UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

The complexity of circular business models and the effect of firm size in the clothing industry

- A variable development and quantitative study for the clothing industry

Bachelor Thesis in Corporate sustainability
School of Business, Economics and Law at the University of Gothenburg
Spring semester 2020
Supervisor: Elisabeth Karlsson
Authors:
Christoffer Lindström
Carl Berggren

Abstract

With the newly added focus on the social and environmental costs associated with the fast fashion and clothing industry, many researchers have attempted to solve the problem and come up with valid theories for change. A way to minimize externalities is with the implementation of circular business models, which have become increasingly relevant to prolong the life cycle of products, reduce the use of natural resources and minimize harmful emissions and can, therefore, be a possible solution to the problem. However, there are many different interpretations of the model, and there is no general consensus that can be applied regardless of industry. Instead, it appears that customization is necessary to fully capture the possible benefits. This thesis attempt to address this gap and provide clarity to the subject by conducting an extensive literature study review in order to investigate prominent research in the field of circular business models and present their similarities and differences regarding the distinct benefits, problems and opportunities of the model. Based on the result of the literature study, three variables are developed to show how a quantitative analysis can be made with a focus on a single industry. This was made as little research has been done regarding the correlation of (clothing) firm-size and the willingness to implement circular business models. The result of the thesis indicated that, while the implementation of circular business models appears to somewhat correlate with firm size, more research is needed to better understand the full extent of the potential benefits and problems. Furthermore, as customization of circular business models appears to be a requisite for implementation due to differences between industries, a general consensus could, therefore, facilitate the development of such personalized models and enable the transition throughout the economy.

Keywords: Circular business models, circular economy, sustainable business models, closing the loop strategies.

Definitions

Circular Business Models (CBM), *Circular Economy* (CE) and *Sustainable Business Models* (SBM) are all different names for the same type of business model which values the regenerative nature of production processes.

Linear Business Models are the traditional way of doing business, where firms focus on economic growth and avoid spending money on renewable resource transitions unless it benefits them financially.

Take-Make-Dispose is a term for the process when raw materials are extracted and transformed into a product that can be used and finally discarded as waste, generating a limited amount of value creation.

Cradle-to-Cradle and *Closed-Loop* are both terms used in order to explain the process of making linear business strategies more circular, and their objective is to eliminate all waste generated from production and maintain the value in the products.

Table of Contents

1. Introduction

During this section of the thesis background information regarding circular business models are introduced along with an explanation of why this area is important to research as well as examples of previous studies made. Based on the information presented the purpose of the report and the adjoining research questions are developed.

1.1 Background

Sustainability has become a significant issue in the clothing industry, while there is descending weight on costs and expanding rivalry, there is also a developing worry regarding social and ecological issues. The unsustainable levels of clothing utilization and the associated disposal patterns of today are some of the problems that have been recognized in the business (Niinimäki & Hassi, 2011). For example, it is estimated that in the previous 15 years, apparel creation has doubled. Driven by a developing middle-class and expanded per capita utilization in developing economies. These things are heavily connected to the phenomenon of fast-fashion, which is defined by faster turnarounds of collections and styles per year, lower costs and a dispensable nature of style. It has been assessed that half of the produced fast fashion clothing is discarded within a year, promoting an unsustainable lifestyle. If the present direction continues unchanged, the clothing business will utilize 300 million tonnes of non-sustainable assets by 2050, which is close to triple the amount of the 98 million tonnes in 2015 (Ellen MacArthur Foundation, 2017).

Since the clothing industry is to a high degree using materials that can be recycled, and since the clothes themselves are reusable, a potential solution for solving the sustainability challenges could be the implementation of sustainable circular business models. These models create positive value, not only for society and the environment but also for consumers and the organizations that implement them. They integrate multiple stakeholder perspectives in the way business is operated (Stubbs & Cocklin, 2008). An example of how they could work is by firstly employing fewer materials and resources for manufacturing products and services. Secondly, by extending the life cycle of current products and services through refurbishment and manufacturing, and thirdly by closing the loop in the value chain through recycling (Innovation management, 2017). This is one idea of how a circular business model could create value, but in order for firms to accelerate change and to implement the best-suited model, experimentation is key. Since there are a lot of different circular business models, firms need to understand what works best in their particular situation depending on real-life business context. Otherwise, it could be difficult to properly address relevant sustainability challenges (Bocken, Weissbrod & Tennant, 2016). The implementation of circular business models is increasingly important for firms active in the clothing industry due to the high number of negative externalities caused in the value chain, and the high possibility of implementing closed-loop systems that can increase resource effectiveness and minimize waste creation. (Ellen MacArthur Foundation, 2017)

1.2 Problem Discussion

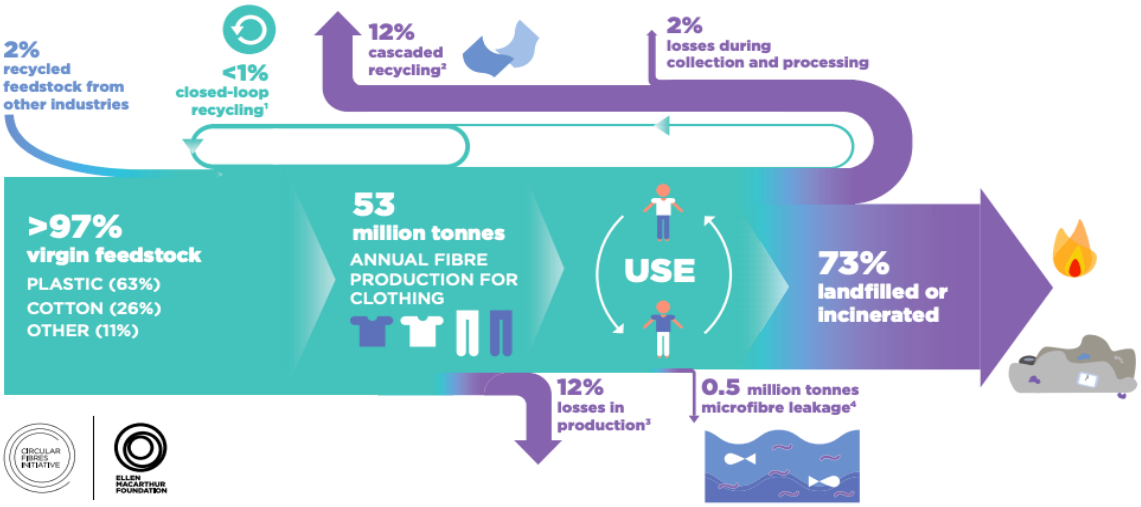
According to the Ellen Macarthur Foundation (2017), the current system in place for producing, transporting and using clothing is operated on a predominantly take-make-dispose model. Significant volumes of non-renewable resources are extracted to produce clothing that is frequently used for only a short period of time, after which the materials are discarded and largely lost to landfills or incineration. It is estimated that more than half of the products manufactured through the strategy of ''fast fashion'' are disposed of during its first year (McKinsey, 2016). This extreme linear system leaves untapped economic opportunities and value creation unfulfilled while also pressuring the renewability of resources, polluting the environment, creating ecosystem degradation and generating significant societal impacts on local, regional and global scales.

Underutilization of clothing is a massive economic and environmental problem due to consumers being quick to throw away garments post use. Clothing utilization worldwide - meaning the average number of times a garment is used before being discarded- has decreased by 36% during the past 15 years. The usage is relatively high in lower-income countries -meaning more wears before being discarded- while being much lower everywhere else. Clothes in the US are, for example, worn only a quarter as long as the global average, and the clothing utilization in China has decreased in a similar fashion, amounting to a 70% decrease over the last 15 years. (Euromonitor (From Ellen MacArthur Foundation, 2017)

The underutilization of clothing creates a significant value-capturing opportunity for firms and economies around the world. On a global scale, consumers lose 460 billion $ of value each year by discarding clothing that they can continue to wear (Ellen MacArthur Foundation, 2017). Even more, it is estimated that certain garments are thrown out after only seven to ten uses (Barnardos, 2015).

After the clothes are thrown out, almost all the value that was once collected in the fabric is lost. Out of all fibres used for clothing, around 87% gets incinerated or thrown in landfills, exhibiting a value loss of over 100 billion $ annually (Ellen MacArthur Foundation, 2017). Out of the materials used for production, 73% is lost after the final garment use, 10% is lost during production processes (e.g., as offcuts) and around 2% is discarded straight from factories and never make it to the market. The part of the clothing that is recycled is less than 1% of the original materials used. This includes both recycled items of clothing that have been used, as well as from factory offcuts. This method of reusing or recycling materials for the production of garments is what is generally known as closed-loop-recycling and is depicted below. To put things into perspective, around the world one garbage truck of textiles is incinerated or landfilled every second (Ellen MacArthur Foundation, 2017).

Recent research presented by Reverse Resources indicates that this might be an underestimation and that the real number of materials lost during the production process is closer to 25%, meaning even more waste creation. However, due to the fact that the study made is limited to seven garment factories in China and Bangladesh, the results have the potential of undercutting the truth with such a small sample size (Reverse Resources, 2017).



1 Recycling of clothing into the same or similar quality applications
2 Recycling of clothing into other, lower-value applications such as insulation material, wiping cloths, or mattress stuffing
3 Includes factory offcuts and overstock liquidation
4 Plastic microfibres shed through the washing of all textiles released into the oceans

Figure 1: Global Material flows for clothing in 2015 (Ellen MacArthur Foundation, 2017)

Figure 1 above illustrates the prevalent linear business models active today. The consequences of the model are substantial and create expanding pressure on resource renewability and reducing the high levels of pollution creation. Hazardous substances used affects the health of workers, wearers, and leads to the release of plastic microfibres into the environment. The current materials used have significant drawbacks, making them unfit for implementation in a circular system. For example, the use of polyester requires large quantities of non-renewable resources and fossil fuels to produce, and growing cotton - the most used material for garment production around the world- requires high volumes of pesticides and fertilizers (unless farmed using renewable agriculture methods), as well as enormous volumes of water. These materials, along with many other commonly-used materials, all have significant negative impacts for people and ecosystems around the world, opening up the possibility for innovation in materials and agricultural practices (Ellen MacArthur Foundation, 2017).

Due to the linear business models used and the complicated and resource-intensive materials required for those models, the clothing industry, and inherently the textile industry, has an immense carbon footprint. During the year 2015, the total greenhouse gas (GHG) emissions created from textile production amounted to 1.2 billion tonnes of CO_2 emissions, which can be compared to more than all international flights and maritime shipping combined during the same year (International Energy Agency, 2016). The production of 1 tonne of textiles generates 17 tonnes of CO_2 emissions, compared to 3.5 tonnes for plastic, and less than 1 tonne for paper (Eunomia, 2015). The trajectory of the industry indicates the potential for a global disaster. The demand for clothing continues to grow at an exponential rate, and should it continue as predicted, total sales of clothing could reach 175 million tonnes in 2050 - indicating triple the amount of 2015. The industry would cover over 25% of the global carbon budget used according to the Paris agreement (Ellen MacArthur Foundation, 2017). This would further amplify the externalities caused by the industry and the impacts of the current system, while also risking the industry's reputation and profitability. Moving away from the linear models of today is therefore crucial to keep the current target obtainable. The report ''Pulse of the fashion industry'' from 2015 projected that by 2030 fashion brands can see a decline of profitability of over 3% (in terms of EBIT). This would translate into a total profit reduction of roughly 52 billion $

for the industry. The same report also estimates a potential benefit to the world economy of 193 billion $, if the fashion industry were to successfully address the social and environmental issues (Global Fashion Agenda & BCG, 2017).

A potential solution to the unsustainable linear production processes could be the implementation of a more sustainable alternative. Some researchers argue that circular business models, with its high focus on circularity, is that alternative. The problem, however, is the fact that there are many different interpretations of what a circular business model actually entails. For example, according to the Ellen MacArthur Foundation, a key concept is the reusing and recycling of materials (Ellen MacArthur Foundation, 2017). While other researchers such as Chiaroni and Urbinati are more focused on the internal aspects of the organization (Chiaroni & Urbinati, 2017). Therefore, a model that works in one industry might not necessarily function as well in another, which indicates that more research is required in order to establish a general model befitting every industry.

Furthermore, the reasoning behind the implementation of corporate social responsibility and sustainability processes within organizations has been a hot topic for many theoretical and empirical debates. The study by Orlitzky (2001) examines the debate and research done between corporate social performance (CSP) and firm financial performance (FFP) made by a multitude of researchers with a sample size of 15 000 firms. He concludes that the relationship between firm size and CSP is only correlated to a small extent, while the relationship between CSP and FFP is significantly positively correlated, regardless of firm size (Orlitzky, 2001). Chen and Metcalf (1980) argue that firm size is the real impacting variable regarding both CSP and FFP. While Orlitzky argues that this result was obtained due to sampling error, the real cause and correlation are still up for debate. Therefore, the real reasoning behind sustainability practices and financial performance, and to what extent these are affected by firm size, is not clearly explored. This is especially the case for firms involved in specific industries, such as the clothing industry, since the relationships between corporate social performance and firm size have not been sufficiently investigated. The importance of firm size is therefore not properly concluded, and improved knowledge can be of relevance to governments, NGOs and researchers for establishing regulations and rules regarding pollution control and maintaining the 2-degree target carbon budget.

1.3 Purpose

The purpose of the report is two-fold, firstly it aims to get a better understanding of contrasting definitions of circular business models and compare their similarities and differences regarding the distinct benefits, problems and opportunities for the clothing industry. Secondly, it examines whether or not there is a relationship between the size of a clothing firm and its efforts towards implementing circular business models.

1.4 Research Questions

- What are Circular Business Models, and do they have any potential benefits, problems and opportunities when applied to the clothing industry?

- Is there a correlation between the size of a firm and its implementation of a circular business model within the clothing industry?

2. Method

In this section of the thesis the choice of methodology is presented, supported by a description of the research design and approach used. This is followed by a literary study review where articles used in the thesis is included as well as the quantitative research process where firm selection is presented.

2.1 Choice of Method

The two dominant ways of gathering, processing and analyzing data are the qualitative and quantitative research approach (Patel & Davidsson 2003). The qualitative approach is primarily based on inductive research, which is used to gain a better understanding of underlying opinions and reasons of a theory. It provides improved insight into the problems presented and helps to develop ideas and hypotheses for potential quantitative research (Bryman, Bell & Harley, 2018), which is tested with the use of a deductive research approach. For the thesis, this entails research regarding relevant established theories to discover a general consensus of the model, and to use the results to establish relevant quantitative variables. The thesis is therefore based on a qualitative and quantitative approach, where the variables are first developed from theories and then collected based on a measurement system of choice and afterwards analyzed with statistical methods and processes.

2.2 Research Design and Approach

The theory-intense portion of the thesis is based on an inductive research approach, where conclusions are drawn based on generalizations of relevant articles (Bryman et al., 2018). During this part of the thesis, different benefits, problems and opportunities relevant to the clothing industry are presented that are recurring in the research reviewed. This means in practice that different theories regarding the subject are selected, analyzed and compared with each other in order to come up with an improved understanding of the model. This methodology was chosen due to the lack of a general theory regarding circular business models and the uncertainty surrounding the subject.

The theories chosen are three well established academic papers explaining the definition of circular business models, including the author's views regarding degrees of circularity, the effects of circular approaches as well as the possibilities associated with the implementation. Based on the theories, different interpretations of circular business model concepts are described, along with their distinct problems, benefits and opportunities for application. The theories were selected due to their different views on circular business models, where one of the articles is focused on the possibilities within the textile industry, another with a general view applicable to all industries and the last one being a framework as well as a way to categorize different firms, which makes them all relevant to the thesis. The results from this part of the thesis are therefore used to develop an improved understanding of circular business models and their distinct problems, benefits and opportunities, as well as to establish three variables to be used in the quantitative section.

The second part of the thesis is the quantitative research focused on the clothing industry, which is based on the variables extracted from the theoretical findings, through the use of a deductive research approach. This means that the question, whether firm size affects the implementation of circular business models, is tested empirically in order to be confirmed or denied (Bryman et al., 2018).

The information-gathering process consists of reviewing and researching clothing firm's sustainability reports and other sources of information and comparing the findings using relevant graphs where applicable to facilitate comparison.

2.3 Literary Study Review

The process of finding relevant studies made entailed using the search engine Google scholar with the key words ‘’circular business models'', ''circular economy’’, ‘’sustainable business models’’ and ‘’closing the loop strategies’’. The authors reviewed different theories regarding circular business models and concluded that it is a complex subject since there are many interpretations with contrasting concepts and approaches.

Table (1): Other articles reviewed

Name of the article	Author
'Circular economy as an essentially contested concept'' (2018)	Korhonen, Nuur, Feldmann, Eshetu-Birkie.
'Circular Business Model Framework:Mapping value creation architectures along the product lifecycle" (2017)	Nussholz.
'Product design and business model strategies for a circular economy" (2016)	Bocken, de Pauw, van der Grinten.
'The triple layered business model canvas" A tool to design more sustainable business models" (2016)	Joyce, Paquin.
'Towards the circular economy" (2013)	Ellen MacArthur foundation
'The Circular Economy-A New Sustainabilty Paradigm?" (2017)	Geissdoerfer, Savaget, Bocken, Hultink
'Designing the business models for circular economy-Towards the conceptual framework" (2016)	Lewandowski

The theories used for this thesis were therefore selected after several articles had been reviewed (see table 1 above). They were specifically chosen due to their contrasting views, in order to explore different perspectives as well as the similarities and differences between them.

In the process of finding relevant articles, the authors found multiple references in different reports to an organization called ''The Ellen Macarthur foundation'', which is a UK based charity with the ambition to accelerate the transition towards a circular economy (Ellen MacArthur Foundation, n.d). The authors of this thesis concluded that the foundation is the leading expert on circular business models, not only due to their thorough work and research on the subject, but also because they are referenced as such by other researchers in this area.

The first theory, ‘’A new textile economy’’ (Ellen MacArthur Foundation, 2017), was therefore selected due to it being written by the Ellen Macarthur Foundation and its focus on the textile industry. The article could provide insight into how the leading experts viewed circular business models and how they could be applied and function in the textile industry, which was fortunate since this thesis is focused on that industry in particular. It also gave information on how circular business models could work when focused on a single industry of choice, which is an aspect the authors previously had not seen in other research reviewed. Additionally, the theory presented three principles that were very useful for the development of the quantitative variables.

The second theory, **’’**Towards a new taxonomy of the degree of circularity'' (Chiaroni & Urbinati, 2017), was selected due to its contrasting views on circular business models and the creation of the taxonomy. The article focuses on business relationships and management, which is argued to be very important when implementing circular business models. Additionally, they have created their own

taxonomy to distinguish firms' different circular business strategies. The importance of business relationships and management, in combination with the taxonomy, was a concept the authors of this thesis did not find in any other reports, and it provided an additional perspective of how circular business models can function.

The third theory, ''A literature and practice review to develop sustainable business archetypes'' (Bocken, Short, Rana & Evans, 2014), was partly selected due to who the author is, as well as for the contents of the article. The name of the author (Bocken) was found on multiple occasions during the literature study, not only had they been referenced to in different articles, but they had also contributed to the subject through several published papers, which led to the conclusion that this person was of significance in the area of circular business models, and that the inclusion of this author's work (similarly to the Ellen Macarthur Foundation) would benefit this thesis. It also gave an additional perspective since it presented a broader view, which is more applicable to industries in general, compared to the other articles.

2.4 Quantitative Research Process

The data for the quantitative variables was primarily extracted from relevant sources, such as sustainability reports and reputable third-party sources like the carbon disclosure project (CDP). The process entailed reading through every firm's sustainability report of 2018 in the attempt to locate their carbon emissions, energy consumption, renewable energy consumption, net sales as well as their closing the loop strategies. Which was information concluded as relevant based on the variables selected from the theoretical findings. It also included the reading of reports created by the carbon disclosure project in order to locate carbon emissions, energy consumption and renewable energy consumption if not presented in the firm's sustainability reports. If information regarding emissions and energy consumption was presented in both a firm's sustainability report and through the CDP the latter was chosen, as it is perceived as the more reliable source of information. Furthermore, the firm's own websites were researched in order to understand what circularity measures they use in practice. Due to one of the variables being analytical, and therefore without numbers that can be used for comparison, it required coding. This entails that the information is transformed into numbers to facilitate the comparison of data (Bryman et al., 2018).

All data researched from the sustainability reports, the carbon disclosure project and the firm's websites were collected in an excel document to facilitate comparison of data and the creation of graphs which is presented in the analysis/discussion as well as in the appendix.

2.4.1 Firm Selection

The definitions presented by the European Commission (2003) argues that an SME (small and medium-sized enterprise) have fewer than 250 employees with net sales of below 50 million € or balance sheet below 43 million €. Firms above these limits are therefore considered as large enterprises. For the quantitative analysis, and therefore the firm's used, a much higher limit has been made in order to distinguish ''large firms'' from ''very large firms''. If the authors were to follow the European Commission's definitions completely, the quantitative data selection and conclusion would be irrelevant due to the fact that nearly all firms investigated would be considered as large and the sample size would be far too small to use. The limits used to divide the firms investigated into different

groups are therefore based on the European commission's definition, although made significantly different in order to have a more accurate comparison.

Furthermore, due to the analysis considering not only fast fashion brands in the clothing industry but also high-end brands, employees are not a valid limit to determine firm size, as high-end firms have a much higher net sales per employee compared to fast fashion firms and would therefore inhibit a fair comparison. The limits made for the quantitative analysis are therefore the following:

Medium sized firms= 0-10 billions SEK net sales
Large sized firms=10-100 billions SEK net sales
Very large sized firms = 100+ billions SEK net sales

The firms selected for the quantitative process range from medium-sized firms to very large multinational corporations, from the fast fashion industry to the high-end couture and from countries around the world. The majority of firms used for the quantitative process are of European origin, which is due to the prevalence of sustainability reports of higher quality in that area, compared to other parts of the world with less stringent laws and regulations. Furthermore, only clothing firms are used, meaning textile firms and organizations that do not have the process of selling clothes as their main business strategy are excluded. The emissions, energy consumption and net sales associated with the sale of accessories are included as a part of the firm's clothing sales due to the difficulties in separating it from the firm's total carbon emissions, energy consumption and net sales. Firms considered as high-end couture are based on the authors opinions, although the definition used, for simplification, is firms that rarely, if ever, offer sales on clothes, as well as having a high pricing strategy. The firms considered as fast fashion are distinguished by a very high turnover rate as well as aggressive price competition. The remaining firms that are not befitting to either of the two distinctions can be simply referred to as clothing firms.

Table (2): Firms included in quantitative analysis

Very Large	Large	Medium
LVMH (Fashion)	PVH fashion	Ted baker
Nike	Hermés	Patagonia
Inditex	Levi Strauss & Co.	Lindex
Adidas	Puma	Kappahl
H&M	Burberry	Eileen Fisher
Fastretailing	Asics	Ellos
Gap	Hugo Boss	Acne Studios
Kering	Mango	Peak Performance
VF Corporation	Guess	Vaude
	Esprit	Filippa K
		Björn Borg

The firms used for the quantitative analysis was therefore based on nine very large firms, ten large firms and eleven medium-sized firms with a total of 30 firms investigated. The basis for dividing the firms into the three categories was made through a net sales based method, where medium-sized

firms had a net sales of less than 10 billion SEK, large-sized firms between 10-100 billion SEK and very large firms above 100 billion SEK. Furthermore, the firms are presented in graphs according to their size, starting with the largest firm (LVMH fashion), and ending with the smallest firm (Björn Borg).

Three firms, Lindex, Patagonia and VF Corporation, have sustainability reports that are used from the years 2017 and 2019. The reasoning behind the use of Lindex 2017 sustainability report is due to the sharing of their sustainability report from 2018 and forward with the Stockman Group, which therefore inhibits the distinction of emissions between the firms. Patagonia only discloses emissions in their 2017 report, which is the reason why it was used. In the case of VF Corporation, the year 2019 was used due to inaccuracies in the 2018 scope 3 emissions presented by the CDP and their sustainability report. The numbers from 2019 are therefore more trustworthy regarding their emissions. Some firms also presented unreliable numbers regarding either their CO_2 emissions or their renewable energy and were therefore excluded from the respective category. However, they were included in the other two variables in order to showcase that there is a lack of reporting standards, and therefore, the transparency of firms. These firms were marked by adding ''N/A'' after their names in the graphs.

Table (3): Firms investigated but not included in the quantitative analysis

Other firms investigated							
Colmar	Jeans Company	Yamamoto	Billa bong	J Lindeberg	Klätternmusen	Hollister	Primark
Chanel	Victorias Secret	Zadig & Voltaire	Quiksilver	The reformation	Under Armour	Abercrombie & F	Topshop
MosMosh	Calvin Klein	Woolrich	Boomerang	Dedicated	G-star	Nordstrom	Stradivarius
Ida Sjöstedt	Replay	Michael Kors	Cheap monday	Tentree	Scotch & soda	Tommy Hilfiger	Boohoo
Hunkydory	Canada goose	Fila	John Varvatos	Cuyana	Abbacus	Salvatore Ferrag	New Look
Daily	Rodebjer	Casall	Odd Molly	ThredUP	Galvin Green	Superdry	Missguided
SamsoeSamsoe	Dagmar	Dr denim	Röhnisch	Everlane	Kjus	NA-KD	Peacocks
Day	Helmut Lang	Oscar Jacobssor	Twist & Tango	Pact	Lexington	Fashion Nova	Oysho
Marlene Birger	Juicy couture	Bestseller	Indiska	Alternative Appa	Bymalina	Urban Outfitters	Asos
Dea kudibal	Diesel	Alpha industries	Pyua	Amour Vert	Tom ford	Rip Curl	Beya Made
Made trade	Wunderkind	Ed hardy Clothin	Ascot Chang	Nudie Jeans	Eton	G-Lab	Emilio Pucci
Tamga Designs	Triumph	Christian Loubou	Champion	MQ	Sandro	Ermenegildo Zeg	Lacoste
neu nomads	Jack Wolfskin	Chanel	Fred Perry	Brooks	Asket	Benetton	Versace
Monki	MCM	Ellesse	Reebok	Gant	Escada	Paul smith	Alden
Desigual	Thom Browne	Pierre Cardin	Lyle and scott	Gina Tricot	Hanesbrands Inc	Ralph Lauren	
Uterqüe	J crew	Brioni	Phillip plein	Mud jeans	S.Oliver	Hackett	
Marc O'Polo	Club Monaco	Comme des Gar	Helly Hansen	Fenixoutdoor	Lee Jeans	Moncler	

In total, hundreds of firms were reviewed as potential additions to the quantitative section and their sustainability reports were therefore analyzed (175 depicted above). The reason why only 30 firms were included was due to the small number that properly addressed the scope 3 emissions produced by their organizations, as well as the amount of renewable energy used (see variable development chapter 4.2.1 and 4.2.3 for an explanation of scope 3 and renewable energy).

2.5 Critical Method Discussion

This section discusses the reliability and validity of the research and considers the potential improvements of the thesis while also defending the choices made.

2.5.1 Reliability

When gathering the data required for the quantitative data collection, as well as for the theoretical analysis, reliability is important in order to present a result as accurate as possible. In regard to the reliability of the thesis, and therefore the consistency of a measure related to the subject, the stability is crucial (Bryman et al., 2018). This entails that the information chosen is stable over time, in order to be confident that the results are not fluctuating. The time frame selected for the quantitative variables is based on the results of one-years' worth of data, which is used in order to have an extended period of time as comparison. This is arguably a sufficiently large time frame. However, in order to increase reliability, more years could be applied in order to make sure the results are completely stable over time. More articles could also be included to give an even broader perspective and an improved understanding of circular business models.

2.5.2 Validity

In regard to the validity of the research, it refers to whether or not the indicators measured accurately reflect the concepts chosen (Bryman et al., 2018). Since there has been little research done on the subject, and no quantitative research made with the variables chosen, the validity can be questioned. Although, since the selected variables are derived from theoretical findings on the subject, they are arguably relevant enough to gauge the concepts chosen. However, the validity of the research can be compromised by the transparency of the reports presented by the firms investigated, which should be considered when analyzing the results. Furthermore, in order to positively conclude whether or not firm size has an effect on the implementation of circular business models, a wide sample is required, which is partially inhibited by different rules and regulations regarding reporting principles around the world, resulting in the inclusion of more firms of European origin. To improve the validity of the research, more non-European firms should be included, which requires a change in global reporting standards.

3. Theory

There are many different versions and interpretations of what a circular business model actually entails, and the scientific attributions that have emerged over the past decades have not been able to fully compromise on a specific explanation that is befitting to all industries. In order to add some clarity regarding the definitions, this section begins with an explanation of the most commonly used traditional business model, the Business Canvas Model, followed by a description of linear and circular business models and, finally, three highly reputable and relevant articles to display different interpretations of the more circular adaptation.

3.1 Business Models

A business model is used to describe in what way organizations create, delivers and captures value for its shareholders (Osterwalder & Pigneur, 2010). The creation of the Business Model Canvas has been and continues to be, one of the leading models explaining the use and value of business models. It is comprised of nine building blocks, which together create the possibility of establishing a value-driven organization by increasing efficiency and guidance. The building blocks recognized are the following:

1. Customer Segments
2. Value propositions
3. Channels
4. Customer Relationships
5. Revenue Streams
6. Key Resources
7. Key Activities
8. Key Partnerships
9. Cost Structure

The building blocks can be separated into three different segments, value proposition, value creation and value capture (Richardson, 2008).

- Value proposition refers to the value that is provided by the firm and for whom it is provided. It consists of products and services, customer segments and relationships as well as value for the customers.
- Value creation refers to in what way value is provided and therefore consists of activities, resources, distribution channels, partners and suppliers as well as technology and product features.
- Value capture is focused on the way firms make money and captures other forms of value. This area includes every aspect consisting of cost structure and revenue streams, value capturing for key actors as well as the growth strategy of the firm.

The necessary degree of change is dependent on whether the company aims to completely reconfigure its existing business model or whether a startup-firm is investigating different ways of developing a completely new business model indicating the necessity of inventing new elements and designs from the start (Hockerts & Wüstenhagen, 2010).

The highest potential possibility for capitalizing on sustainability strategies is during the time when business model innovation takes place within all of the three value creation dimensions:

- which is when the value proposition is comprised of new services and products or is offered to new segments of customers;
- and when value creation systems are comprised of new production processes and technology and new relationships and activities;
- and when new possibilities and sources of value capturing, such as new revenue streams, are exploited and identified. (Bocken et al., 2014)

Circular business models, with the help of innovative technology, therefore, facilitates the creation of opportunities for organizing business activities with the objective of creating and delivering value from more resource-efficient and circular resource flows to the market. In order for firms to use a circular business model, it therefore has to be implemented in every area of the organization and be deeply embedded into its strategies.

3.2 Linear vs. Circular Business Models

The main objective of circular business models is to replace currently existing open production systems that are based on a linear consumption model, where raw materials are extracted from the environment, processed into finished products and returned to waste after consumption. Which is contrasting to closed-loop systems that reuse resources and conserve energy. Furthermore, the CBM attempts to overcome the current take-make-dispose model existing in linear business models. Even though great progress has been made regarding streamlining and efficiency, which has reduced waste and pollution, the linear business models incorporate various sources of unnecessary waste along the entirety of the supply chain that can be greatly reduced (Ellen MacArthur Foundation, 2013).

Circular economy, or circular business models, proposes a completely different way of giving new life and meaning to previously known concepts such as cradle-to-cradle or closed-loop economy. A solution presented by the Ellen Macarthur Foundation is that there are four key loops that exist within a circular system. (Ellen MacArthur Foundation, 2013)

(i) Product-life extension, i.e., Products are designed to be durable and have a long lifetime to reduce consumption. Such products are by definition of higher quality, so businesses often need to alter their business models in order to offset increased production costs and reduced profit margins. For example, by leasing instead of selling products or generating revenue by selling additional services such as maintenance or repair;

(ii) Redistribution/reuse, i.e., The most sustainable products are often the ones already created. The reusing of a product preserves all of the added value within that product, while also reducing the cost of emissions for additionally would-be-procured products;
(iii) Remanufacturing, which is defined as a series of manufacturing steps acting on an end-of-life part of a product, in order to return it to like-new or better performance and therefore extend its life cycle;
(iv) Recycling, which is the most common circular business model process through which previously consumed materials are treated to improve the possibility for reuse of materials. (Ellen MacArthur Foundation, 2013)

These are the four main loops related to the manufacturing of products. However, there are also other ways that circular business models can be used, and researchers have not made a specific explanation regarding its definition. The way firms work with different principles of circularity is depending on their strategies and objectives. The clothing firm Puma for example, has developed a new line of shoes and clothing called INCYCLE, which consists of recyclable (iv) or biodegradable products that are all certified as cradle-to-cradle. To achieve such progress, the firm required a complete redesign of its production processes in order to change the materials and pigments used to allow the chemicals to degrade naturally and avoid ending up in the soil (Mynewdesk, 2013). Furthermore, the Garment Collecting Program created by H&M is aimed at collecting worn clothing that is used by their customers, and how it can be (i) reworn by others, (ii/iii) reused and turned into other products and also (iv) recycled and turned into textile fibres (H&M, n.d). Another example can be made with the partnership of Patagonia and eBay called the Common Threads Initiative, which allows their customers to become a business partner of the brand, with the intended objective to reduce consumption of clothes by extending the life cycle of the garments or textiles through the use of methods such as repair, reuse and recycle (Prnewswire, 2011).

3.3 Selected Theories

The first circular business model used in this thesis is presented by the Ellen Macarthur Foundation, which focuses on several issues related to the linear way of doing business and how it needs to adapt in order to become more circular (Ellen MacArthur Foundation, 2017). Other articles, created by Bocken et al. (2014) as well as Chiaroni and Urbinati (2017), will be used in order to showcase the differences and similarities between researchers on the subject of circular business models.

3.3.1 A new Textiles Economy; Ellen Macarthur Foundation (2017) (EMF)

In recent years, the world and its people have become increasingly aware of the negative impacts of the current linear textile economy. Different brands have begun to address both the environmental and the social challenges within their supply chains. However, the majority still focus on reducing the impacts of their current system, instead of tackling the root cause of the problem and the system's hazardous nature directly. Traditional businesses tend to use techniques to make their production more efficient or their materials less impactful, which only results in a short-term solution to the industry's problems. The EMF presents principles and ambitions which creates a sustainable long-term textile economy and which, if followed correctly, could facilitate the transition from linear to circular business models. (Ellen MacArthur Foundation, 2017)

The Three Main Principles

The new textile economy relies on the EMF's principles of a circular economy, which creates economic, natural and social capital and addresses several of the resource system challenges that the textile system is facing today. The principles are based on their interpretation of a circular business model that can be used to create a general understanding of all industries. (The following principles are extensions of the four loops presented earlier: Product-life extension, redistribution/reuse, remanufacturing and recycling)

- **Design out waste and pollution.** A circular economy attempts to reveal and design out the negative impacts of economic activity that causes harm to natural systems and human health. This includes the discharge of greenhouse gases and toxic substances, the pollution of air, land and water.

- **Keep products and materials in use.** A circular economy prioritizes activities that preserve more value in the form of energy, labor and materials. Designing for durability is key in order to be able to reuse, recycle and remanufacture as much of the products, components and materials as possible. Circular systems make effective use of biologically-based materials by encouraging many different uses before nutrients are returned to natural systems.

- **Regenerate natural systems.** A circular economy avoids the usage of finite resources and preserves or enhances the infinite ones. This is done by, for example, returning valuable nutrients to the soil in order to enhance regeneration or by using renewable energy as opposed to relying on fossil fuels.

The Four Ambitions

While the new textile economy rests on the principles of a circular economy, it is insufficient for clothing firms to focus on them alone. The EMF argues that in order to achieve significant sustainable changes in the textile industry, firms need to work towards four additional ambitions as well. These are more focused on solving the unique problems in the textile industry and, if followed correctly, would lead to not only better environmental and societal outcomes, but increased financial growth as well. Furthermore, they would make it possible to capture opportunities that are overlooked by the current linear textile systems.

To stop the pollution of substances of concern and microfibre is the first ambition that businesses should strive for. This means that substances that are of concern to the health of the public or the environment are designed out of the materials, and no pollutants, such as plastic microfibres, are inadvertently released into the environment and ocean. According to the EMF, there are two areas of action which could facilitate the start of this transition. Firstly, it is important to innovate new process inputs, production processes as well as textile materials, to remove negative impacts related to substances of concern. Secondly, it is necessary to use processes that radically reduces the number of microfibres shed by clothing alongside technologies that effectively capture any releases.

The second ambition is to transform the way clothes are designed, sold and used to break free from their increasingly disposable nature. Increasing the average number of times clothes are worn is the

most direct way to capture value and design out waste and pollution in the textile industry. The EMF suggests that there are three ways businesses can speed up this transition. To start, companies need to scale up short term clothing rental. In other words, firms need to make the option of renting clothes more viable, since it would increase the number of uses for products significantly. Clothes that regularly are thrown after one or two uses can just be washed and reused by someone else. Additionally, firms need to make durability more attractive and increase their dedication to making long-lasting garments as this would further prolong the life of the product.

The third ambition is to radically transform recycling by changing the clothing design, collection and reprocessing. The EMF argues that it is very important to capture the value of materials that can no longer be used. For example, every year 100 billion USD worth of materials is lost in the system due to insufficient value capturing. This represents an economic opportunity that can be taken advantage of if the recycling systems are updated. In order to successfully update the system, four things need to be done: Firstly, companies need to align clothing design and recycling, there needs to be a clear recycling process for the clothes that cannot be used anymore. Secondly, in order for the recycling systems to function properly, firms need to pursue technological innovation, since existing recycling technologies for common materials fail to capture the full value of the recovered clothing. Thirdly, companies need to stimulate the demand for recycled materials, which can be done by clearly communicating commitments towards increased recycling activities and by increasing the input of recycled materials. Fourthly, Businesses need to radically increase their clothing collection activities, especially in places where it currently does not exist. This is important since it can increase the amount of recyclable material and prevent more garments from being landfilled or incinerated.

The fourth and last ambition is to make use of resources and move to more renewable inputs. This means that where there is no possibility to use recycled materials, and when virgin materials are a necessity, they should originate from renewable sources. In addition, the production processes should function on renewable energy and strive to generate as little waste as possible while requiring the least amount of resources.

3.3.1.1 The benefits of a new Textile Economy.

The EMF presents a number of benefits for implementing the four ambitions of their theory; these benefits are related to the environment, society as well as the global economy.

Benefits for Businesses and the Economy.
The new textile economy can make it possible for clothing firms to gain and preserve economic resources due to an improved understanding of business opportunities available. Firms will not only be sustainable but profitable as well. One of the benefits is that the costs of using virgin materials would decrease due to the excessive use of recycled materials. Using more recycled materials instead of virgin materials would also make the firm more stable against volatile price changes on scarce raw material. These benefits are in line with the aforementioned third ambition but are dependent on the assumption that the firms have developed more efficient recycling methods.

Introducing new rental and subscription models is in line with the second ambition of the new textile economy and is another option that can create economic benefits for businesses. This would make it easier for companies to build long-term customer relationships and would also allow firms to create

profits without an increase in throughput. In addition to these two benefits, firms would also be able to not only create value through enhanced resale but from other services such as maintenance and individualisation as well.

Other benefits are: *New sources of innovation* due to increased demand for circularity and *additional economic growth* created by the growing regenerative parts of firms' value chains that promote circularity.

Benefits for the Environment.
The benefits for the environment are clearly linked with the reduction of virgin material use and increased recycling. The amount of GHG emissions would be reduced due to garments having longer lives, products being made out of recycled materials and the usage of more low carbon production processes such as renewable energy. By following the concepts of the EMF, firms would also be able to ensure that fewer plastic microfibres enter the ocean.

The new textile economy would aid farmers by bringing new regenerative and non-hazardous agricultural technology to the production of cotton and other renewable materials. This would enhance land productivity and return nutrients to the soil, in conjunction with a decrease in overall pollution.

Other benefits are: *Reduced water use in water-scarce regions* and *reduced consumption of virgin, non-renewable materials and energy,* both due to the increased clothing utilization and recycling.

Benefits for Citizens and Society.
The societies of the world and its inhabitants would profit from the new textile economy in a variety of ways. Firstly, customers would have greater utility and choice with lower costs overall. This means that the new enhanced sales and services models in the textile economy would increase customer satisfaction since they have more choices and firms can more easily meet their individual needs. Furthermore, these benefits are expected to cost less for customers in the new textile economy. However, further research is necessary in order to accurately estimate exactly how much less and what the other impacts may be.

Another benefit of the new textile economy is the reduced health impacts on the industry's production workers and wearers of clothes overall. This is due to the avoidance of unhealthy material inputs that expose workers to hazardous substances and endangers the customers who later buy and wear the garments.

Other benefits are: *Better deals for employees* due to higher salaries throughout the whole value chain and *reduced obsolescence and fewer wanted items* because of longer-lasting higher quality clothes.

3.3.2 Circular Economy Business Models: towards a new taxonomy of the degree of circularity - Chiaroni D, Urbinati A (2017) (CU)

The paper by CU explores the adoption of a circular economy based on relevant business model literature. The result of their findings is a new taxonomy that explains the different degrees of circularity found in practice adopted by firms within different industries. The theory is not limited to the clothing industry, and therefore includes firms from several different industries throughout the article. The core of the article aims to explain how firms adapt to the circular economy, in particular, they focus on the distinction of two emerging dimensions;

- (1) Customer value proposition & interface, i.e., the positioning against competitors in the market;
- (2) Value network, i.e., the organization of internal activities and the relationships with suppliers. (Chiaroni & Urbinati, 2017)

The definition of a circular economy used by the authors is adapted from the four key loops presented by the EMF (Ellen MacArthur Foundation, 2013):

(i) Product-life extension
(ii) Redistribution/reuse
(iii) Remanufacturing
(iv) Recycling

The result of their empirical study is based on the two emerging dimensions discussed previously. (1) The customer value proposition & interface includes the definition of a firm's positioning analyzed against their market competitors, based on customer segments, relationships, distribution channels and value proposition. The authors argue that the first dimension is only relevant if the firms are transparent towards the customers of their compliance with the circular economy principles, and how that becomes part of the competitive positioning of the firm. The variables used to calculate this was based on price and promotion. Where price indicated the different ways value is offered to the consumers, i.e., if it was focused on use rather than on ownership, and by function rather than by product. Promotion was considered as how much of the firm's marketing campaign content was promoted as being based on circularity. The second dimension was more focused on the internal activities of the firm, as well as the associated value network, which includes the suppliers and other relationships that influence business decisions.

Furthermore, based on the two dimensions investigated, the article highlights four available modes of adoption of a circular economy, which are named Linear, Upstream Circular, Downstream Circular and Full Circular firms. These modes are used to explain how different firms see and value the circular economy from a business model perspective and how their views differ. The following taxonomy is the result of the paper and indicates how a distinction of firms can be made based on their intentions and commitment towards a circular economy.

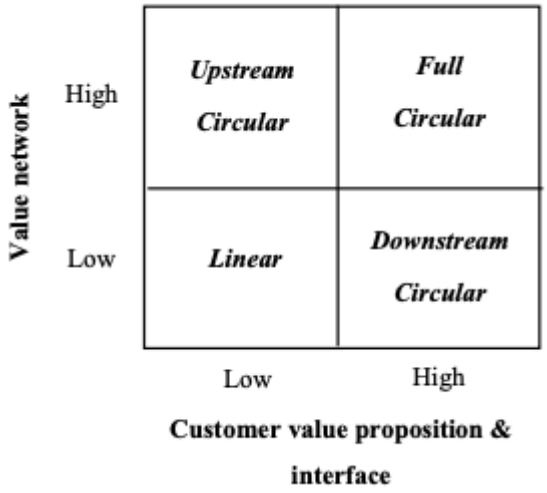


Figure 2 - The New Taxonomy
Source: *Chiaroni and Urbinati, (2017)*

1. The Linear adoption mode is befitting to firms that do not adopt the circular economy as an economic approach. These organizations are lacking circularity practices in their internal activities and cannot even use effective marketing campaigns to promote themselves as circular to reach end customers.
2. The Downstream Circular adoption mode is explained as befitting of firms that adopt a price scheme or marketing campaign based on ''reuse'' or ''use'' of products, although where internal practices and design processes of the firm are foremost based on a linear economy approach. Firms within this area are focusing on marketing acceptance rather than leveraging on it for changes in internal activities, suppliers or product designs.
3. The Upstream Circular adoption mode contains firms that are active in adopting circular principles for product design activities and that eventually establishes effective relationships with new suppliers, but do not make it visible to the customers, neither through marketing campaigns or price regarding their adoption of a circular economy. Therefore, the customer relationship process is still considered as a linear economy approach.
4. The Full Circular adoption mode is the final mode that firms can reach, which includes the implementation of both external and internal circular approaches. These kinds of firms manage production systems according to the principles of the circular economy while also involving the suppliers in the circular production systems that are relevant and effective. Clear communication towards the customers regarding the firm's circular practices in their internal activities is considered valuable and necessary to reach the final mode.

3.3.2.1 Benefits and Findings Presented

The benefits pointed out in the article is based on the willingness of firms to share assets, recycling wastes as well as local infrastructures, and refers to the reduction of negative externalities caused by the firms while increasing the positive externalities. This is the result of a reduction of pollution and/or disposal activities through the concepts of reuse, recycling and remanufacturing of products. It is also argued that the circular economy is used to encourage change toward more sustainable be-

havior, while also being used as a tool for policymakers when creating regulations based on sustainability. Furthermore, difficulties presented are based on the article by Linder and Williander (2015), who identifies a set of implications for businesses when adapting or changing their business models. They argue that the key problems are fashion vulnerability and the large quantities of bound capital required for R&D and other investments. The article by Vermeulen (2015) further argues that the problems are more focused on the ever-increasing population growth and the appearance of unhealthy megacities, which increases the volume of consumption and carbon-intensive energy systems, and how circular economy based firms have difficulties keeping up with the production rates.

Furthermore, CU's findings suggest that exogenous factors such as size, the industry, the geography and age of the company does not seem to matter in the adoption process of the modes and cannot explain why or how companies belong to the determined quadrant of the theoretical framework. Their conclusion is that the modes are not directly linked, which they considered the possibility of there being representative patterns of firm-evolution and industries in adopting the circular economy. Rather, the authors deemed the firm's adoption of circular economy principles dependent on the willingness of the company, and therefore the management commitment. It is therefore likely that the people in management positions are the reason behind the implementation of the circular economy.

3.3.3 A literature and practice review to develop sustainable business model archetypes - Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014) (BSRE)

The existence of corporate social responsibility, eco-efficiency and eco-innovative practices is what defines most of the industrial sustainability agenda. Although important, they are insufficient in regard to delivering the holistic changes necessary. In order to achieve long-term environmental and social sustainability, new methods and strategies must be implemented. The main problem is how to properly encourage corporate innovation, which has the potential of significantly changing the way existing firms operate in regard to improving sustainability.

The concept presented by BSRE is based on sustainable business models that use the triple bottom line approach while considering a wide range of stakeholder interests as well as society and the environment. Furthermore, it is a useful tool for implementing and pushing for further corporate innovation in regard to sustainability, while also facilitating the concept of sustainability into business purpose and processes, as well as being a key driver of competitive advantage.

The definitions of sustainable business models used by the authors are designed and presented by Jackson (2009), who argues that there might be six general explanations of what they should include:

- A system encouraging the minimization of consumption through behavior, or by the imposing of personal and institutional caps or quotas on water, goods, energy, etc.;
- A system which is specifically designed to maximize the environmental and societal benefits, rather than focusing on economic growth;

- A closed-loop system based on the premise that nothing is allowed to be wasted or discarded into the environment, where the concepts of reuse, repair and remakes are preferred to recycling;
- A system which emphasizes the delivery of experience and functionality over product ownership;
- A system which is designed to provide rewarding, fulfilling work experiences that promotes human creativity and skills;
- A system created on the concepts of collaboration and sharing while avoiding aggressive competition.

For the changes to be implemented, a fundamental shift regarding the purpose of business and how it is conducted is necessary. Business model innovation is regarded as the most likely approach to deliver the required change through a more holistic approach that incorporates the entirety of the firm (Bocken et al., 2014). The assertion made is that with the help of business model redesign it is possible for existing firms to be ready to integrate sustainability into their business practices, as well as for start-ups to pursue and design a sustainable business from the start (Porter & Kramer, 2006).

Based on the previous assumptions regarding what should be included into a business and how their strategies and business models should be aligned accordingly, the model by Osterwalder and Pigneur (2010), and the following adaptation by Richardson (2008), is used in the article to explain the benefits and problems associated. From this, eight archetypes are presented, which describes the main type of business model innovations necessary to achieve a sustainable business. These include technological, organizational as well as socially oriented innovations.

The Sustainable Business Model Archetypes

The technical grouping of archetypes is based on those that require a technical innovation component, such as those related to manufacturing and product redesign. The organizational grouping is referred to as those with a more dominant organizational innovation change component, such as the fiduciary responsibility of firms, while archetypes in the social grouping include those with social innovation components such as consumer behavior change and consumer offerings. Examples of the eight archetypes are presented in the article as well as how they are producing a value that is unattainable for traditional firms that employ a more linear business model strategy.

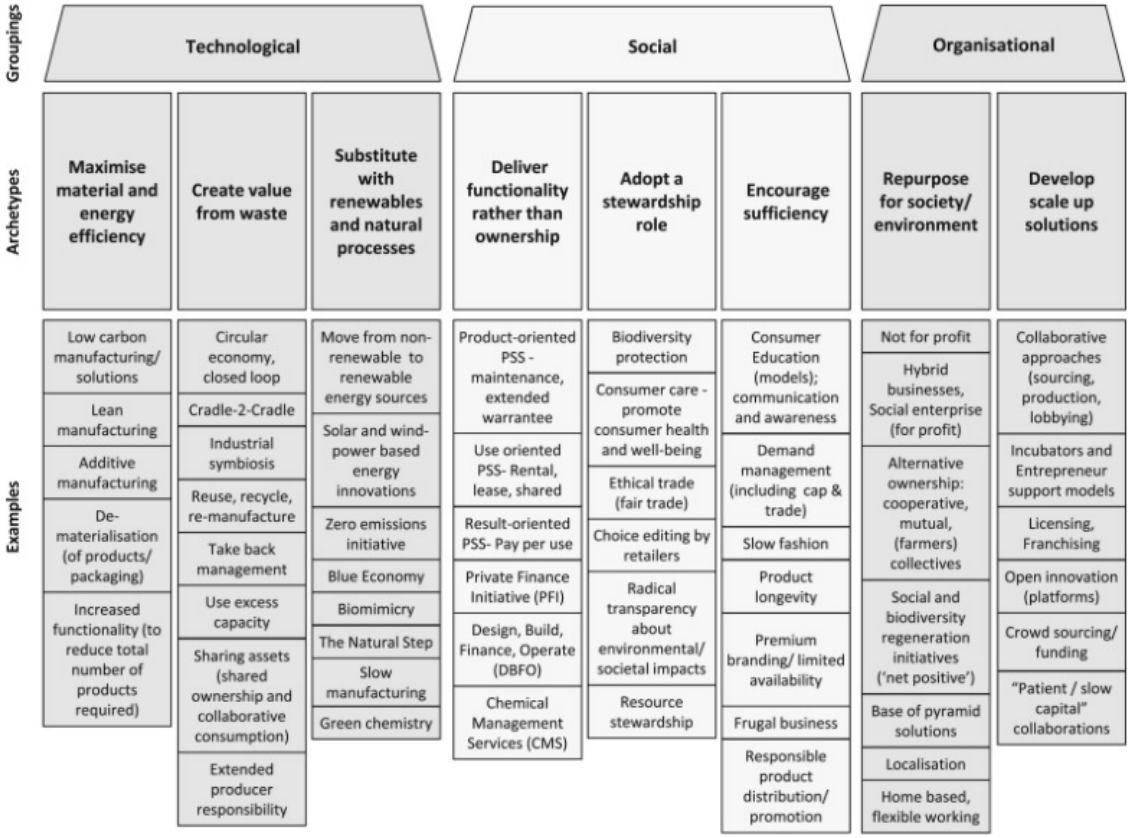


Figure 3 - Business Model Archetypes
Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

Archetype 1 ''Maximize material productivity and energy efficiency.''
This archetype explains that businesses need to be able to achieve more from fewer resources and at the same time generate fewer emissions and waste.

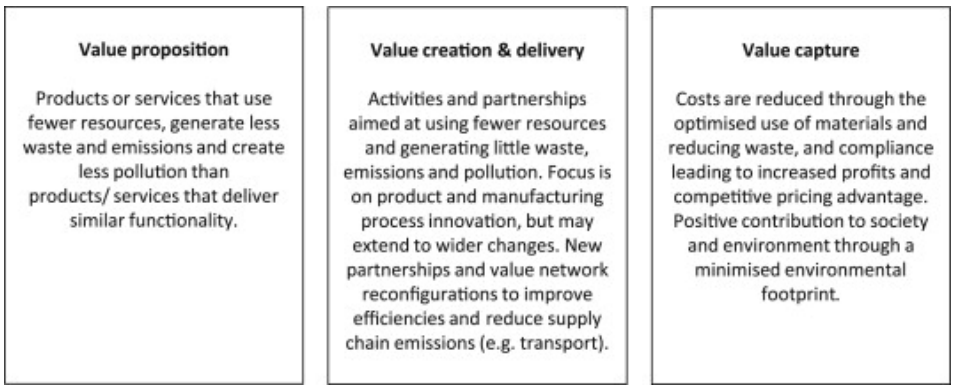


Figure 4 - Archetype 1
Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

It is focused on maximizing material productivity, energy efficiency and waste reduction. This is important from a sustainability perspective, and due to resource constraints becoming more acute and

energy prices increasing, the archetype is likely to have more relevance. An example of this archetype in business practices is *lean manufacturing,* which is known to be frequently used in the car industry (Shah & Ward, 2003). In this case, the first archetype is not only focused on physical waste material and energy waste but also over-production, over-processing, defects, rework and materials handling. The objective is to promote cleaner production circles in wasteful industries prone to high emissions. However, a major issue with this archetype is that it generates rebound effects in isolation and that the increased efficiency has eliminated a lot of traditional manufacturing jobs.

Archetype 2 ''Create value from waste.''.

This archetype explains that the concept of waste can be eliminated by turning waste streams into useful and valuable inputs.

Figure 5 - Archetype 2

Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

The second archetype is focused on identifying how value can be created from waste. By using the concepts of this archetype, firms can lower the environmental impact by reducing the demand for hazardous and virgin resources as well as landfills. This is done by closing material loops and by using waste streams as useful inputs to new production. However, in order to achieve global change, the speed of new product introduction needs to be reduced. Examples of this archetype *are closed-loop business models* (Winkler, 2011) and the *cradle to cradle* concept (Mcdonough & Braungart, 2002).

Archetype 3 ''Substitute with renewables and natural processes.''

This archetype explores firm resource constraints associated with non-renewable resources and current production systems, and how it can reduce their environmental impact.

Figure 6 - Archetype 3

Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

The two earlier archetypes explain the importance of efficiency and waste management. However, they miss the potential of exploring more renewable resources. If used correctly, this archetype can substantially reduce unwanted waste and pollution by focusing on non-finite resources. An example of this concept is the *local renewable energy solutions,* which include solutions such as the usage of windmills and solar to provide electricity for production processes (Evans et al., 2009).

Archetype 4 ''Functionality over ownership.''
This archetype explains the benefits of providing services that satisfy consumer needs, by focusing on delivering functionality over ownership.

Figure 7 - Archetype 4
Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

The basis of this archetype originates from relevant literature on Product-Service Systems (PSS) and Servitisation (Goedkoop et al., 1999; Tukker, 2004), which is focused on how firms can shift the business models from offering a manufactured product, towards a combination of producing and servicing. Offering and producing the product is still important for the firm, although the customer experience is fundamental to the offering or value proposition.

Firms that implement the archetype into their business model is, therefore, delivering functionality on a more pay-per-use basis rather than the sale of products. The potential benefits of such an approach are argued to be:

- Breaking the link between production volume and profit (not affecting demand and therefore usage volume)
- Possibly reducing consumption
- Opportunity and motivation to deal with through-life and end-of-life problems as the manufacturer always retains the ownership of the assets.
- Promoted efficiency in use
- Enhanced longevity/durability of products
- Reusing of materials

The archetype has the potential to change consumption patterns by reducing the need for ownership. It can also incentivize manufacturers to develop longer-lasting products, design for repairability and reduce resource use during production.

Archetype 5 ''Adopt a stewardship role.''

This archetype explains the importance of maintaining healthy relationships with stakeholders.

Figure 8 - Archetype 5

Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

The goal of this archetype is to enhance positive societal and environmental impacts. This can be done by ensuring the well-being of stakeholders through the use of sustainable business models. By creating value through every process of the organization, the archetype moves towards keeping stakeholders content and creating a sustainable planet and society. Examples of this archetype in business practice are the use of certifications, which leads to more environmentally friendly economic activities.

Archetype 6 ''Encourage sufficiency.''

This archetype presents solutions to reduce the consumption and production of goods.

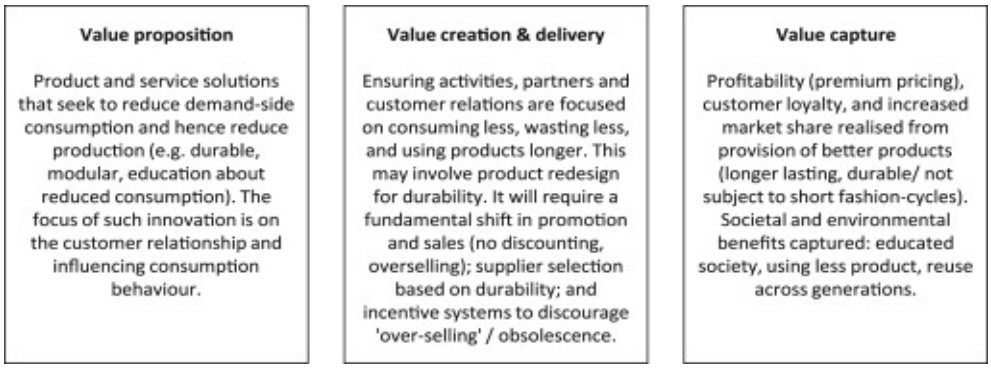


Figure 9 - Archetype 6

Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

Many different NGOs and academics argue that a radical change in consumption and production is the only true solution for achieving a sustainable future. It is considered insufficient to only change the production aspects since a lot of the impacts are created by overconsumption. The new business models should have a broader view and address a broader selection of stakeholders. Furthermore, the sufficiency approach should also focus on the appropriate use of marketing and sales activities. Some examples are *product longevity* and *durability*, *energy-saving companies* and *market places for second-hand goods.*

Archetype 7 ''Re-purpose the business for society/environment.''

This archetype explains why firms should prioritize the delivery of social and environmental benefits, rather than economic profit maximization.

Figure 10 - Archetype 7
Source: *Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)*

This archetype is mainly focused on the change of a firm's structure. The goal is to alter the traditional view of ''business as usual'' and implement ideas which, in the long run, will lead to more social and environmental benefits. On a global scale, this archetype could contribute to altering the fundamental purpose of business and potentially change the way firms behave in the world economy. A known example of the use of this archetype can be found within the business practice of *social enterprises.* The profit in a social enterprise is secondary, and the firm exists to fulfill their established non-profit mission (Grassl, 2012).

Archetype 8 ''Develop scale up solutions.''

This archetype explains the importance of delivering sustainable solutions at a large scale to maximize benefits for society and the environment.

Figure 11 - Archetype 8
Source: Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014)

This archetype highlights the importance of large firms to scale up their sustainability practices and implement as many of the aforementioned archetypes as possible. It also suggests that larger companies will play a significant role once the general sustainability consensus changes, and competition forces them to adapt. These actions are therefore more often found in small business practices rather than in large (Nerkar & Shane, 2003). Well documented examples of this archetype are licensing

and franchising. These strategies can enable a rapid replication of sustainability principles with localized adaptation and financing.

Archetype results

The authors argue that the archetypes presented in the article can be used to assist in an educational role to expand the degree of familiarity for firms and therefore promote concepts of sustainable business models. The archetypes presented are therefore viewed as a sort of starting point used to broaden and unify research agendas for sustainable business models. Firms can decide whether or not they want to implement all of the business model archetypes, or if they prefer to use only one of them. Their main purpose is to assist in the way firms explore new solutions to create and deliver sustainable value and further improve their business models. However, even though each can be applied on their own, different archetypes can be combined, and in order for firms to achieve any kind of real sustainability, several of them should be implemented (Bocken et al., 2014).

4. Analysis/Discussion

During this part of the thesis the results of the literature reviewed is discussed in relation to the first research question. This discussion leads to the development of three variables that are subsequently used for the quantitative analysis in order to answer the second research question.

4.1 Systematic Literature Study

The systematic literature study is structured with the initial part explaining the different characteristics of the theories reviewed, followed by their benefits, opportunities and problems. Throughout the study, a comparison of the differences and similarities between the theories is made in order to develop variables for the quantitative section. Finally, a summary is presented in order to highlight the most important findings.

4.1.1 Circular Business Model Characteristics

The replacement of the linear way of business has proven to be of many different names, circular economy, sustainable business model and circular business model. Furthermore, the research has been difficult to compare and evaluate due to few practical applications made. However, the main idea behind the models is the same; they all intend to create a circular business strategy that is regenerative in nature, while also being more profitable than the linear alternative. The theories different perspectives can be explained due to their areas of focus. While the EMF is focused entirely on the textile industry, the other two articles are focused on a broader sense of circularity. Even further, the article presented by CU is more concentrated on business relationships and their role in the process of becoming more circular. BSRE, on the other hand, is more focused on the different areas of circularity (technological, organizational and social), with a much broader perspective, including all industries.

The theories have different methods of communicating their research, as well as how they can be applied in practice. The circular business model (EMF) maintains the three principles in the core of the theory in order to explain how industries, in general, can be more circular, with the ambitions presented to showcase how they can be applied to the textile industry specifically. This is different from the sustainable business model (BSRE) since it is focused on the general scope of sustainability, and what the different methods are of becoming more sustainable, based on the archetypes chosen. The circular economy (CU) is more focused on the managerial and internal perspectives related to the business strategies, as well as how different firms can compare their degree of circularity with the taxonomy created.

4.1.2 Benefits, Opportunities and Problems.

The EMF has been a leader in the emerging concepts of circularity over the years and has presented different ways the world can improve by switching from a linear to a circular economy. By making this systematic shift, the creation of long-term resilience and more sustainable business processes becomes possible. It would push firms away from non-renewable resources and therefore minimize hazardous waste creation from consumption while simultaneously facilitating the transformation towards renewable sources. This is in line with the general definitions presented in the archetypes by

BSRE, where they focus on moving towards sustainable alternatives to traditional production, while also considering the consumption of products and stakeholder relationships as important. The relationship aspect is strengthened by CU's findings and could be argued to be crucial for the clothing industry in regard to keeping a clear communication between suppliers and retailers.

The first ambition of the EMF is to reduce the use of substances of concern and microfibres, which decreases the pollution of land, water and air created by firms through the redesign of products and systems. This will promote better health of the public and environment while also having the potential to greatly reduce externalities. It can be considered in line with the technological archetypes presented by BSRE and how these can be used to reduce and capture waste. However, both theories neglect to explain whether or not it is possible with the technology available today. Furthermore, the concept of technological advances necessary is according to CU problematic due to the large quantities of bound capital required for R&D. This might indicate that the industry is not yet prepared to take the actions suggested by EMF and BSRE until there is a significant improvement in innovation.

The second ambition of the EMF is to increase clothing utilization, which consists of altering the way clothes are designed, sold and used, in order to increase the average number of wears. This promotes a value-capturing ideal and further reduces waste and pollution caused by the textile system. By making it possible to rent clothes, businesses can still retain a constant income, while also reducing the pollution caused by their production. It also promotes more uses per clothing piece. By moving towards the final taxonomy mode presented by CU, the full circular adoption mode, promotion of reuse and use is considered, as well as the improved relationships with suppliers and consumers. The benefits of reusing materials and increasing the number of uses the garments experience has the potential to increase profitability for the firm. This is also something considered by BSRE, which makes it recurring in all three articles. The reuse of materials would create enhanced longevity/durability of products and motivate firms to deal with the end-of-life problems associated with the products since the manufacturer always retains the ownership of the assets. Clothing will therefore evolve from being a transaction of assets towards a steady stream of income for firms.

By reducing the consumers' needs for ownership, the potential to change consumption patterns becomes possible, which arguably is the only conceivable way to make real sustainable change. The arguments made by CU further evolve the potential for changing consumer patterns, and by promoting transparency and compliance, firms can obtain efficient competitive advantages through marketing and campaign promotion. This is somewhat neglected by the other theories as they only focus on the importance of changing consumption patterns, without exploring how it could work in practice. An example of this is the recurring trends and fashion vulnerability inherent to the clothing industry, which has the potential to counteract the progress made through leasing by making clothing outdated quicker than necessary. This would result in increased production and therefore make leasing less effective than originally expected. An additional argument made is the notion that leasing would give consumers greater utility and choice with lower overall costs. This is not properly explained since little research has been done regarding margins, cost of leasing, cost of repairing goods, whether the leasing is done as a monthly subscription or per individual pieces and so on.

Furthermore, the problems discussed by CU, the increasing population growth and megacities, are real impacts that can act as a roadblock for the circular economy. The results of the concept of leasing, if successfully implemented across the world, could therefore greatly reduce the number of products manufactured and impact the countries that depend on it. A reduction in manufacturing could add more problems to global challenges such as poverty, hunger and inequality by increasing unemployment rates and forcing entire industries out of work. It is therefore possible that more research on consumer behavior is necessary, as well as the consequences of reduced consumption, in order to understand how to successfully make the transition towards the concept of leasing clothing without creating negative impacts on a global scale.

The third and the fourth ambitions of the EMF is to radically improve recycling, as well as make resource use more efficient, while moving towards more renewable inputs. If the firms were to consider recycling during the design process, they could retain the value lost and improve their revenue streams by making garments last longer and more easily repairable, which would further make leasing a more attractive alternative to sales. Additionally, by investing in more efficient recycling systems, more materials can be captured and reused, which can reduce material costs as well as the extraction of virgin materials. The move towards renewable inputs presented by the EMF is viewed similarly by BSRE and can be considered a byproduct of implementing a more circular system, and therefore a secondary outcome of recycling. CU does not mention this specifically, although it is arguably included in the full adoption mode and the four loops since it entails the implementation of internal and external circular activities. The shared opinion of all theories is that recycling and reuse is an important part of becoming more circular. However, none of the theories explores how to execute it properly with the technology of today, which indicates that further development and research in closing-the-loop technologies is necessary.

Something considered by BSRE and CU, although neglected by the EMF, is the opportunities and benefits associated with maintaining healthy relationships with stakeholders. In order for clothing firms to properly establish new business processes and develop more sustainable alternatives to traditional production, transparency and long-term relationships with suppliers is crucial to reduce emissions and promote efficiency. The partnerships are especially important for clothing firms that outsource production and recycling, as these would have to be kept to the same standard as the alternative in-house production.

4.1.3 Summary of Findings Related to Theories

The three different theories presented above have their own perspective on how to create an effective circular business model; however, there are some similarities and differences between them.

A reduction in pollution is a concept everyone agrees is important and is presented in the first and second ambition of the EMF in the first archetype of BSRE as well as through the full circular adoption mode by CU. However, the reduction of CO_2 is somewhat of a byproduct, since all three researchers argue that is can be influenced through other activities. The general consensus found is that it is achieved through altering material compositions and moving towards reuse, recycling and remanufacturing. However, for all of these concepts to properly work, firms need to develop their

closing the loop technologies, since the systems of today do not have the capability to fulfill the purposes the theories have intended.

Based on the closing of material loops, the concept of leasing is promoted as a sustainable alternative to ownership throughout the articles. This can be achieved through the full circular adoption mode presented by CU with the promotion of external and internal approaches, the second and third ambitions presented by EMF as well as through the sixth archetype of BSRE, which focuses on creating a reduction of consumption while promoting longevity of products. However, recognized problems with leasing, such as fashion vulnerability and the consequences of reduced production in developing countries, have yet been resolved and may require further research.

Additionally, the use of renewable energy is an example of improved circularity recommended by BSRE with the third archetype, which is similar to the fourth ambition created by the EMF that explains the benefits of implementing such strategies. CU does not explicitly mention the transition towards renewable energy, although it is arguably included in the full adoption mode and the four loops. By improving circularity and therefore reducing unwanted waste and use of materials, a reduction in both CO_2 emissions and energy consumption is created.

4.2 Development of Variables

The data collection for the quantitative part is based on the theoretical findings from the literature study. The articles by EMF, BSRE and CU were analyzed to assess the most relevant variables for quantitative analysis. The three principles created by the EMF were used as a source of inspiration when establishing the following variables since they explain how industries, in general, can be more circular. Although, since they are more general and not specifically created for the textile industry, other theories were required in order to consider specific attributes inherent to the clothing industry, and in order to not be limited to a single author's point of view due to the complexity of circular business models. This resulted in the creation of the following variables:

1. Carbon Intensity
2. Circularity
3. Energy Intensity

Data collection
The three variables selected are two quantifiable variables (Carbon Intensity and Energy Intensity) and one analytical (Circularity). The necessary data to quantify these variables were gathered from sustainability reports from the year 2018, which also served as the base year for currency exchanges in order to maintain accuracy. Relevant print publications and reputable third-party sources such as the Carbon Disclosure Project was also used and applied using the same base year. This year was chosen since the 2019 sustainability reports had not yet been released everywhere in the world due to differences in rules and regulations. Furthermore, the joint currency chosen was the Swedish krona, and currencies in yen, dollar, pound, Danish krone, Hong Kong dollar or euro were exchanged according to the 2018 base year exchange rate chosen. Yen=0.08 SEK, USD=9 SEK, Pound=12 SEK, DKK=1.35, HKD=1.10, Euro=10 SEK. The reasoning behind choosing the SEK as the base currency was to facilitate the comparability between firms.

4.2.1 Carbon Intensity

A reduction of CO_2 emissions is one of the most important aspects for implementing circular business models, which can be achieved through the use of redesign and improved efficiency. This is developed from the first ambition of the EMF, which focuses on the importance of decreasing pollution. Researchers such as CU have also argued in favor of closing material loops and have included it in their research. BSRE have a similar view throughout their eight archetypes, where they argue that improving the efficiency of resource use will reduce the environmental impact through minimized waste creation as well as improved longevity of products. In order to calculate the CO_2 emissions of clothing firms, and consider their size difference, the **carbon intensity** is used. The variable explains the relationship between a firm's net sales and its total CO_2 emissions. In order to take into consideration that many of the firms are of different size and stage in their life cycle, and therefore have more or less CO_2 emissions depending on their size, the authors used the firm's total CO_2 emissions divided with their total net sales.

According to the World Resource Institute, carbon intensity is normally used to compare the effectiveness of nations (WRI.n.d). Where the nations with a high carbon intensity are less efficient at creating value from CO_2 emissions than nations with a lower intensity. The thesis uses the core idea of calculating the carbon intensity by replacing GDP with net sales of firms investigated. These figures, however, can be greatly manipulated and unreliable depending on which emissions are included in the calculation, as well as how the GDP is measured. For firms, the standardized method of calculation is the three scopes of emissions according to the GHG protocol, which facilitates the comparison and minimizes the risk of miscalculation (Greenhouse Gas Protocol, 2011). In regard to the calculation of net sales, there is only one universal way to calculate it, which reduces the margin of error.

The result will give an insight into how much economic value a firm can create with the use of their total CO_2 emissions, and depending on their degree of intensity, how efficient they are compared to other competitors on the market. This is valuable information and a relevant variable since it can reveal which firms are more efficient in capturing value from finite resources.

Emission scopes

The measure of CO_2 emissions discharged are reviewed as per the GHG convention, which groups an organization's GHG outflows into three 'scopes'.

Scope 1 discharges are the direct emissions caused by the firm which includes the emissions from combustion in owned or controlled boilers, vehicles, furnaces, emissions from own production and so forth (Greenhouse Gas Protocol Initiative, 2004).

Scope 2 discharges are indirect emissions from the purchase of electricity, heat or steam from a utility provider. Within the second scope, there are two different ways of calculating the emissions from energy, location and market based method.

''In short, the market-based method reflects emissions from electricity that companies have purposefully chosen (or their lack of choice), while the location-based method reflects the average emissions intensity of grids on which energy consumption occurs.''– GHG protocol (2014, p.27).

The location-based method therefore reveals what the firm physically releases into the air, while the market-based method shows the emissions the firm is responsible for through its purchasing decisions (WRI, 2015). Both methods are therefore individually important for explaining the firm's carbon footprint and its carbon reduction strategies. However, for the purpose of the quantitative method, the authors will use the market-based method when calculating different firms' scope 2 emissions in order to have a base method to focus on, as well as it being more relevant since the emissions through purchasing decisions are often higher.

Scope 3 emissions are on the whole backhanded outflows (excluded from scope 2) that happen in the value chain of the revealing organization, including both upstream and downstream discharges (Greenhouse Gas Protocol, 2011). It is therefore not only emissions in direct control of the organization that is considered in the report but also the indirect emissions caused by their actions. However, even though there are many indirect sources that are applicable to the calculation of scope 3 emissions, not all are relevant for every firm. Some firms have in-house production and will therefore have a higher scope 1 emissions, while some firms outsource their production and will have more scope 3 emissions. Furthermore, some firms have no leased assets, capital goods, investments or franchises and will therefore have lower scope 3 emissions overall.

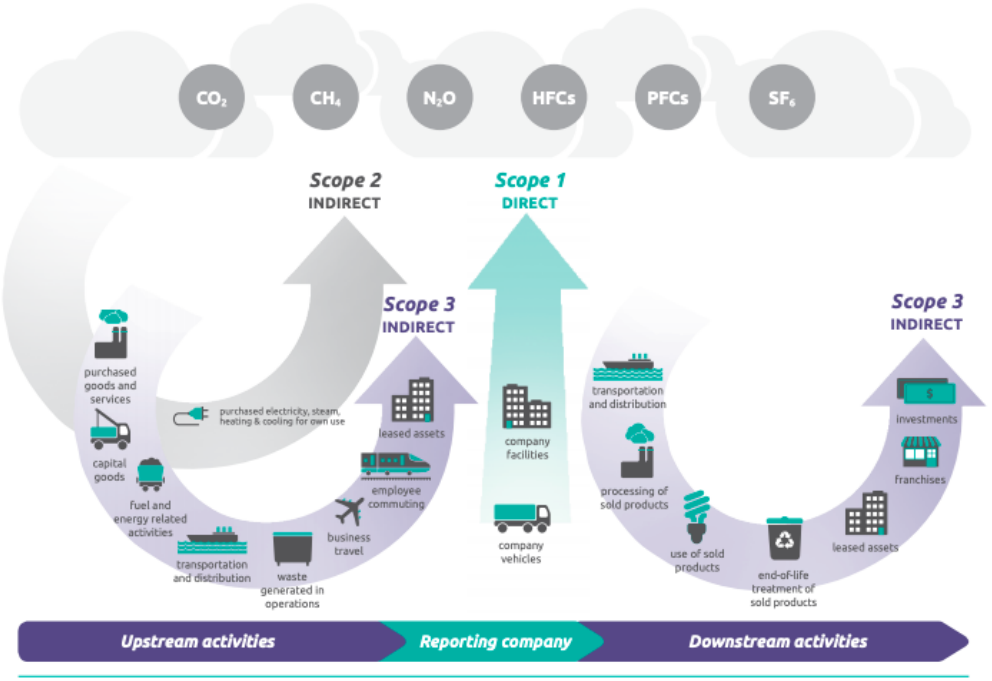


Figure (12) Overview of GHG protocol scopes and emissions across the value chain
Source: Greenhouse Gas Protocol, (2011). Corporate value chain (Scope 3) accounting and reporting standard.

Reporting principles and trade-offs

According to the guidance for applying the accounting and reporting principles presented by the GHG protocol, there are five principles for firms to take into consideration during the calculation phase: Relevance, Completeness, Consistency, Transparency and Accuracy. The GHG protocol further explains that firms might encounter trade-offs between these principles when attempting to complete a scope 3 inventory. For example, in order for a firm to achieve the most complete scope 3 inventory

possible, they might have to exclude activities with low accuracy, compromising the overall accuracy of the report (Greenhouse Gas Protocol, 2011). It therefore depends on the accounting methods used by the individual firms investigated, which is something the authors have no control over. For the thesis, this means that the accuracy of the quantitative part can be slightly askew and should therefore be considered when analyzing the results. In order to minimize the misinformation presented in the sustainability reports, firms with scope 3 emissions that are only partially complete are removed from consideration and therefore not included in the quantitative part. This includes firms that, for example, only reveal information regarding their business travel CO_2 emissions.

4.2.2 Circularity

The implementation of a circular approach affecting the actions of a firm and its strategy is crucial to alter the fundamentals of the clothing industry. The contents included in the **circularity** variable are based on the findings of the literature study and focuses on firms' need to design for durability to allow the potential for reuse, remanufacturing, and recycling to maintain products, materials and components circulating within the economy. An example of this strategy is the concept of leasing, which promotes the development of more circular material loops. These circular systems are designed to make effective use of biologically-based materials and products by encouraging many uses during its lifetime, before the nutrients are finally returned to the natural systems. The definition is partly developed from EMF's second and third ambitions and is further strengthened by BSRE's second and fourth archetype. Furthermore, CU use the four loops of manufacturing while developing the model in their article, and it can therefore be concluded that they agree on its importance within a circular economy. The three parts of the circularity variable are therefore based on the four loops of manufacturing and strengthened by the research presented by the authors.

Grading scales

Due to differences in how firms value and work with keeping their products and materials in use, and the lack of statistical numbers recurring in the sustainability reports, a judgment of the authors was applied in order to rank firms depending on their active system through the process of coding. An analysis and comparison were then made to investigate if the size of a firm has any relevance towards the implementation of said closed-loop systems.

A firm's grade was decided based on three different analytical variables, recycling/remanufacturing, reuse/redistribute and repair/prolong. The first variable, recycling/remanufacturing, could be explained as a system used by firms to collect clothing or materials in order to, at a later stage, either recycle or remanufacture them. An example of this is when clothing companies use collected materials to create a new collection of clothes. The second variable, reuse/redistribute, is a system in place that a company can use to maximize the number of wears their clothing can have. An example is when a company sends all their unsold clothing to a second-hand shop where they can have another chance of being purchased. The third variable, repair/prolong, can be described as a system that has the ability to extend the life cycle of clothes. This is done by repairing damaged products handed in by consumers in order to promote more wears.

Firms will be given a score between 0-3 depending on their active systems and will be divided into three groups, medium, large or very large firms. A firm will be granted different scores depending on how many of the three variables they have in place in their current business models. For example, a

score of three will only be given to firms that have all three variables in place. A company with two out of three systems in place will be given a score of 2, a firm with one variable will be given a score of 1, and if no variable is present at all, a score of 0. Furthermore, there needs to be a clear explanation of how the firm works with each variable as well as numerical proof to back it up. Firms with no information at all will also be given a score of zero. If a firm has a system in place with no numerical proof of work, they will only be given a score of 0.5 out of 1 for that specific variable. Therefore, the existence of proof of work is the only way for firms to achieve a full score. This is used in order to punish firms that claim work without any proof (greenwashing) and promote firms that are transparent.

4.2.3 Energy Intensity

The emissions and waste caused by the consumption of energy is an important aspect to consider when implementing circular business models. Work towards this variable would push firms away from non-renewable resources and promote a more circular approach, which can be fulfilled by improving recycling and moving towards more renewable inputs, concepts that are considered by all three researchers in the literature study. The use of renewable energy is recommended by BSRE with the third archetype, as well as through the full adoption mode and the four loops used by CU (recycling), which is similar to the fourth ambition created by the EMF that explains the benefits of implementing such strategies.

The third variable extracted is therefore **Energy Intensity**, which is based on the research presented in the literary study**.** A firm's degree of energy intensity indicates how efficient their organization is in producing economic value from energy. A high energy intensity therefore indicates a high cost of converting energy into net sales, and a low intensity the opposite. The method of calculation is similar to that of carbon intensity, the only difference is that the firm's total energy consumption is interchanged with their CO_2 emissions. The firm's total energy consumption is calculated in KWH (Kilowatt hours) and limited to the use within the firm's own organization, due to the difficulties in predicting how much energy is consumed upstream, as well as it being more difficult for smaller firms to calculate. Furthermore, the use of energy from renewable sources lower the energy intensity and therefore improves the overall value creation.

Renewable energy

The degree of renewable energy used in firms' business activities is collected from their sustainability reports, or other reliable sources, where they disclose to what extent their energy consumption comes from renewable sources such as solar, wind or water. The rate of renewable energy use displays how effective their implementation of circular business models is, since a well-established CBM focuses on renewable resources and avoids environmentally hazardous alternatives. The energy consumption is based on the activities of which the firm has direct control over, and indirect energy consumption from third-party production is therefore not included. This was excluded due to the difficulties in the calculation, as well as the low degree of transparency in reporting. Furthermore, firms that did not provide proof of their renewable energy consumption were calculated as having no renewable energy at all. This method is the most reliable as it is focused on proof and avoids speculation of numbers based on the information presented.

In order to maintain an accurate picture of the firm and its energy intensity, its renewable energy consumption is removed from the KWH consumption calculation. This means that firms that are more circular and therefore have less non-renewable KWH consumption will have a more effective energy intensity (compared to a firm with identical net sales without renewable energy). Firms that are more efficient at creating value with a slightly higher energy consumption can still have a lower energy intensity due to the increased net sales. It is therefore possible for firms without renewable energy to have a lower energy intensity than firms with renewable energy. However, firms that only use renewable energy in their organization will have a 0 in energy intensity, which is the lowest number possible. The calculation is therefore the following:

((1-Renewable energy%) x total KWH consumed)/Net sales= Energy Intensity

4.2.4 Summary of Variable Calculation

The three quantitative variables chosen, based on the theoretical findings, are therefore Carbon Intensity, Circularity and Energy Intensity. The variables are calculated using the following formulas (Circularity used coding of information).

Carbon Intensity= *CO_2 emissions in kilo/Net sales*

Circularity=
1. Recycling/remanufacturing (0-1 points)
2. Reuse/redistribute (0-1 points)
3. Repair/prolong (0-1 points)

Energy Intensity= *((1-Renewable energy%) x total KWH consumed)/Net sales= Energy Intensity*

4.3 Quantitative Study

The quantitative portion of the thesis is based on the actions of 30 different clothing firms segmented from medium to very large firms. The green color on the graphs indicates that the firm is a medium-sized firm, and therefore has a net sale of less than 10 billion SEK. The blue color represents large firms with net sales of between 10-100 billion SEK, and finally, very large firms have more than 100 billion SEK in net sales and are shown with the color red. Some firms have been omitted from graphs due to unreliable numbers regarding their sustainability reports and will therefore have the sign ''N/A'' after their name to indicate that the numbers were Not Available for that specific variable. The firms in the graphs are listed according to their net sales, starting with the largest firm closest to the y-axis.

4.3.1 Carbon Intensity

The following graphs depict the quantitative findings of carbon intensity and are presented in order of net sales (Firm Size).

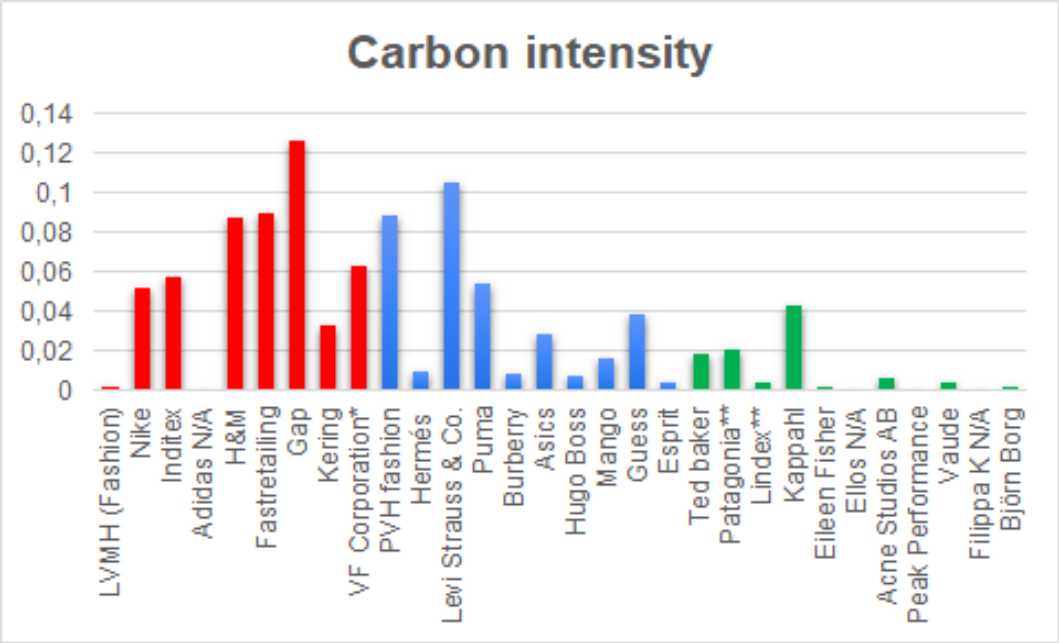


Figure 13 - Carbon intensity results
*Information from 2019
** Information from 2017

According to the graphs depicting our carbon intensity findings, we can clearly see that there is some kind of correlation between the size of a firm and the average carbon intensity. The comparison is facilitated by placing the firms according to size, and we can see that the average emissions are much lower for medium-sized firms (Green) (0,011) than for large (Blue) (0,036) and/or very large (Red) (0,063) firms. For example, Gap has the highest carbon intensity of all firms investigated and is therefore the most ineffective at creating value from finite carbon-intensive resources, while Peak Performance has the lowest score. However, there is no clear indication that this must always be the case. The graph shows that even a transnational organization such as LVMH, which has the second lowest score, can obtain a lower carbon intensity than much smaller firms like Kappahl and Patagonia, the latter being famous for its sustainable approaches.

One finding, which needs to be addressed, is that the majority of luxury brands in this research (LVMH, Burberry and Hermés) have a very low carbon intensity. These brands are not medium-sized companies, but they manage to have low carbon intensity compared to the majority of the fast-fashion companies of this list (H&M, Inditex, Nike, Gap). This, however, is not true for all of the luxury brands or all of the fast-fashion brands since PVH fashion has a much higher number than Mango, which proves that there is no guaranteed correlation between luxury brands and low carbon intensity based on this sample size.

4.3.2 Circularity

The following graph depicts the quantitative findings of the degree of circularity and is presented in order of net sales (Firm Size).

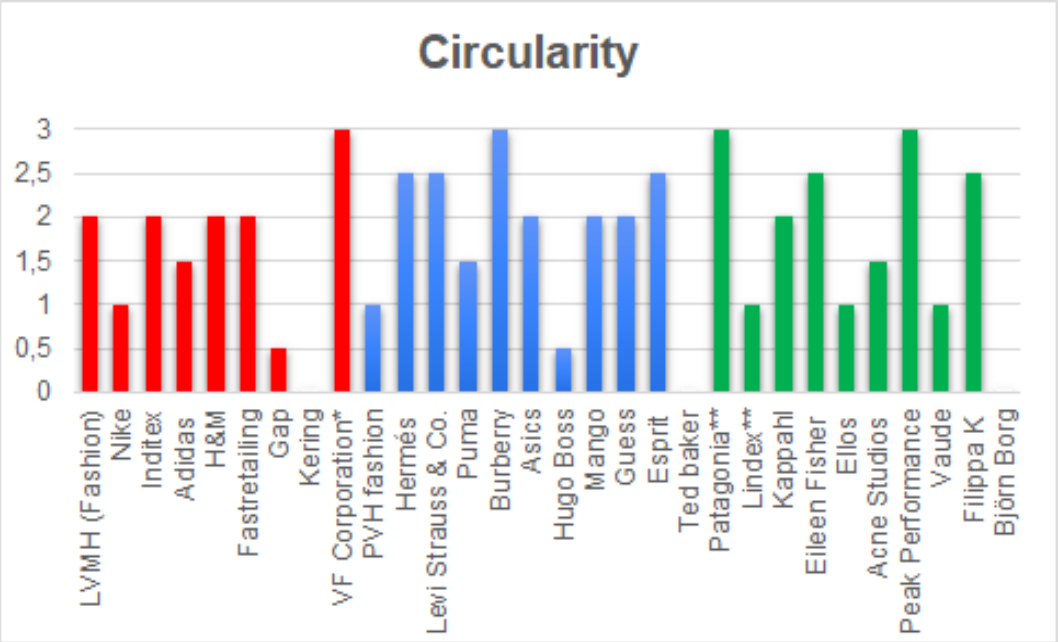


Figure 14 - Circularity results

The graph shows a more average spread between the firm size, compared to carbon intensity, where large sized firms have the highest average score (1,95) followed by medium-sized firms (1,59) and, lastly, very large firms (1,55). We can clearly see that there are firms in each category that are operating without any plans to work towards creating sustainable production processes. The averages indicate that there is no significant difference between the ambitions of being more circular, depending on firm size. Large-sized firms have proven to be better than the other groups which shows that those firms are, in general, more invested in promoting a circular approach. High-end fashion brands such as Burberry, Hermés and LVMH are all above the averages for their respective category, the exception is Kering, which shows no indications of wanting to implement any circular production processes today or in the future. Certain fast-fashion brands, such as H&M and Inditex, are surprisingly invested in improving their circularity efforts. Furthermore, Peak Performance is once again one of the leaders, along with Patagonia, VF Corporation and Burberry. In general, we can see that the majority of firms within the clothing industry are focused on improving their circularity.

Furthermore, based on the results of the study, we can see that recycling/remanufacturing is the most utilized strategy with 24 out of 51 total points, followed by reuse/redistribute with 20 points and lastly, repair/prolong with 7 points (see appendix for explanation). This indicates that more efforts are made towards improving recycling methods compared to the other strategies, especially when considering repair/prolong, which appears to be largely neglected by all firms.

4.3.3 Energy Intensity

The following graph depicts the quantitative findings of energy intensity and is presented in order of net sales (Firm Size).

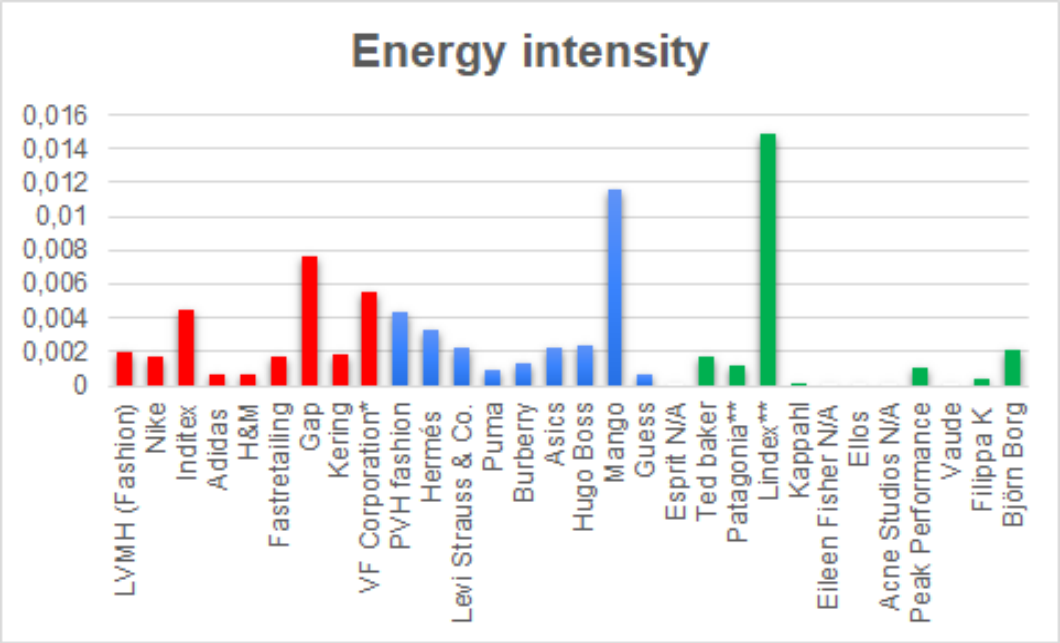


Figure 15 - Energy intensity results
*Information from 2019
** Information from 2017

The energy intensity graph represents our findings regarding energy consumption in relation to sustainable energy sources from all firms investigated. Three firms had inaccessible data regarding their energy consumption and are therefore marked with ''N/A'' and excluded from the calculation of the averages. The aim for firms is to achieve the lowest energy intensity possible, and therefore to reach ''0''. Firms such as Ellos and Vaude reached a 0 by having all of their energy consumption originating from sustainable sources.

Medium-sized firms, with the exception of Lindex, are in general very effective at maintaining a low energy intensity compared to large and very large firms. The averages show that medium sized firms (0,0023) have the lowest energy intensity, followed by very large firms (0,0029) and lastly large firms (0,0032). Based on the findings, there is a slight correlation between size and energy intensity, and if we remove the outliers, i.e., the firms with the highest energy intensity in each section, there is an even larger correlation. This indicates that a larger sample size is required to even out the averages and minimize the effect of the outliers.

Furthermore, the research indicates that medium-sized firms are worse at utilizing renewable energy, while large and very large firms are better. This, however, can be partially explained by the fact that larger firms are superior at providing proof of energy consumption originating from renewable sources. This appears to be linked to the problem of transparency in reporting and the difficulties in calculating consumption for smaller firms.

4.3.4 Summary of Quantitative Findings

By looking at the findings of each variable, it can be determined that there is no clear linear relationship between the size of a firm and its level of implementing circular business models. A large or very large firm is not necessarily worse at utilizing these models, and a smaller firm is not necessarily better. It can, however, be determined that smaller firms, in general, are better at using circular business models in their organizations compared to the average of very large firms, which ultimately means that the size of a firm has somewhat of a significance. If carbon intensity and energy intensity are included with the circularity, there is some evidence that suggests a prevalence of efficiency in smaller firms, due to them having a lower average in both areas. Furthermore, there is some evidence suggesting that, while firm size might not have a substantial impact on the implementation of circular business models, the type of firm does. As presented by the graphs, high-end couture firms seem to be more efficient at utilizing carbon emissions, as well as maintaining a low energy intensity, which can be explained by their high prices and lower production outputs. The sample size used in the quantitative section is arguably not large enough and should be increased in future research. This is, however, difficult under the current reporting standards due to the revealing of total emissions and energy consumption being voluntary. It therefore has to change, preferably on a global scale, in order to accurately include more firms, which would make it possible to see the true correlation between size and the implementation of circular business models.

5. Conclusion and Further Research

The conclusion of the entirety of the thesis is presented in this section along with recommendations for the clothing industry as well as our thoughts regarding further research areas.

5.1 Conclusion

Researchers and scientists have for a long time tried to create a solution for global warming by innovating new technology and coming up with ways to reduce emissions. What often follows a reduction in emissions is increased production outputs due to the possibility of producing more within the same carbon budget. The answer is therefore not completely solvable through innovation and research, but by the actions of individuals and the companies they run.

The result of the quantitative analysis has partially answered our first research question, whether or not there is a correlation between a firm's size and their degree of implementing circular business models. While the size of the firm has proven to be of some significance, the real impacts depend on the volume of clothes sold and their price, although more research is necessary in order to clearly understand the relationship between size and sustainable efficiency. The results also showed the difference in value creation between fast-fashion and high-end couture, especially in regard to carbon intensity. However, it appears the high price of products created by the high-end couture brands is one of the reasons behind their low carbon intensity, coupled with the fact that fewer products are created by these firms. It does not necessarily indicate that high-end couture firms are more sustainable than fast fashion brands, but rather that more value is created for each ton of CO_2 that is consumed during the process. They therefore have less of an impact by producing fewer clothes, for a higher price, compared to the fast-fashion strategy. Furthermore, due to the few firms that actually reveal their total CO_2 emissions, renewable energy use as well as circular approaches, the initial difficulties lie in promoting a more transparent global reporting standard in order to make it possible to make comparisons in the future.

The theoretical discussions presented argue that there are untapped economic resources to be claimed through value-maximization and closed-loop strategies. Based on the research reviewed, the most effective strategy to reduce the clothing industries' impact on the environment is through leasing, and based on the quantitative study made, it should be done by fast fashion firms. This is due to them being worse at creating value from CO_2 consumption compared to high-end couture firms and should therefore limit the number of products made. Preferably all clothing firms should adopt leasing as their main source of income, although it is more important that fast-fashion firms do it than high-end couture. However, as the consequences of leasing on a global scale are unknown, further research is required before implementation.

Finally, because of the many different theories available on the subject of circular business models, and due to their different areas of focus, it can be difficult to understand what they actually are and attempt to accomplish. The authors of this thesis have attempted to facilitate this by displaying how a selection of theories can be used, both as a way to develop quantitative variables, as well as how to use those variables to better understand certain relationships in specific industries, such as the correlation between firm size and circular business models within the clothing industry.

5.2 Further Research

While circular business models have proven ambitious when discussing solutions to environmental implications of the linear business model, they neglect to consider some social consequences of the new system, such as unemployment and poverty, which can have a significant impact on developing countries around the world. Further research in circular business models should, therefore, consider the consequences of implementation and include the subject of social sustainability since a sustainable environment cannot be created from an unsustainable society. Based on the result of the thesis, leasing appears to be a possible solution to some of the clothing industry's future complications. However, more research is necessary to better understand the potential side effects and benefits associated. Furthermore, since the circular business models seem to require customization depending on the industry, it can be difficult for firms to understand the most optimal strategy for becoming more circular. The Ellen MacArthur Foundation has partially initiated this process with their work in the textile industry, although more research in specific industries is necessary in order to facilitate the transition from linear to circular business models.

Reference List

Barnardo's. (2015). One worn, thrice shy – British women's wardrobe habits exposed!. Accessed: 10/03/2020 Retrieved from: https://www.barnardos.org.uk/news/Once-worn-thrice-shy-8211-British-women8217s-wardrobe-habits-exposed/press_releases.htm

Bell, E., Bryman, A., & Harley, B. (2018). *Business research methods*. Oxford university press.

Bocken, N. M., De Pauw, I., Bakker, C., & van der Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, *33*(5), 308-320.

Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of cleaner production*, *65*, 42-56.

Bocken, N.M.P., Weissbrod, I., Tennant, M., (2016). Business model experimentation for sustainability. Sustainable Design & Manufacturing Conference, Crete, Greece, 4-6 April 2016.

Chen, K. H., & Metcalf, R. W. (1980). The relationship between pollution control record and financial indicators revisited. The Accounting Review, 55(1), 168-177.

Chiaroni D, Urbinati A (2017) Towards a new taxonomy of the degree of circularity

Circular Fibres Initiative. (2016). Analysis based on Euromonitor International Apparel & Footwear 2016 Edition (volume sales trends 2005–2015).

Ellen MacArthur Foundation (n.d): Accessed 10/03/2020. Retrieved from: https://www.ellenmacarthurfoundation.org/our-story/mission

Ellen MacArthur Foundation (2017). A new Textiles economy - Redesigning fashions future.

Ellen MacArthur Foundation (2013). Towards the Circular Economy Vol. 1: an economic and business rationale for an accelerated transition.

Evans, S., Gregory, M., Ryan, C., Bergendahl, M. N., & Tan, A. (2009). Towards a sustainable industrial system: With recommendations for education, research, industry and policy. University of Cambridge, Institute for Manufacturing.

Eunomia (2015). The potential contribution of waste management to a low carbon economy.

European Union Commission (2003). Commission recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. *Official Journal of the European Union*, *46*(L124), 36-41.

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm?. *Journal of cleaner production*, *143*, 757-768.

Global Fashion Agenda and Boston Consulting Group. (2017). Pulse of the fashion industry.

Goedkoop, M. (1999). Product service systems. Ecological and economic basis.

Greenhouse Gas Protocol Initiative. (2004). A Corporate Accounting and Reporting Standard, Revised Edition. (Scope 1)

H&M (n.d): Accessed 17/03/2020. Retrieved from https://www2.hm.com/sv_se/dam/kampanjer/16r-garment-collecting.html

Hockerts, K., & Wüstenhagen, R. (2010). "Greening Goliaths versus emerging Davids — Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship." Journal of Business Venturing(25): 481–492.

Innovation management. (2017). Accessed 16/03/2020. Retrieved from: https://innovationmanagement.se/2017/11/16/what-are-circular-business-models-cbm/

International Energy Agency. (2016)., Energy, Climate Change & Environment: 2016 insights.

Joyce, A., & Paquin, R. L. (2016). The triple layered business model canvas: A tool to design more sustainable business models. *Journal of cleaner production*, *135*, 1474-1486.

Korhonen, J., Nuur, C., Feldmann, A., & Birkie, S. E. (2018). Circular economy as an essentially contested concept. *Journal of Cleaner Production*, *175*, 544-552.

Lewandowski, M. (2016). Designing the business models for circular economy—Towards the conceptual framework. Sustainability, 8(1), 43.

Linder, M., Williander. M. (2015). Circular Business Model Innovation: Inherent Uncertainties. Business Strategy and the Environment.

Jackson, T., & Senker, P. (2011). Prosperity without growth: Economics for a finite planet. Energy & Environment, 22(7), 1013-1016.

McDonough, W., & Braungart, M. (2010). Cradle to cradle: Remaking the way we make things. North point press.

McKinsey. (2016). Style that's sustainable: A new fast-fashion formula.

Mynewdesk (2013): Accessed 17/03/2020. Retrieved from: http://www.mynewsdesk.com/fi/pressreleases/puma-launches-incycle-836240

Nerkar, A., & Shane, S. (2003). When do start-ups that exploit patented academic knowledge survive?. International Journal of Industrial Organization, 21(9), 1391-1410.

Niinimäki, K., & Hassi, L. (2011). Emerging design strategies in sustainable production and consumption of textiles and clothing. Journal of Cleaner Production, 19(16), 1876-1883.

Nussholz, J. (2017). Circular Business Model Framework: Mapping value creation architectures along the product lifecycle. Delft University of Technology, 8, 10.

Orlitzky, M. (2001). Does firm size confound the relationship between corporate social performance and firm financial performance?. Journal of Business Ethics, 33(2), 167-180.

Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers. John Wiley & Sons.

Patel, R., & Davidsson, B. (2003). Forskningsmetodikens grunder. Studentlitteratur AB

Porter, M. E., & Kramer, M. R. (2006). The link between competitive advantage and corporate social responsibility. Harvard business review, 84(12), 78-92.

Prnewswire. (2011): Accessed 17/03/2020. Retrieved from: https://www.prnewswire.com/news-releases/patagonia-launches-common-threads-initiative-a-partnership-with-customers-to-consume-less-129372068.html

Protocol, G. G. (2011). Corporate value chain (Scope 3) accounting and reporting standard. World Resources Institute and World Business Council for Sustainable Development, Washington, DC.

Protocol, G. G. Standard, C. (2014). GHG protocol scope 2 guidance.

Reverse Resources. (2017). The Undiscovered Business Potential of Production Leftovers within Global Fashion Supply Chains: Creating a Digitally Enhanced Circular Economy

Richardson, J., (2008). The business model : an integrative framework for strategy execution. Strategic Change, 17(5-6), pp.133–144.

Shah, R., & Ward, P. T. (2003). Lean manufacturing: context, practice bundles, and performance. Journal of operations management, 21(2), 129-149.

Short, S. W., N. M. P. Bocken, C. Y. Barlow and M. R. Chertow. (2014). "From Refining Sugar to Growing Tomatoes. Industrial Ecology and Business Model Evolution." Journal of Industrial Ecology
Stubbs, W. Cocklin, C. (2008). Conceptualizing a “Sustainability Business Model”, Organization & Environment, 21 (2), 103-127.

Tukker, A. (2004). Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet. Business strategy and the environment, 13(4), 246-260

Vermeulen, Walter JV. (2015). Self-Governance for Sustainable Global Supply Chains: Can it Deliver the Impacts Needed? Business Strategy and the Environment, 24(2), 73-85.

Winkler, H. (2011). Closed-loop production systems—A sustainable supply chain approach. CIRP Journal of Manufacturing Science and Technology, 4(3), 243-246.

WRI (n.d): Accessed 17/03/2020. Retrieved from: http://pdf.wri.org/navigating_numbers_chapter5.pdf

WRI (2015): Accessed 17/03/2020 Retrieved from: https://www.wri.org/blog/2015/01/scope-2-changing-way-companies-think-about-electricity-emissions

Sources used for Quantitative analysis

1= Carbon intensity

2=Circularity

3= Energy intensity

4= Net sales

Company	**Source**
H&M	**1:**https://www.cdp.net **2:**https://about.hm.com **3:Same as number 1** **4:**https://about.hm.com
Inditex	**1:**https://www.cdp.net **2:**https://static.inditex.com **3:Same as number 1** **4:Same as number 2**
Nike	**1:**https://www.cdp.net **2:**https://s3-us-west-2.amazonaws.com https://www.nike.com **3: Same as number 1** **4:**https://news.nike.com
Adidas	1:N/A 2:https://www.businessinsider.com https://www.knittingindustry.com 3:https://www.cdp.net 4:https://www.adidas-group.com
LVMH	**1:**https://r.lvmh-static.com **2:Same as number 1** **3:Same as number 1** **4:**https://www.lvmh.com
Gap	**1:**https://www.cdp.net **2:**https://www.gapincsustainability.com **3:Same as number 1** **4:**https://www.macrotrends.net

Kering	**1:**https://www.cdp.net **2:N/A** **3:Same as number 1** **4:**https://www.kering.com
VF Corporation	**1:**https://www.cdp.net **2:**https://d1io3yog0oux5.cloudfront.nt **3:Same as number 1** **4:**http://www.annualreports.com
Levis Strauss & Company	**1:**https://www.cdp.net **2:**https://www.levistrauss.com https://www.levi.com https://www.levi.com **3:Same as number 1** **4:**https://s23.q4cdn.com
PVH fashion	**1:**https://www.cdp.net **2:**https://responsibility.pvh.com **3:Same as number 1** **4:**https://www.pvh.com
Fastretailing	**1:**https://www.fastretailing.com **2:**https://www.fastretailing.com **3:Same as number 2** **4:**https://www.fastretailing.com
Mango	**1:**https://press. mango.com **2:**https://st.mngbcn.com **3:Same as number 1** **4:Same as number 1**
Puma	**1:**https://www.cdp.net **2:**https://annual-report-2018.puma.com https://www.close-the-loop.be **3:Same as number 1** **4:**https://www.statista.com
Asics	**1:**https://www.cdp.net **2:**https://assets.asics.com **3:Same as number 1** **4:**https://www.statista.com

Vaude	**1:**https://csr-report.vaude.com **2:**https://csr-report.vaude.com **3:**https://csr-report.vaude.com **4:**https://www.owler.com
Hugo boss	**1:**https://www.cdp.net **2:**https://group.hugoboss.com **3:Same as number 1** **4:**https://annualreport-2018.hugoboss.com
Esprit	**1:**https://www.esprit.com **2:**https://www.esprit.com **3:N/A** **4:**https://www.esprit.com
Hermés	**1:**https://finance.hermes.com **2:Same as number 1** **3:Same as number 1** **4:Same as number 1**

Kappahl	**1:**https://www.kappahl.com **2:**https://www.kappahl.com https://www.kappahl.com **3:Same as number 1** **4:**https://www.kappahl.com
Filippa K	**1:N/A** **2:**https://www.filippa-k.com **3:Same as number 2** **4:Same as number 2**
Eileen Fisher	**1:**https://www.eileenfisher.com **2:**https://www.eileenfisher.com https://www.eileenfisher.com **3:N/A** **4:https://www.nytimes.com**
Acne studios	**1:**https://www.acnestudios.com **2:**https://www.acnestudios.com https://www.acnestudios.com **3:N/A** **4:**https://www.acnestudios.com

Peak Performance	**1:**https://www.peakperformance.com **2:Same as number 1** **3:Same as number 1** **4:**http://1ij5r73z81m72a9uqy1ago7a
Björn Borg	**1:**https://corporate.bjornborg.com **2:N/A** **3:Same as number 1** **4:**https://corporate.bjornborg.com
Lindex	**1:**https://about.lindex.com **2:** https://about.lindex.com **3:Same as number 1** **4:Same as number 1**
Ellos	**1:N/A** **2:**http://www.ellosgroup.com **3:Same as number 2** **4:Same as number 2**
Ted Baker	**1:**https://www.cdp.net **2:N/A** **3:Same as number 1** **4:**http://www.tedbakerplc.com
Patagonia	**1:**https://www.patagonia.com **2:**https://www.patagonia.com **3:** https://www.patagonia.com **4:**https://www.forbes.com

Burberry	**1:**https://www.cdp.net **2:**https://www.burberrry.com **3:Same as number 1** **4:**https://www.burberryplc.com
Guess	**1:https://www.cdp.net** **2:https://sustainability.guess.com** **https://investors.guess.com** **3:Same as number 1** **4:https://www.marketwatch.com/investing/stock/ges/financials**

Appendix

Carbon intensity

The following tables include the information extracted from sources related to the carbon intensity.

Very Large Firms Used	Co2 Emissions (kilo)	Net sales	Carbon Intensity
LVMH (Fashion)	932547000	416520000000	0,002238900893
Nike	16883118000	327573000000	0,05154001703
Inditex	14932035000	261450000000	0,05711239243
Adidas		N/A	
H&M	18279128000	210000000000	0,08704346667
Fastretailing	15307847000	170400000000	0,08983478286
Gap	18121160000	142695000000	0,1269922562
Kering	4482060000	137000000000	0,03271576642
VF Corporation*	7798418000	124200000000	0,06278919485

Large Firms Used	Co2 Emissions (kilo)	Net sales	Carbon Intensity
PVH fashion	7667016000	86913000000	0,08821483553
Hermés	584000000	59660000000	0,009788803218
Levi Strauss & Co.	5293310000	50400000000	0,1050259921
Puma	2528449000	46500000000	0,05437524731
Burberry	278209000	32796000000	0,008483016221
Asics	887242000	30700000000	0,02890039088
Hugo Boss	218053000	27960000000	0,007798748212
Mango	370007000	22330000000	0,01656995074
Guess	820429000	21240000000	0,03862660075
Esprit	61710000	17000500000	0,003629893238

Medium Firms Used	Co2 Emissions (kilo)	Net sales	Carbon Intensity
Ted baker	130449000	7100400000	0,01837206355
Patagonia**	141003000	6750000000	0,02088933333
Lindex**	23287000	6060000000	0,003842739274
Kappahl	206193000	4760000000	0,04331785714
Eileen Fisher	10151000	4500000000	0,002255777778
Ellos		N/A	
Acne Studios AB	16920000	2560960000	0,006606897413
Peak Performance	1552500	1440450000	0,001077788191
Vaude	4049270	1041300000	0,003888668011
Filippa K		N/A	
Björn Borg	1655000	709576000	0,002332378773

Circularity

The following tables displays the grading of firms based on extracted information.

Very Large Firms Used	Recycling/Remanufacture	Reuse/Redistribute	Repair/prolong	Circularity Score
LVMH (Fashion)	1	1	0	2
Nike	1	0	0	1
Inditex	1	1	0	2
Adidas	1	0,5	0	1,5
H&M	1	1	0	2
Fastretailing	1	1	0	2
Gap	0,5	0	0	0,5
Kering	0	0	0	0
VF Corporation	1	1	1	3

Large Firms Used	Recycling/Remanufacture	Reuse/Redistribute	Repair/prolong	Circularity score
PVH fashion	0,5	0,5	0	1
Hermés	1	1	0,5	2,5
Levi Strauss & Co.	1	1	0,5	2,5
Puma	1	0,5	0	1,5
Burberry	1	1	1	3
Asics	1	1	0	2
Hugo Boss	0,5	0	0	0,5
Mango	1	1	0	2
Guess	1	1	0	2
Esprit	1	1	0,5	2,5

Medium Firms Used	Recycling/Remanufacture	Reuse/Redistribute	Repair/prolong	Circularity score
Ted baker	0	0	0	0
Patagonia	1	1	1	3
Lindex	0,5	0,5	0	1
Kappahl	1	1	0	2
Eileen Fisher	1	1	0,5	2,5
Ellos	0,5	0,5	0	1
Acne Studios AB	0,5	0,5	0,5	1,5
Peak Performance	1	1	1	3
Vaude	1	0	0	1
Filippa K	1	1	0,5	2,5
Björn Borg	0	0	0	0

Energy Intensity

The following tables include the information extracted from sources related to the energy intensity.

Very Large Firms Used	Energy Consumption (KWH)	(1- Renewable Energy %)	KWH x (1-Renewable Energy %)	Net sales	Energy Intensity
LVMH (Fashion)	1056629000	0,77	813604330	416520000000	0,001953337967
Nike	701947000	0,82	575596540	327573000000	0,001757155016
Inditex	1895244000	0,6125	1160836950	261450000000	0,004439995984
Adidas	189708000	0,722	136969176	219150000000	0,0006250019439
H&M	1637283000	0,08	130982640	210000000000	0,0006237268571
Fastretailing	284440613	1	284440613	170400000000	0,001669252424
Gap	1096279000	1	1096279000	142695000000	0,007682672834
Kering	342270000	0,75	256702500	137000000000	0,001873740876
VF Corporation*	735443000	0,927	681755661	124200000000	0,005489176014

Large Firms Used	Energy Consumption (KWH)	(1- Renewable Energy %)	KWH x (1-Renewable Energy %)	Net sales	Energy intensity
PVH fashion	436580000	0,861	375895380	86913000000	0,004324961513
Hermés	208682000	0,96	200334720	59660000000	0,003357940329
Levi Strauss & Co.	139123000	0,81	112689630	50400000000	0,002235905357
Puma	81173000	0,562	45619226	46500000000	0,0009810586237
Burberry	81943000	0,5265	43142989,5	32796000000	0,001315495472
Asics	75586000	0,909	68707674	30700000000	0,002238034984
Hugo Boss	89783000	0,73	65541590	27960000000	0,002344119814
Mango	257784000	1	257784000	22330000000	0,01154429019
Guess	13409000	1	13409000	21240000000	0,0006313088512
Esprit	N/A				

Medium Firms Used	Energy Consumption (KWH)	(1- Renewable Energy %)	KWH x (1-Renewable Energy %)	Net sales	Energy intensity
Ted baker	12005000	1	12005000	7100400000	0,001690749817
Patagonia**	7612331	1	7612331	6750000000	0,001127752741
Lindex**	90528000	1	90528000	6060000000	0,01493861386
Kappahl	26658000	0,003	79974	4760000000	0,0000168012605
Eileen Fisher	N/A				
Ellos	10575000	0	0	2600000000	0
Acne Studios AB	N/A				
Peak Performance	1566000	1	1566000	1440450000	0,001087160262
Vaude	1242252	0	0	1041300000	0
Filippa K	314000	1	314000	729000000	0,0004307270233
Björn Borg	1470000	1	1470000	709576000	0,002071659695