as nice and had similar prices as new ones. Although, it is hard to know if the customers actually care about remanufacturing in their buying decision, imply another practitioners. There exist an unbalance between awareness, wanting and action and it is important to make sure that consumer want to buy this kind of products when it comes to the right fashion level. It is a niche category that a few customers are willing to adopt. A plenty of work still need to be done until an adoption of the mass market is possible, mainly due to the look of garments, imply the practitioners.

Political challenges

The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models. Stronger incentives are therefore required for companies to

be able to change their structure and system, since remanufacturing requires a high turnover to be able to achieve re:design in a scalable manner, mean one of the practitioners. Several practitioners indicate a need of regulations and standards for a faster movement. Politics will not change the system until the consumers tell them to, mean one of them. The politicians do not know the reality, how this new business model actually are running, such as working progress and resources, mean another. A third practitioner highlight that there is a lack of resources initiating of new models in fashion businesses, and explains it by the risk with going circular. On the other hand, there are companies that still have faith in more circular activities. One of the practitioner mean that they have been able to take steps towards using recycled materials for their products without any obstacle. However, there is a need of regulations and standards to enable remanufacturing as a transition towards a circular economy.

5.2.2 System-level challenges

Business model challenges

Visualising the economic value created through remanufacturing activities is challenging due to more complex revenue models. Several of the practitioners perceive to find this as one of the most challenging issue. One practitioner means it will be more difficult for the big brands/retailers to manage remanufacturing in large scale until the economic impact is clear. Another practitioner highlight that all internal systems are built for traditional business models and that companies are forced to change the whole structure in order to work with re:design in a scalable manner. A third practitioner has similar thoughts. More than monetary values need to be brought to the discussion; the cost of the climate change has not received enough attention. A last opinion highlights that economic value lies within growth, volume and margins, which is a completely unsustainable approach to a business in a world that has limited resources. To visualise the economic value created through remanufacturing appear to be a challenge among the practitioners.

Information and knowledge challenges

Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of

remanufacturing business models. Several practitioners find that the knowledge and awareness is not lacking and that the fashion industry is well informed compare to other industries. The environmental impact rather requires regulation in order to have the industry to follow. In opposite, one of the practitioners has a different point of view: Current system that do not include any costs for activities that damage the environment and that has expensive sustainable solutions is a result of ignorance, and lack of knowledge. However, one other practitioner clarifies that it is required to understand when remanufacturing is not the best overall solution, i.e. how to know we are not just creating another problem? Knowledge that concerns environmental and social impact seems to exist in the fashion industry, but information sharing and seeking is perceived to need more attention.

Design for remanufacturing challenges

Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position. The common view among the practitioners is that the designers are aligning with the company's guidelines and that the management has the role to decide about the design process. If the company would have remanufacturing in their strategy, the designer would be given the tools that are needed, mean one of the practitioners. The challenge perceives to be in other aspects; earlier in the process where it is a desire of designing to facilitate recycling of the garment; challenges with knowing all the aspects that actually have an impact; to be innovative and work close to factories to be able to create new solutions and overcome production problems; and the challenge with high performance requirements. One of the practitioners mentions also that many modern designers are interested and well aware of the possibilities with remanufacturing. People in the industry seem to lead the debate and demand change in the production, purchase and other departments. With that said, it is not the designers them self that has a challenge with designing remanufactured products; it is rather the chain as whole.

5.2.3 Process- level challenges

Core challenges

Missing product regulations regarding, standards and quality challenge the development of remanufacturing activities. The common opinion from the practitioners is that the industry

requires more regulations and standards that everyone is directed to follow and the reasons perceives to be many: Circular systems and sustainable business models will take long time to develop without strong regulations; political and financial ways that control and push companies and consumers in the right direction; It is easier to work with standards than without; Guidelines of what "counts" as remanufactured products is preferable; also the chemical content of the end-of-used material that will be used in remanufactured products; the need of standards and regulations depends on what products that the companies are producing; A more complex product with more complexities on care label is more depended on this; There is a risk of greenwashing without regulations; and the lack of standards would not prevent the industry from having remanufactured products if they saw a business potential in doing it, imply the practitioners.

Operation challenges

Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing. Several practitioners perceive to agree that growth, volumes and margins over shed the incitements and interest of remanufacturing in operation, where the knowledge it self is not the problem. Additional practitioners mean that remanufacturing is still relatively new for all practitioners and the industry is actually pushing the development forward. Remanufacturing gains interest but there is limited operational processes available at larger scale. The challenge is scaling up remanufacturing and adopting the processes into normal routines within product development. Contrary, another practitioners mean that the manufacturers need more knowledge, due to e.g a desirable of new set ups for the production. Another issue is the difficulties when creating patterns, as there is an uncertainty of how the end-of-use material will look like. Operational challenges within remanufacturing are perceived to be, and a new system for the production is desirable to be able to produce and scale it up.

Cost challenges

Higher operational costs related to an increase in manual work challenge the scaling up of remanufacturing. Among the practitioners there is an agreed opinion that cost is always an issue. Scaling up remanufacturing is challenging as current processes are mostly manual, and there is a lack of systems. Furthermore, finding production units that can handle

remanufacturing is also challenging. In addition, there is no room for increase in costs for the business model, imply one practitioner. However, some of the practitioners mean that all changes take time and it will cost money and we need to afford this change. The challenges with costs are perceived to mainly concern big volume driven companies with big market shares, rather than small value driven companies.

5.2.4 The enabling conditions on industry-level

The enabling conditions from a consumer perspective

To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives. The opinions about the consumer perspective are following a similar thread. If there is huge demand most obstacles are manageable. Volume is such an important success factor for a large scale no matter what companies try to do, mean one of the practitioners. Another practitioner thinks that most consumers are first attractive by price and that companies need to explain the benefits of more environmental friendly choices. A third practitioner implies that it is similar to all other sustainable options; it might not be special for remanufactured item. Additionally, other aspects like emotion and brand are also perceived to attract the consumers. In contrast mean one of the practitioner that this is only an issue if you are trying to sell consumer a product that performs more poorly or costs more. In other words, remanufactured products do not seem to be more difficult to marketing than other sustainable options.

The enabling conditions from a political perspective

To facilitate adoption of and transition towards a remanufacturing business models through regulations, such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers. The opinions from the practitioners perceive to be a tense of disagreement in this sense. One of them means that policymakers are the last ones to "get it", as ones the businesses have the customer and popular opinion on their side, the policymakers will tag along. Cooperation is needed; more pressure from consumers, more knowledge and more regulations from "above", points another practitioner out. While a third practitioner imply that there is no time and resources to work with lobbying. Some changes are necessary

to be able to have remanufacturing competing with new product, mean a forth practitioner. To facilitate the adoption of remanufacturing is not policymakers perceived to be the solution alone. A mix of customers, policies and stakeholders has the potential to enable remanufacturing among fashion companies.

5.2.5 The enabling conditions on system-level

The enabling conditions for business models

Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume. Several practitioners agree that rethinking the business model is desirable but difficult to reach. There are difficulties to earn more money by going sustainable, mean one of the practitioners. The investment in product and marketing today will take time to give the ROI the business need. Another comment on this issue highlights the lack of evidence that remanufacturing can be scaled up to match current revenue, particularly for incumbents. Most pilot projects that the practitioners have seen are not making much money and are being used as marketing initiatives. It is desired to understand different values than just money, comment a third practitioner, while a forth practitioner mean it is critical to scale up and have volume. Lastly mention is that these are two separate tracks, and further down the line it will be clear that both aspects serve the same goal. The shift from one model to another is difficult enough and the practitioners find it difficult to see the advantage of focusing on the product rather than the volume.

The enabling conditions for marketing strategy

Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products. Emotional value is perceived to be the most essential when it comes to marketing. Making the consumer feels smart and trendy choosing "right" is probably the only way, mean one of the practitioners. In Sweden being a "LOHAS" (Life-of-health-and-sustainability) is trendy, the practitioner continues. In Sweden we can afford it and consumers in other countries might strive for other social goals. Storytelling and social media can enhance the demand for remanufactured products, implies

another practitioner. With the right marketing remanufacturing will have the same value as a high-end brand, but a clean environmentally friendly story connected to the clothes.

The enabling conditions for supply and demand

Adoptions of data collection and analysis systems facilitate the prediction of supply of “end-of-use materials” and meet customer demand. Waste is probably the greatest resource in the world and the system to recycle waste requires to be developed even more on a global basis imply one practitioner. Most virgin plastics that exist today are still cheaper than recycled, argues one practitioner. In addition would everything become so much easier if remanufacturing was standardised and as simple to use as conventional solutions, mean a third practitioner.

The enabling conditions for design for remanufacturing

Optimisation of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products. The practitioners agree on this proposition. It can never be less attractive than new products, rather exceed the customers expectations, mention one practitioner. Remanufactured products have a certain look and attract a certain customer group, whereas some high quality products have a more timeless look, mentions another practitioner. These two are not necessarily contradictory (new garments versus remanufactured garments), as the benefits of a remanufactured product need to be apparent and the disadvantages could then be solved imply a third practitioner.

5.2.6 The enabling conditions on process-level

The enabling conditions for core

A solid flow of reliable end-of-use material would enhance the interest of adopting remanufacturing activities for manufacturers and brands. Several practitioners agree that a solid flow of reliable end-of-use material is necessary to guarantee a certain volume and to decrease the price and become competitive with recyclable materials. Available flows of end-of-use materials that fit with current supply chains would help the process of scaling up

remanufacturing. Similar as recycled polyester, as it can be purchased and used in same way as regular polyester, mean one practitioner. The challenge lies among natural materials and not plastic, and a solid flow of reliable end-of-use material is desired for slow fashion and durability, means another practitioner. However, the most interesting would be to use the companies' own flow of materials, like unsold goods imply a third practitioner. A solid flow of end-of-use material for remanufacturing perceives to be important to be able to implement remanufacturing into the business model.

The enabling conditions for operation

Technology is crucial for establishing the remanufacturing processes establish, and to create efficient information and material flows between the stakeholders. Tech is attractive and the practitioners have a common opinion on the proposition. Tech and innovation is the only things that can solve the environmental problems. This unless mankind can agree to consume less and live with a lower level of welfare, argues one of practitioners. Technology is always of great importance and make most processes easier mean the practitioners.

The enabling conditions from a cost perspective

High operational costs around remanufacturing can be decreased by optimising the process, and through establishing collaboration that can enhance the benefits with remanufacturing. There was few comments on the enabling conditions from a cost perspective but the key is optimising the process to decrease the cost agrees the practitioners. Shorten lead times and optimisation of the production can decrease foremost transport by moving it closer to the user, imply another practitioner.

The comments from the practitioners gives some perspective of the subject and their thoughts about challenges and the enabling conditions gives further insights of what motivate and make an adoption of remanufacturing attractive within the fashion and apparel industry. To gain a better overview of the relative importance of the propositions the impact and desirability are positioned in relation to the probability of the propositions.

5.3 Impact and desirability in relation to the probability

The relative importance of the propositions after the second round of questionnaire is presented through positioning the impact and desirability in relation with the probability on each of the propositions (see figure 3 and 4). Most of the propositions had a probability over 50% and only one of them was under 50%. Among the result from the impact and desirability had almost half of the propositions a value over 4. The probability of challenges or the enabling conditions is compared with the impact on the industry in fig 3, while in fig. 4 the probability is compared with the desirability of more attention to the outlined proposition. Challenges concerned P1-P9 and the enabling conditions P10-P18. A probability over 60% was reached on 14 of the propositions after the second round and seven of those reached a probability over 70%: business model perspective (P3), cost perspective (P9), consumer perspective (P10), marketing strategy perspective (P13), cost perspective (P16), operation perspective (P17) and cost perspective (P18). As the result can tell, the propositions that gained the highest score on the probability were challenges referring to business model perspective (P3) and costs (P9), and the enabling conditions from the operation perspective (P17).

After the second round, nine of the propositions gained an impact over 4 on the Likert-scale for the impact, namely: political perspective (P2), business model perspective (P3) operation perspective (P8), cost perspective (P9), consumer perspective (P10), marketing strategy perspective (P13), core perspective (P16), operation perspective (P17) and cost perspective (P18). The propositions from a consumer perspective on the enabling conditions (P10) gained the highest impact score, 4,46. Followed by challenges from a business model perspective (P3), challenges and the enabling conditions from a cost perspective (P9 & P18), which scored 4,31 on the Likert-scale. The desirability for the propositions gained similar results. Seven of the propositions had a desirability over 4 on the Likert-scale: business model perspective (P3) cost perspective (P9), consumer perspective (P10), business models perspective (P12), core perspective (P16), operation perspective (P17) and cost perspective (P18). The enabling conditions from a consumer perspective (P10) gained also a high score for the desirability but challenges from a business model perspective (P3) had the highest score, 4,38 contrary 4,31 for P10 together with the enabling conditions from a cost perspective (P18).

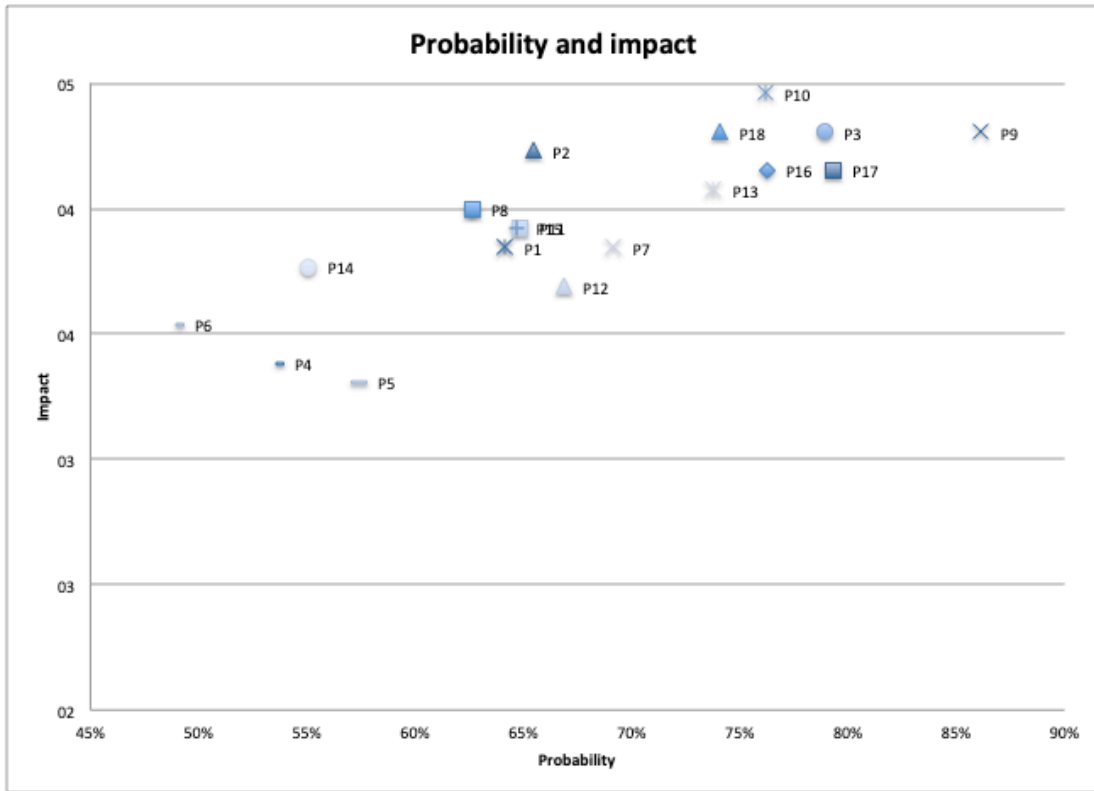


Figure 3. Probability and impact of the propositions after 2nd round

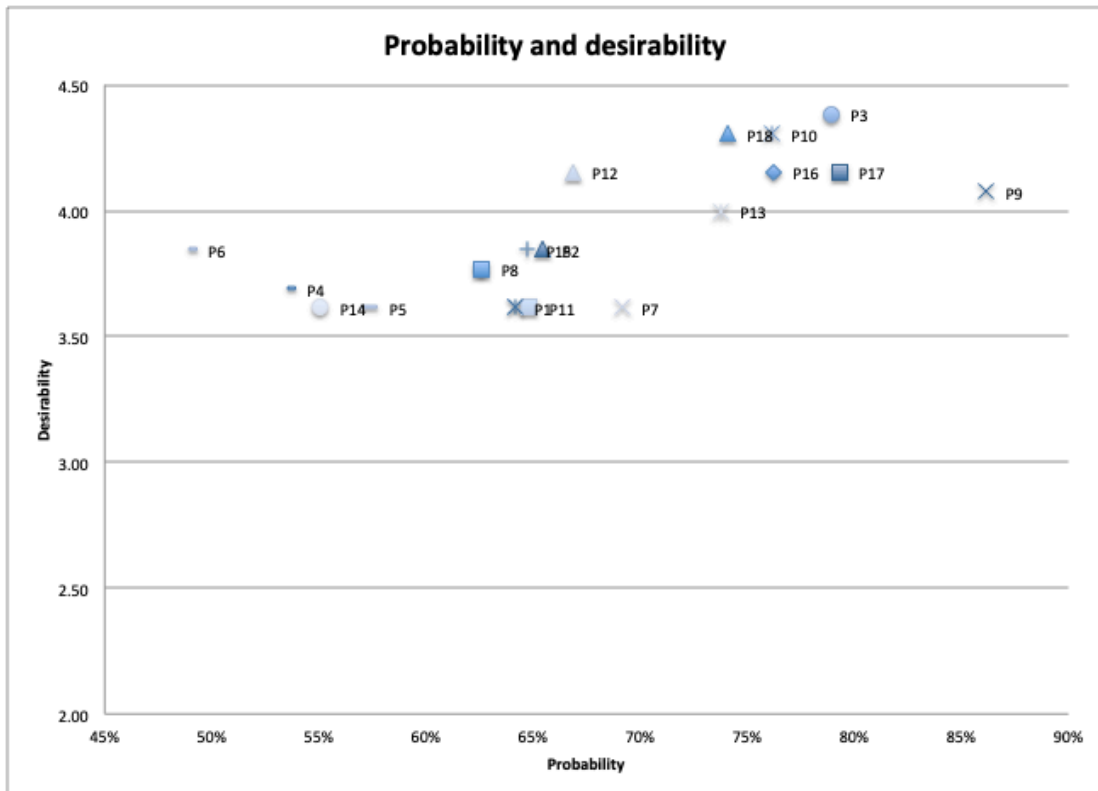


Figure 4. Probability and desirability of the propositions after 2nd round

5.4 Ranking Delphi

To understand the relative order of importance of the propositions and which of them that was most important, the practitioners were asked to rank the challenges and the enabling conditions. The propositions were outlined with the same position as in previous questionnaires, in order to avoid any possibility of affecting the practitioners' decision. However, the calculation of Kendall's W present only a value of 0,13 for the ranking of challenges and 0,10 for the enabling conditions. Thus, the results from the ranking round show a low degree of agreements between the practitioners on both challenges and the enabling conditions. Values lower than 0,3 indicate that there is a low degree of agreement. This result indicate that the relative importance of the propositions differentiate among the practitioners, compared to previous round where there was a high degree of agreement among them.

Even though the results of agreement indicated to be low, the ranking resulted in an order of challenges and the enabling conditions (see table 9 & 10). *Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging positions (P6)*, reached the lowest mean rank, where the rank closets to one is perceived to be the most important. *Higher operational costs related to an increase in manual work challenge the scaling up for remanufacturing (P9)*, is the challenges that is ranked as the least important challenges. Furthermore, when it comes to the enabling conditions, proposition P18 *High operational costs around remanufacturing can be decreased by optimizing the process, and through establishing collaboration that can enhance the benefits with remanufacturing*, reached the lowest mean rank and positioning as the first. *Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume*, is the proposition for the enabling conditions that gained the highest mean rank and was positioning as the last. Since the result indicates of a low degree of agreement, and a fourth round would not benefit any to the study due to bias, a comparison with the second round has been applied. In addition, the practitioners were also asked to give their opinion on the diverge result to get better explanation and understanding of the importance of the propositions.

Table 9. Ranking of challenges after 3th round

Challenges	Mean rank	Rank
P6. Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position.	3,4	1
P1. The consumer attitudes and preferences are challenging when working with remanufactured products.	4,2	2
P8. Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing.	4,4	3
P4. The fluctuation of consumer demand and awareness for sustainable products makes it challenging to market remanufactured products.	4,8	4
P5. Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of remanufacturing business models.	5,0	5
P2. The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models.	5,1	6
P7. Missing product regulations regarding, standards and quality challenge the development of remanufacturing activities.	5,6	7
P3. Visualising the economic value created through remanufacturing activities is challenging due to more complex revenue models.	5,8	8
P9. Higher operational costs related to an increase in manual work challenge the scaling up of remanufacturing.	6,8	9

Table 10. Ranking of the enabling conditions after 3th round

The enabling conditions	Mean rank	Rank
P18. High operational costs around remanufacturing can be decreased by optimising the process, and through establishing collaboration that can enhance the benefits with remanufacturing.	4,2	1
P15. Optimisation of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products.	4,4	2
P17. Technology is crucial for establishing the remanufacturing processes, and to create efficient information and material flows between the stakeholders.	4,7	3
P10. To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives.	4,8	3

P13. Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products.	4,8	5
P14. Adoption of data collection and analysis systems facilitate the prediction of supply of “end-of-use materials” and meet customer demand.	4,9	6
P16. A solid flow of reliable end-of-use material would enhance the interest of adopting remanufacturing activities for manufacturers and brands.	4,9	7
P11. To facilitate adoption of and transition towards a remanufacturing business models, through regulations, such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers.	5,3	8
P12. Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume.	6,8	9

To give the third ranking round a comparison, the results from the second round was calculated where the probability was combined with the result of impact and desirability. An easy multiplication was done due to the aim of reaching a ranking list where the highest score indicated of the highest probability/impact or probability/desirability, and to be able to identify the relative importance of the proposition (see table 11 & 12). The result of the second round of ranking only indicate how the propositions are perceived during the previous round where the propositions reached a high degree of agreement. The table 11 and 12 do not add any value in form of re ranking of the final round.

Table 11. Ranking from mean value of the probability multiply with impact after 2nd round

Challenges Probability x Impact			The enabling Conditions Probability x Impact		
<u>Proposition</u>	<u>Total value</u>	<u>Rank</u>	<u>Proposition</u>	<u>Total value</u>	<u>Rank</u>
P9	371,1	1	P10	339,8	1
P3	340,0	2	P17	329,4	2
P2	277,0	3	P18	319,1	3
P7	266,0	4	P16	316,7	4
P8	250,5	5	P13	300,8	5
P1	246,7	6	P11	254,4	6
P5	189,8	7	P15	253,8	7
P4	181,2	8	P12	246,8	8
P6	173,1	9	P14	207,6	9

Table 12. Ranking from mean value of the probability multiply with desirability after 2nd round

Challenges Probability x Desirability			The enabling conditions Probability x Desirability		
<u>Proposition</u>	<u>Total value</u>	<u>Rank</u>	<u>Proposition</u>	<u>Total value</u>	<u>Rank</u>
P9	351,2	1	P17	329,4	1
P3	346,0	2	P10	328,0	2
P2	251,8	3	P18	319,1	3
P7	250,0	4	P16	316,7	4
P8	236,0	5	P13	295,1	5
P1	231,9	6	P12	277,7	6
P5	207,5	7	P15	248,8	7
P4	197,7	8	P11	234,4	8
P6	188,2	9	P14	199,1	9

5.5 Comments on the ranking

The ranking Delphi round showed a low degree of agreement among the practitioners. Although, it was possible to gain some insights in this diverge view of the relative importance of the propositions. It was seven out of the 12 practitioners who had a commentary input on this final round.

One of the practitioners had knowledge from being involved in a RE:design project, and contributed in the study with insights from this knowledge but also from the structure of the own company and decisions. The practitioner implies that individual designer and purchaser often attributes with too much responsibility when it comes to companies moving towards sustainability. The responsibility should be positioned within the business structure instead, where the decision about working with re:design would be decided from a strategic level. Therefore, the managers need to make the decision to make it possible for the designers to adapt the process and follow the path. Another practitioner, which is a retailer of premium second hand clothes, has a common perspective about the designer and implies that they are perceived to have established knowledge about remanufacturing and the issue is therefore not the lack of knowledge. Thus, the general result probably highlights more of insights rather than proven theory, continues the practitioner.

Another practitioner indicate that they work with re:design at the moment, where they use their left over stock in the process. The most difficult task for them has been to develop a sustainable strategy that also includes economical benefits. Thus, their project at the moment is more for goodwill. Higher volumes could increase the potential for economic benefits,

where the operational costs would decrease, which also two other practitioners argues for. However, the consumers need to be aligning with the offering, which is the most difficult part at the moment, continues the practitioner. The original design still perceives to attract the consumers more than remanufactured products, however there is always room for new consumer segments. The practitioner ends with indicating that they have not met any barriers in the process of remaking the products, and there is a potential of succeeding with remanufacturing.

One of the practitioners, who is an retailer agrees with the previous mentioned practitioner. The consumer attitude and demand is one of the main challenges when it comes to remanufacturing, and it affects the development of the process. Contrary, another practitioner who is working in the outdoor-industry implies that the consumers perceive to have a positive attitude towards remanufacturing and it would not be an issue to reach them. Lastly, the practitioners also commented on their own expertise within the field, where two of them highlighted their misunderstanding of two of the propositions, P16 and P1, where both of them motivated a higher rank to them.

6 DISCUSSION

The findings of the evaluation and ranking of challenges and the enabling conditions are discussed in relation to the literature. First, the key factors that influence the adoption of remanufacturing are addressed followed by a deeper discussion about the perspectives with the highest influence. Thereafter, the ranking of challenges are addressed and compared with the results from the second round to highlight the relative importance of the propositions within the textile and apparel industry.

6.1 Key factors that influencing the adoption of remanufacturing

This modified Delphi method showed several key aspects and views on remanufacturing. Given this range the study highlights several directions for development of remanufacturing. In this section the key aspects with the highest probability, impact and desirability are discussed using commentary inputs from the practitioners and input from the literature. It is evident from this study that several propositions are of importance within the fashion and apparel industry, with none of the propositions with a probability fewer than 50%, and seven

was even over 70%. An agreement was reached among the practitioners and especially after the second round and controlled feedback. Still, there is a risk that the practitioners got influenced by change their opinion rather than reaching agreement. Thus, the importance of additional comments from the ranking round could explain and enhance the practitioners' own thoughts without getting any group pressure. However, the study indicated that the practitioners got a more common view after taking part of the others perspective where several ideas been outlined and additional comments supported the results that it was more of an agreement than changed opinion. This is also shown to be vital for a transition towards a circular economy (Planing 2015). Furthermore, the most influencing perspectives are from a business model-, costs- and consumer perspective as evident in this study through the high score on the impact and desirability. Even though almost half of the propositions had a score of over 4 on both the impact and desirability, with none under 3 on the Likert-scale, these three were excelled.

The business model perspective is one of the most challenging issue when it comes to adopting remanufacturing into the business model, as shown from the high influence and consensus reached (P3). The result is expected, as a circular business model is difficult to achieve, due to the need of additional time, and sales to cover the costs that occur (Linder & Williander, 2017). As pointed out by Jensen et al. (2019), a whole new structure is required with additional practices and business activities to be able to work with remanufacturing as a transition towards a circular economy. There is a challenge of rethinking the business model and it is necessary to include monetary values in the discussion, as argued by one of the practitioners.

Following this, it is evident in this study that the cost perspective emerges as another essential aspect, supported by the low IQR after the second round (P9). Also confirmed by one practitioner comment, cost perceives always to be an issue, especially as remanufacturing mainly consists of manually work, also supported by Vogtlander et al. (2017). Consequently, there is difficult to find room for increase in costs within the business models, implies another practitioner. This also verifies the difficulties with scaling up the process (Östlin et al. 2009). Thus, the projects that are available on the market are not convincing enough, and additional evidence of how to make remanufacturing profitable needs to be proven. As pointed out by Linder & Williander (2018), capitalising circular strategies depend on a company's ability to take economic value that is left in products and offer it into new ones. This is something that

is dependent on investments especially for larger companies, as argued by one practitioner. However, by drawing a conclusion from the previous section, the challenge with visualizing a new business model seems to inhibit the discussion about the how to solve the costs.

Based on the high score on fig 3 and 4, I identified that the consumer perspective are essential when it comes to enabling remanufacturing (P10). Here it is necessary to understand that the consumer attitudes are a critical aspect in the long time changes and investments, as stated by a practitioner in the discussion about challenges from a consumer perspective (P1) and in line with Gurita et al. (2018). The uncertainty of the consumers' behaviour challenges the companies, as evident in this study through the statement about lack of awareness, demand and action and also supported by Veleva & Bodkin (2018). There are few consumers that actually care about sustainable options. Therefore, it is essential to have companies to understand the importance of their role in environmental initiatives to be able to push the consumer in the right direction (Hazen et al. 2017). This support one practitioner that propose the benefits of a more environmental friendly offer need to be explained by the companies. Promoting remanufactured products would not be different to any other sustainable options.

I can conclude that several perspectives stood as important influences to the adoption of remanufacturing, namely: marketing strategy- core- and operation perspective besides from business model-, costs- and consumer perspective, this is shown by the fig 3 and 4 and supported by the literature. There are several propositions that scored over 70% on the probability and 4 on the Likert scale, for the impact and the desirability. The importance of this gives insight of where to direct the focus for further development and confirms the key requirements for a transition towards a circular economy presented by Lieder and Rashid (2016).

6.2 Essential factors for remanufacturing

There was no agreement as the most challenge or the enabling condition for adopting remanufacturing as a transition towards a circular economy, this is evident through the ranking (table 9 & 10). A significant number of propositions scored over 4 on the impact and desirability and can explain the diverge result. I can conclude from the result of the ranking

that there is consensus reached among the top propositions, but not any significant score for the impact and desirability were noted on the challenges.

Additional, the result from the second round can explain why the designer perspective ended up as the highest ranked. The practitioners reached consensus, but the proposition only reached an IQR of 25, which indicate that the result could have been weighted. In addition, the result on the proposition also gained some support from the practitioners' interest, as there were several comments made (P6). Their discussion committed the knowledge among the designer, and instead directed the critic towards the business structure, as demonstrated in text from the comments in section 4.2.1.2. This supports by Bocken et al. (2016), which points out that a combination of design and business model strategies gives a clearer vision and focus. However, the result was showing a very similar mean rank on all of the propositions of the enabling conditions (see table 10). The relative importance of the enabling conditions is reached within many propositions, which is especially evident through the result, but none is specific the most important. I found it to be a general interest in the propositions among the practitioners, but with a low agreement on which of challenges and the enabling conditions that are the most important. The need of several perspectives is therefore needed, as pointed out by Dissanyake & Sinha (2015), the fashion and apparel industry needs synergies among stakeholders to drive the innovation of remanufacturing, where several perspectives are important.

As previously discussed, this study shows that there is a high degree of agreement among the practitioners, but with evident from the ranking, they perceives to have a diverge opinion of where to start focusing. This can be explained by the unique situation of each company, where the size, type and focus matters, which is shown by an opinion on the ranking, that the general result probably bases on more insights rather than proven theory (see section 4.2.3.1). I can also conclude the limited knowledge, lack of standards, reliable material and the specific focus on volumes challenge the companies as shown in this study by the opinions from P7, P8, and also supported by Kurilova-Palisaitiene et al. (2018). Therefore, a combination of integrated activities is required where the enabling conditions need to be balanced against the challenges to be able to build a strategy for remanufacturing, which is in line with Jensen et al. (2019).

7 CONCLUSION

In line with the purpose, the challenges and the enabling conditions that influence an adoption of remanufacturing within fashion and apparel industry were identified, and a significant agreement among a group of practitioners identified the relative importance of them. The findings show that the three most important factors for an adoption of remanufacturing lie within the business model- costs- and consumer perspective. As the aim for this study also were to prepare the industry of where to go deeper, the perspectives on challenges and the enabling conditions were on a holistic point of view. A significant number of key factors had high influence when it comes to an adoption of remanufacturing especially the one concerning limited knowledge, lack of standards, reliable material and the specific focus on volumes. However, there was no agreement reached on the relative ranking of challenges and the enabling conditions, as there were several perspectives that influenced the practitioners, but also the variety of companies and their activities. This study provides further support for collaborative development for remanufacturing, where several perspectives is needed (Bocken et al. 2016; Jensen et al. 2019), which will be discussed in the coming sections.

7.1 Theoretical implication

The interest for the field of remanufacturing is increasing within both research and practices, but further research is required with specific focus on the fashion and apparel industry, as the existing body of literature is still limited (Sinha et al. 2016). This study contributes to the field by addressing the relative importance of challenges and the enabling conditions among practitioners within the fashion and apparel industry. Further insights were gained through identifying which challenges and the enabling conditions that influences the most. In addition, by addressing practitioners' perspective from the fashion and apparel this study contributed to the need of more contexts to guide a smoother transition towards a circular economy in the future (e.g Franco, 2018). The study also provided with some insights of where the bottlenecks for a transitions towards a circular economy (e.g Lathi et al. 2018), and also indication of where to start focusing for a transition towards a circular economy (Lewandowki, 2016). As in line with Stål and Corvellec (2018), this study provides an updated view of practitioners' opinion about circularity within fashion and apparel, and the

systematic literature review highlights the current aspects within remanufacturing within a circular business model.

This result identifies important challenges and the enabling conditions when it comes to remanufacturing within the fashion and apparel industry, as emphasised by Franco (2018). Whereas, numbers of challenges and enablers has been outlined in the literature (e.g Fischer & Pascucci 2017; Veleva & Bodkin, 2018; Linder & Williander, 2017), the relative importance in the context of fashion and apparel has not been sufficiently addressed. The result indicate that the relative interest among the different perspectives and the findings can provide an understanding and as a support about remanufacturing more broadly in relation to transition towards a circular economy within the textile and apparel industry. In addition this study also provides guidance regarding how strategies can be developed, this is discussed in the following section.

7.2 Practical implication

The findings can serve as support for managers and provide some valuable insights for policy and practice in an adoption of remanufacturing. As discussed earlier, the findings identified a relative importance of challenges and the enabling conditions from several perspectives, and can serve as an insight of what can influence the process, especially, business model-, costs- and consumer perspective. As the industry is cost sensitive, collaborations for efficiency and development could enable lower costs for establishing remanufacturing. Furthermore, the practitioners' perspective give guidance regarding what of interest for the industry and what is essential to consider for an adoption of remanufacturing. However, remanufacturing is not beneficial in the terms of labour costs, production costs and low demand. Thus, company size, type and the supply chain including activities, along with the consumer behaviour complicates the transition towards a circular economy.

In conclusion, through understanding the relative importance of challenges and the enabling conditions specific to remanufacturing it can enable better managerial decisions for future implementation towards a circular economy. In addition, a better understanding of which challenges and the enabling conditions for an adoption of remanufacturing, can provide guidance to the development of the concept within the fashion and apparel industry.

7.3 Limitations and future research

This study is limited, based on the delimitations and the used methodology, thus there are opportunities for further contribution to the research. The findings can be seen as limited due to the relative limited context within the fashion and apparel industry, which also could explain the lack of agreement of the ranking among the practitioners. However, the concept needs to be explored among more stakeholders to have the potential to gain more interest and to be developed (Franco, 2018). Further the study does also lack a sense of generalisation since the selection of participants was purposive, as well as there exist dropouts during the process. That opens for future studies that could address the subject through a more generalised perspective within a specific size of companies where the study is less dependent on the individual. Therefore, to gain an even richer understanding, the concepts could gain additional insights through a variety of methods.

As the study contribute with an overall perspective of which challenges and enabling conditions that influences an adoption of remanufacturing, the findings can be used to build up theories emerging from a specific perspective or level. It would also be interesting to contribute with an extension of this study and investigate why the transitions towards a circular economy goes so slow within the textile and apparel industry, as in line with Lathi et al. (2019) and Stål and Corvellec (2018).

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9 APPENDIX

APPENDIX An outline of the online questionnaire

Remanufacturing within the Textile and Apparel Industry

How probable is the challenge or the enabling condition?

*1. What's your name?

Challenges

Consumer perspective

*2. The consumer attitudes and preferences are challenging when working with remanufacturing products.

0 Probability 100

Political Perspective

*3. The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models.

0 Probability 100

Business model perspective

*4. Visualizing the economic value created through remanufacturing activities is challenging due to more complex revenue models.

0 Probability 100

Marketing strategy perspective

*5. The fluctuation of consumer demand and awareness for sustainable products makes it challenging to market remanufactured products.

0 Probability 100

Information and knowledge perspective

*6. Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of remanufacturing business models.

0 Probability 100

Design for remanufacturing perspective

*7. Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position.

0 Probability 100

Core perspective

*8. Missing product regulations regarding standards and quality challenge the development of remanufacturing activities.

0 Probability 100

Operation perspective

*9. Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing.

0 Probability 100

Cost perspective

*10. Higher operational costs related to an increase in manual work, challenge the scaling up of remanufacturing.

0 Probability 100

Enabling conditions

Consumer perspective

*11. To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives.

0 Probability 100

Political perspective

*12. To facilitate adoption of and transition to a remanufacturing business models, through regulations such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers.

0 Probability 100

Business model perspective

*13. Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume.

0 Probability 100



Marketing strategy perspective

*14. Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products.

0 Probability 100



Supply and demand perspective

*15. Adoption of data collection and analysis systems facilitate the prediction of supply of “raw materials” and meet customer demand.

0 Probability 100



Design for remanufacturing perspective

*16. Optimization of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products.

0 Probability 100



Core perspective

*17. A solid flow of reliable raw material would enhance the interest of adopting remanufacturing activities for manufacturers and brands.

0 Probability 100



Operation perspective

*18. Technology is crucial for establishing the remanufacturing processes, and to create efficient information and material flows between the stakeholders.

0 Probability 100



Cost perspective

*19. High operational costs around remanufacturing can be decreased by optimizing the process, and through establishing collaboration that can enhance the benefits with remanufacturing.

0 Probability 100



Remanufacturing within the Textile and Apparel Industry

Impact on the textile and apparel industry and grade of desirability.

In this sections will the same questions appear, but you will be ask for the impact on the textile and apparel industry and how desirable do you, as professional in the industry find this to be.

You will also be asked for further explanation and motivations to your answer.

Challenges

Consumer perspective

*20. The consumer attitudes and preferences are challenging when working with remanufacturing products.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Political Perspective

*21. The lack of policies, standards and guidelines challenge the implementation of remanufacturing business models.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Business model perspective

*22. Visualizing the economic value created through remanufacturing activities is challenging due to more complex revenue models.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Marketing strategy perspective

*23. The fluctuation of consumer demand for sustainable products makes it challenging to market remanufactured products.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				

Information and knowledge perspective

*24. Lack of knowledge and awareness regarding environmental and social impact of waste generation and disposal within fashion companies, challenges the implementation of remanufacturing business models.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				

Design for remanufacturing perspective

*25. Limited knowledge on aspects related to designing remanufactured products puts the designers in a challenging position.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				

Core perspective

*26. Missing product regulations regarding standards and quality challenge the development of remanufacturing activities.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Your opinion

Operation perspective

*27. Lack of operational knowledge and expertise within the apparel and textile industry challenge the implementation of remanufacturing.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Cost perspective

*28. Higher operational costs related to an increase in manual work, challenge the scaling up of remanufacturing.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Enabling conditions

Consumer perspective

*29. To attract more customers and their personal interest and attitude towards remanufactured products, companies need to understand the factors that influence the customers' acceptance process, as well as communicate their environmental initiatives.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Political perspective

*30. To facilitate adoption of and transition to a remanufacturing business models, through regulations such as tax reduction, stakeholders (manufacturers and brands) need to take action to influence policymakers.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				

Business model perspective

*31. Rethinking the business model for remanufactured products enables companies to both increase the revenue and decrease the environmental impact, through focus on the product rather than the volume.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				

Marketing strategy perspective

*32. Marketing the personal benefit for the customers, such as emotional value and environmental impact, will enhance the demand for remanufactured products.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				

Supply and demand perspective

*33. Adoption of data collection and analysis systems facilitate the prediction of supply of “raw materials” and meet customer demand.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

1 low 2 3 4 5 high

How desirable do you find this to be?

Your opinion

Design for remanufacturing perspective

*34. Optimization of the design process to develop durable products would enhance the attractiveness and competitiveness of remanufactured products, compared to new products.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Core perspective

*35. A solid flow of reliable raw material would enhance the interest of adopting remanufacturing activities for manufacturers and brands.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Operation perspective

*36. Technology is crucial for establishing the remanufacturing processes, and to create efficient information and material flows between the stakeholders.

1 low 2 3 4 5 high

Impact on the industry?

How desirable do you find this to be?

Your opinion

Cost perspective

*37. High operational costs around remanufacturing can be decreased by optimizing the process, and through establishing collaboration that can enhance the benefits with remanufacturing.

	1 low	2	3	4	5 high
Impact on the industry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How desirable do you find this to be?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Your opinion	<input type="text"/>				



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