

The Value Circle: Assessing Value Creation in Circular Business Models

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Abstract

This thesis aims to create a simple evaluation tool suited for assessment of value creation in Circular Business Models (CBMs). Transitioning from a linear business model to adapting the Circular Economy principles, brings in a range of new challenges, for both a company and its consumers. However, it is also important to note the different opportunities of value creation that arise due to such a shift. A strong agreement is found in the existing business model literature, in favour of understanding relevance of value creation within organisations. An extensive literature analysis unveils a relative abundance of frameworks available for business model development, planning and visualisation, pointing out a relative dearth of tools available to evaluate value generation, especially in CBMs. The intent of this research is to first identify a range of possible metrics to assess value generated in CBMs. Five different dimensions (economic environmental, customer, network and information) of value generation and suitable metrics are identified by the researcher through analysis of literature. The value metric checklist is tested for its applicability on selected case companies which are operating a CBM. Three companies which enable reuse of waste material as primary input are taken as cases for the empirical study. Finally, the evaluation tool “Value- Circle” is developed, consisting of ‘value metric checklist’ and ‘pie chart based visual representation’. The thesis provides an insight into need for evaluation of value in CBMs and identifies future opportunities for creating evaluation tools customised to CBMs.

Keywords: Circular Business Model, Evaluation tools, Value Creation, Value assessment, Circular Economy

Executive Summary

Background and Problem Statement

Various pathways to enhance resource efficiency and productivity have emerged, of which Circular Economy (CE) is gaining widespread acknowledgment. A Circular Economy can be defined as an economic system, which reduces waste and pollution by circulating materials within the production system or by feeding them back into production at the end of its useful life. A few businesses are gradually transitioning from a linear business model to adapt the Circular Economy principles, which brings a range of new challenges. Natural friction between the existing economic system and the new approaches to production and consumer interaction with products is bound to arise and create issues for business owners and policy makers alike. However, in spite of such diverse challenges, new opportunities of value creation also arise from shifting away from the traditional business model. A transition requires building upon the existing limited knowledge base to chart progress and identify where effort is needed to achieve change.

In a linear system, value capture is based on maximizing volumes of sales and intensive product consumption. It is representative of short-term planning for financial payback in a typical "take, make and dispose" extractive industrial model. However, circular economy adapted business models have taken value creation a step further by including value dimensions arising from sustainability considerations and new networking opportunities. This indicates the need for evaluation tools suitable for circular business models (CBM). After analysing the available literature, value creation in CBMs can be classified under five broad themes:

- Environmental value
- Economic value
- Customer value
- Network value
- Information value

Assessment of value creation can help companies find more ways to generate value, better serve their customer and increase profit by monitoring whether the business model innovations have indeed delivered the envisioned benefits.

Research Gap: Need for Business Model Evaluation tools

Literature analysis reveals a number of frameworks and tools for business model evaluation, but they are not tailored for the assessing the different value creation dimensions in CBMs. Despite extensive research done on the concept of a business model, frameworks for BM development and evaluation (Hamel, 2000; Amit and Zott, 2001; Afuah and Tucci, 2003, and Osterwalder, 2004), similar research for evaluation of CBMs is not widely available. A few frameworks that exist for the evaluation of sustainable business models (Bocken *et al.*, 2016) are not specific to CBMs. Most of the academic and technical literature available on the subject, focuses on environmental sustainability rather than value creation (Preston 2012). Companies operating within the Circular Economy principles are unlikely to replicate the model of a typical organization as their offering is based on circular principles and resource efficiency. Therefore, an evaluation approach that is better suited to account for the specific features of value creation in circular business practices is needed.

The intent of this thesis is to explore a range of possible metrics for value creation, which can form the basis of a simple evaluation tool for CBMs. Further, the purpose is to achieve the empirical validation of the evaluation framework for the analysis and evaluation of CBMs models through interaction with suitable companies. Development of a theoretical tool is not sufficient on its own, unless accompanied by a verifiable testing and evaluation of the framework. Secondly, knowing the shortcomings can help the firm to adapt and improve the business. In order to address these objectives, the following research questions have been formulated:

RQ1: What are the different dimensions of value creation offered by circular business models?

RQ2: What possible metrics can be identified to build a simple tool for assessing the identified value dimensions?

Brief results

RQ1. What are the different dimensions of value creation offered by circular business models?

The first RQ was answered by analysing literature which helped the researcher identify the different sources of value generation available to CBMs. They are categorised into a list of five dimensions after a thorough discussion on the concepts of business models for Circular Economy and value creation. These five categories of value sources complement those found in linear business models, namely, customer value and economic value, with environmental value, information value, and network value. The inclusion of these value creation sources is reflected in the understanding of the CBM concept by researchers, i.e. ‘a CBM is essentially a sustainable business model, which aims to go beyond delivering economic value and include a consideration of other forms of value for a broader range of stakeholders’ (Bocken *et al.* 2015).

RQ2. What possible metrics can be used to build a simple tool for assessing the identified value dimensions?

The second RQ was answered by compiling a list of relevant metrics as a first step towards the creation of an evaluation tool. A review of available business evaluation frameworks and tools was conducted, and used as guidance to develop a value metrics checklist. The researcher then engaged in semi-structured interviews with representatives from the selected companies, to gain an in-depth insight and empirical validation. Each value metric was given a score, according to a simple scoring scale. In order to provide support for the scoring awarded, each metric was discussed in detail, and examples from the company’s experience were cited. The value metric checklist was discussed with an expert, and revised accordingly to circumvent inherent biases.

The evaluation tool “Value-Circle” is presented as a final result of this thesis. This value assessment approach consists of a value metric checklist and a simple visual tool. The key aim is to assist companies that are in operating in a CBM through an improved understanding of their missed opportunities of value capture in different dimensions. This thesis aims to be of relevance for business developers, researchers in the field of Circular Economy, as well as policy-makers responsible for building the enabling environment for CBMs to thrive.

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Abbreviations

- CBM - Circular Business Models
- CE - Circular Economy
- CLSC- Closed Loop Supply Chains
- EMF- Ellen MacArthur Foundation
- GDP - Gross Domestic Product
- ICT – Information and communication technology
- SME - Small and Medium size Enterprises
- PSS - Product Service System

1 Introduction

1.1 Background and Problem Definition

The linear economic model follows the “take-make-dispose” trend and is responsible for extensive natural resources depletion and waste production. This model of consumption and production applies to most consumer goods nowadays whereby companies extract materials, apply energy to manufacture a useful product. This product which then gets discarded by the customers when its purpose is not served anymore (EMF, 2012). It is predicted that, by 2050 the global industrial system will be under pressure to double their production output to meet growing demands, while aiming to use only half of the current resources and generating one-fifth of the current CO2 emissions. To accomplish this, a new industrial revolution is required (EPSRC, 2016). One widely discussed way to overcome the impending resource scarcity and meet global commitments, is the transformation from a ‘linear economy’ towards a ‘circular economy’. The ‘circular economy’ (CE) has received attention in recent years from academia as well companies. It is seen to reconcile resource efficiency with commercial value creation (Bocken *et al.* 2016; EMF 2012) by commercialising upon more resource efficient solutions and technologies, by means of business models innovation (Moreno *et al.* 2016).

Towards the Circular Economy reports, published by the Ellen MacArthur Foundation, provide strong evidence of how circularity has started to impact the linear economy and has moved beyond being just another academic concept (EMF 2012). New businesses are already thriving, with innovative products and business models designed especially for the Circular Economy. In spite of the diverse challenges to shifting away from a linear business model to one that adopts circular principles, new opportunities of value creation arise from such a shift (Bocken *et al.* 2016). This is because the basic idea behind Circular Economy is to develop new forms of value, to meet a new resource price reality (Preston, 2012). However, in order to seize these opportunities for value creation, companies must have an understanding of the generic areas where value can occur. According to Preston (2012), measuring progress towards a Circular Economy will require more detailed mapping of resources flow and value creation. He further elaborates how more data and analysis on the new forms of value creation in Circular Economy can help create a powerful business case for Circular Economy. Understanding the holistic impact of Circular Economy based business models at product and firm level, is needed (Preston, 2012).

Business models, irrespective of being linear or circular, need to be economically viable. However, they must also provide value for their consumers and stakeholders. Value creation, both for the company and the customer, is at the heart of any business model and can be considered as the most important factor behind the viability of a new product, service or technology (Authority and Allé, 2012). When assessing value, it is important not just account for direct value for the company itself, but to also account for value created for its customers, the stakeholders and the natural environment. Such an evaluation should enable a firm to find new avenues for value creation. Some benefits of the evaluation process could be to allow comparison of various alternatives with respect to their effectiveness. Secondly, knowing the shortcomings can help the company to adapt and improve their business.

In the case of business models incorporating Circular Economy principles, sources of value creation complements those found in linear business models. Future business models will be radically different and consumers are expected to adopt to these new models by changing their current habits of consumption (EMF 2012). Therefore, apart from evaluating a company’s economic value, the customer value dimension is considered important. Such a business model

can have a significant impact on the purchasing and disposal behaviour of the society at large, which directly adds environmental value (Joshi and Rahman, 2015). Clearly, with a change in the consumption patterns, the potential to cut down on emissions increases and material use can become more efficient.

Every business operates within a network of partners and stakeholders (Bocken *et al.* 2016). Therefore 'Network value' is considered as another value dimension. Information technology has significantly enhanced the ability to track both resource and value flows, by enabling better flow of information and receiving feedback. Companies are able to identify wasteful processes along the supply chain and work out new approaches (Preston, 2012). Overall, benefits of the evaluation process could be to identify sources of value creation, explore alternatives and improvement by understanding shortcomings. Theoretical evaluation frameworks are not sufficient to meet the practical needs of businesses, who wish to evaluate and design their business models according to the Circular Economy principles. There is a need for simple instruments for evaluating value creation.

1.2 Research Gap

Literature analysis reveals a number of frameworks and tools for business model evaluation, but they are not tailored for the assessing the different value creation dimensions in CBMs. Focusing on value creation initially can help a company find ways to generate value by better serving the customer and, in the process, generating profit.

Despite extensive research being done on the concept of a business model, frameworks for BM development and evaluation (Hamel, 2000; Amit and Zott, 2001; Afuah and Tucci, 2003, and Osterwalder, 2004), similar research has not been done for evaluation of CBMs. While, frameworks do exist for the evaluation of sustainable business models (Bocken *et al.*, 2016), they are not enough for CBMs. They may be merely visual templates, such as the Moonfish Circular Business Model, (van Dort, 2014). Most of the academic and technical literature available on the subject, focuses on environmental sustainability rather than value creation (Preston 2012). Companies operating within the Circular Economy principles are unlikely to replicate the model of a typical organization as their offering is based on circular principles and resource efficiency. Therefore, for such companies an evaluation scheme that is better suited to account for the specific features of value creation from circular practices, is more informative.

Thus, the intent of this thesis is to explore a range of possible metrics for value creation, which can form the basis of a simple evaluation tool of circular business models. Moreover, this thesis aims at validating the developed evaluation tool on empirical cases. In order to address these objectives, the following research questions have been formulated

RQ1: What are the different dimensions of value creation offered by circular business models?

RQ2: What possible metrics can be identified to build a simple tool for assessing the identified value dimensions?

1.3 Research Approach

The research follows a two-step approach to answer these research questions. As a first step, an extensive literature review has been conducted. The aim of the review was to clarify how value is created in CBMs, which value creation dimensions can be deemed relevant and what are suitable

metrics to assess the generated value. Moreover, available tools and frameworks for business model evaluation have been screened, to identify good practices and features to inform the development of the evaluation scheme for CBMs.

An empirical validation of the CBM evaluation scheme is conducted, as merely developing a theoretical tool is not sufficient for a meaningful contribution. For this, three case companies that operate CBMs have been selected. To keep a limited focus, these were selected to be SMEs which recover used materials and utilize secondary materials as input for a new product. They were chosen to be from different countries, in order to enhance the generalizability of the findings. Additionally, an interview with an expert on Circular Economy and CBMs was conducted to ensure the validity and usefulness of the evaluation scheme and to further develop upon the metrics.

1.4 Outline

This thesis has been structured as follows: Chapter 2 offers an analysis of the literature to build a theoretical background on circular business models, their sources of value creation, and possible metrics to evaluate them under the relevant dimensions. Existing evaluation frameworks are reviewed, and a revised evaluation framework for circular business models is suggested in section 2.2. Chapter 3 outlines the research design and methodology used to develop and test the tool. Chapter 4 provides the reader with the findings from applying the developed evaluation scheme on the three selected case studies. The results and analysis of this empirical study is presented in Chapter 5, to draw a cross comparison between the cases. This is followed by a discussion of the findings from the analysis and research approach in Chapter 6. Finally, Chapter 7 summarizes the findings, as well as the shortcomings of this thesis and lays down the path for further research in the field.

2 Literature analysis

This section provides the theoretical background to aid the readers' understanding on the key concepts of Circular Economy (CE) and circular business models (CBMs) in section 2.1. Followed by this, evaluation frameworks currently available for business models are briefly reviewed, in section 2.2. These are scrutinized with regard to their evaluation approaches, to provide guiding notes for developing an evaluation scheme. Thereafter, the concept of value is discussed in section 2.3, in order to identify the different dimensions of value that can be expected in a CBM. By analysis of available literature, the researcher creates an evaluation checklist with suitable 'value based metrics', presented in sections 2.4 and 2.5.

2.1 Business Models as enablers of Circular Practices

2.1.1 The Circular Economy

Circular economy (CE) is a concept that aims to reach sustainability goals by 'closing the loop'. The term "Circular Economy" is described by the Ellen MacArthur foundation (EMF) as an "industrial system that is restorative or regenerative by intention and design". By applying the principles of Circular Economy to the current systems, there is a possibility to shift from linear industrial processes to closed loop systems. The CE is an economic system which is restorative or regenerative by intention and design, where wastes and other products can become inputs for new processes. According to the definition by the EMF, the Circular Economy is regarded as a system with the following definition:

In this system, waste ceases to exist, as products are designed where its components are strictly differentiated between consumables or biological ingredients and durables, the technical nutrients, which are designed from the start to be reused.

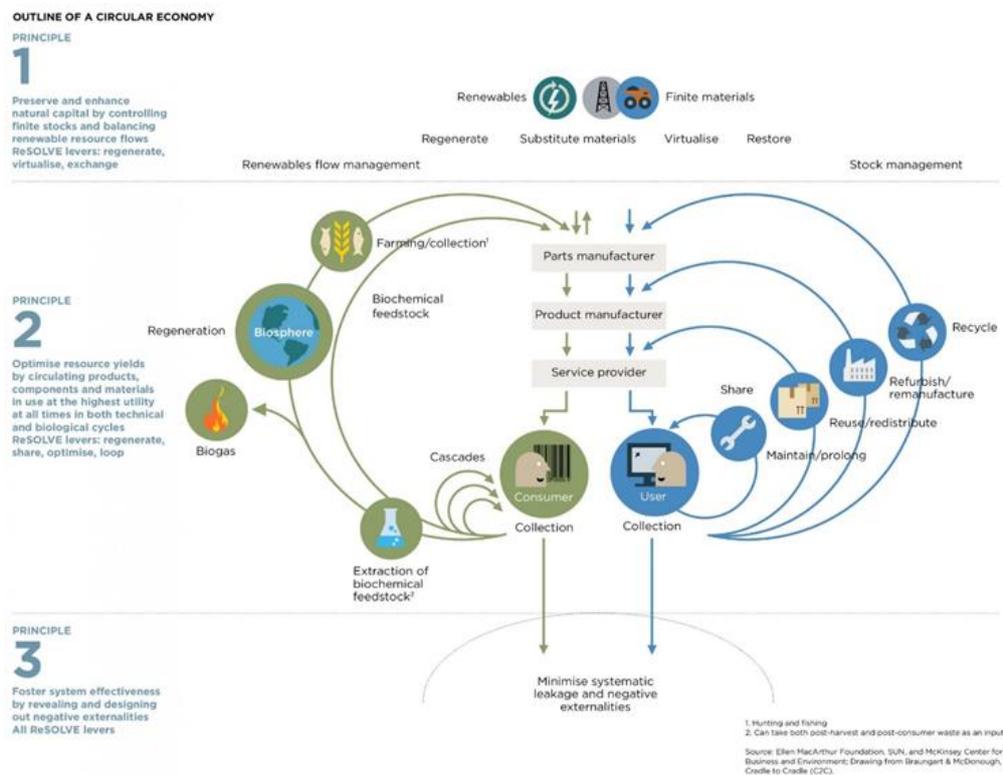


Figure 2-1 Circular Economy System diagram. Source: Ellen MacArthur Foundation

As shown in Figure 2-1, two different cycles for materials can be demarcated according to nutrients present, into biological and technical nutrients. Products need to be designed to separate them easily after use such that non-toxic biological nutrients can be easily degraded biologically in the biosphere, while the technical ones are designed to be reused again with a minimum energy input, within the techno sphere (McDonough & Braungart, 2002). Literature also reveals an extensive conceptual overlap with the circular economy thinking with other terms such as “Industrial Ecology”, “Biomimicry” (Benyus, 1997), “Cradle to Cradle” (McDonough & Braungart, 2002) and others. The Circular Economy relies on three principles according to the EMF, and each one has certain implications for the nutrient cycle:

Principle 1: Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows. This implies the preference of renewable energy sources over fossil fuels and efficiently managing the use of finite materials.

Principle 2: Optimize resource yields by circulating products, components, and materials at the highest utility at all times in both technical and biological cycles. It addresses the design of technical cycles with smaller loops, which increase the lifetime and preserve the embedded energy of products and components are preferred over larger loops, which require additional energy for recovering material value.

Principle 3: Foster system effectiveness by designing out negative externalities. This principle concerns the economic outputs and includes reducing damage to ecosystems i.e. minimizing negative externalities.

2.1.2 Understanding Circular Business Models

Business models are increasingly becoming the new unit for analysis, as they often reach beyond the boundaries of specific companies (Schweizer, 2005). This concept has received attention from scholars and business strategists to explain a company’s value creation, performance, and competitive edge. As opposed to business strategy, the focus of the ‘business model’ concept is more on cooperation and joint value creation (Zott *et al.* 2011). Hamel (2000) states, “in order to thrive in the new age, companies must develop new business models— in which both value creation and value capture occur within a value network”. This can include suppliers, partners, distribution channels, and coalitions that extend the company’s resources (Zott *et al.* 2011).

Analysis of the literature shows that researchers understand the term ‘business model’ differently, and thus it can be interpreted in several ways. Some researchers use a business model as an abstract concept to describe a way to create and deliver value. Some variations in the definition of a ‘business model’, as outlined by Demil and Lecocq (2010), are due to *static* versus *transformational* approaches to its understanding. In a static approach, a BM is a blueprint for the description of how an organization functions and generates revenues. It assists managers to visualise the different activities in their company. In the *transformational approach*, a business model is considered as a tool to address change and focus on innovation (Demil and Lecocq, 2010).

According to Osterwalder *et al.* (2005), a business model can be understood as follows:

A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value relationship capital, to generate profitable and sustainable revenue streams.

The concept of business model has recently gained attention as an enabler to adopt resource efficient strategies that can close material flows through reuse, repair, remanufacturing, or substituting virgin material input. In addition to design of products, it can also drive the development of new business models for CE (Moreno *et al.*, 2016). In Europe, the European Commission (2015) has adopted the “Circular Economy Package”, which is an EU Action Plan for enhancing Circular Economy with an aim to help the business and consumers transition from traditional economy to the Circular Economy. The shift to the circular economy will require new ways of doing business. Under the right enabling conditions, national and international level policy has an eminent role for businesses to take a step towards developing circular models of operation. Planing (2015) lists four essential building blocks for moving from a linear economy to a Circular Economy:

(1) materials and product design (2) new business models (3) global reverse networks (4) enabling conditions. This thesis focuses on new business models for the Circular Economy and how they can be evaluated for their value creation.

A CBM can be defined as the rationale of how an organization creates, delivers and captures value with and within closed material loops (Mentink, 2014). It differs in a number of ways from a conventional model or linear operations. Business models with a Circular Economy framework lay emphasis on resource efficiency and a prolonged life, as compared to merely being consumed and disposed in a linear model. The concept of ownership is altered as customers are not necessarily buyers, but instead have access to a service for the use of a product which delivers the function. Customers are placed within a closed loop system, such that they are positioned to be able to return or cycle the used product back into the production process. Money remains the central medium of exchange in CBMs too. However, the market for this interaction is slightly different because the manufacturer plays the role of consumers at the end of product life. This requires a different approach to supply chains and establishing collaboration.

Short *et al.* (2012) lay out a broader category called ‘sustainable business models’ with several types of business model archetypes. For example, ‘Create value from waste’, ‘Deliver functionality, rather than ownership’ and ‘Maximise material and energy efficiency’ etc. These archetypes relate closely with the CE based business models. The overall aim of a CBM is also to turn waste streams into feed stocks for other products and encourage sufficiency. Therefore it is safe to classify a CBM under this category of ‘sustainable business models’.

Lacy and Rutqvist (2015) have created a list of circular economy based business models:

1. Circular supply chain
2. Recovery and recycling
3. Product life extension
4. Sharing platform
5. Product as a service

A circular supply chain is where resources are designed for degeneration and the nutrients in the chain are renewable or completely recyclable. The input are ideally biodegradable and examples of products in circular supply chain are renewable energy, bio-based and recyclable materials. The second one is ‘Recycling and Recovery’, where the resources in the company's production output and discarded products are recaptured and reused. The idea is to create value multiple times throughout a material's life. The third model is ‘product life extension’ where products are built to last. In a sharing platform, the key aim is to boost the productivity of a product and connect owners with other individuals or companies that would like to use its function. Lastly, ‘product as a service’ concept advocates utilizing the performance of the product, rather than

focusing on its ownership. Based on this understanding of CBMs, the researcher focuses on business model evaluation approaches in the following sections (Lacy and Rutqvist 2015).

2.2 A Review of Business Model Evaluation Approaches

Different evaluation frameworks for traditional business models are found across literature. It is important to understand what and how they attempt to evaluate business models, in order to highlight the need for a value based evaluation tool for CBMs. Some of the commonly found approaches for building evaluation frameworks for business models and understanding value creation were studied by the researcher, which are discussed briefly in the following section. Studying the evaluation frameworks and approaches has informed the researcher's method of creating an evaluation scheme for value based evaluation of CBMs.

2.2.1 A multi-stakeholder approach

Balloon *et al.* (2007) propose a framework of five steps to evaluate a business model with a dynamic, multi-domain and multi-stakeholder approach. It provides a systematic and step-by-step approach to evaluate their business models (Alexa 2014). The first step is to look at the objectives and scope under which it is decided which services or markets will be dealt with. Case study selection is also done in this step. The sources of information can range from client discussion to desk research. The result of the first step is to study the implementation plan. Following this, the design of the BM is analysed for value proposition, value network, its functional architecture and financial model to come up with BM descriptions. It can be validated with interviews with representatives of the companies. Thirdly, market developments are tracked in order to aggregate the BM analysis to the level of such developments. Desk research is the main source of information. Following this, the business model is aggregated to the level of innovation topics once again, desk research is utilized to come up with this list of innovation topics. Further, interviews are done with representatives to identify the perceived bottlenecks in the BM framework. The key question is: what and where are the bottlenecks? This gives an overview of bottlenecks and they are then linked to the existing BM. (Poel *et al.* 2007).

A multi-stakeholder approach is very important in order to develop a well-rounded evaluation tool that accounts for diverse dimensions of value creation. Inspired by this method, the researcher has attempted to create a tool, which encompasses as many dimensions as possible. Additionally, case studies and interviews with relevant representatives were done to validate the model, as the involvement of industry experts is a means of soliciting conventional wisdom.

2.2.2 Critical success factors based evaluation

Horsti (2007) created an evaluation tool for e-business models based on critical success factors gathered from a literature review on management related research and empirical studies. Horsti also gives quantitative values to individual success factors and uses a threshold. Success factors are not ranked according to their importance, but presented as a simple list and are categorized under business model components. However, the instrument does not present the causal inter-relationships between the different business model elements.

Such a way to identify the important factors can be helpful in shortlisting only the key metrics for consideration. This tool has informed the researcher's method of creating a scoring matrix for value based evaluation of CBMs.

2.2.3 Indicator based analysis

An indicator based analysis for business models was put forward by Mourtsen *et al.* (2003). The set of indicators include firstly, 'resource indicators' which is a portfolio of resources in the

company, i.e. what is created and is in stock of the company's resources. Activity indicators look into what is being done at the company, in order to upgrade its resources; i.e. activities initiated to upgrade, strengthen or develop its resource portfolio. The set of 'Effects indicators' reflects the consequences or the total effects of the company development and use of resources. The evaluation knowledge sources are the employees, customers, processes and technologies as shown in the Figure 2-2.

EVALUATION CRITERIA				
K N O W L E D G E S O U R C E S		EFFECTS	ACTIVITIES	RESOURCES
	EMPLOYEES			
	CUSTOMERS			
	PROCESSES			
	TECHNOLOGIES			

Figure 2-2 Analytical Model by Mouritsen et al. 2003.
(Source: Alexa, 2014, adapted by author)

This type of business model analysis helps this research to develop the evaluation criteria and metrics for each value dimension.

2.2.4 Evaluation based on performance indicators

Morris et al. (2006) suggested seven performance indicators for evaluating the overall business model from an entrepreneurial perspective. The indicators include: uniqueness, profit potential, internal consistency, comprehensiveness, imitability, robustness, adaptability and sustainability. Their model represents a strategic framework for conceptualizing a value-based venture and allows the user to design, describe, categorize, critique, and analyse a business model. This approach has been useful in designing the value based evaluation framework for the researcher.

2.2.5 NICE framework or eValue framework: value-centred theme

As Amit and Zott (2001) observe, that the appropriate unit of analysis for scholars interested in value creation spans the company's and the industries' boundaries. Prior frameworks used in isolation cannot sufficiently address questions about total value creation. Based on a sample of 150 companies, they propose four potential sources of value creation through business models: (1) novelty, (2) lock-in, (3) complementarities, and (4) efficiency. These value drivers can be mutually reinforcing; that is, the presence of each value driver can enhance the effectiveness of any other value driver. This framework, 'NICE' was created by Amit and Zott to examine the value-creating potential of various business models from four sources of value.

They also put forward three perspectives or 'design elements' to approach the business evaluation process: content, structure and governance. Novelty refers to the possibility to adopt new activities (content), to manage and connect them in new ways (structure), and to define new ways of managing them (governance). Lock-in is about finding new ways to have their stakeholders locked into the business by managing a switching cost that prevents the stakeholders from trying other products or market offerings. Then, complementarities is the 'bundle of goods' that can provide

more value than the separate value of each single good in total. Finally, efficiency refers to transaction efficiency in terms of reduced costs.

This model informs this thesis about the approach to develop 'key questions', to understand each source of value dimension for the development of a value-evaluation tool.

2.2.6 Competitor based analysis

Afuah and Tucci (2003) put forward an evaluation method which has both a quantitative and a qualitative component. However, its utility is limited because it is based on comparing the business model with those of its competitors. 'Sustainability' is assessed by a benchmark question, such as "Has the company been able to maintain or extend its lead in its industry?" The company would need to have access to detailed information about its competitors in order to assess itself. As discussed before, CBMs may actually benefit from recognition of the circular concept among its competitors. Afuah and Tucci (2003) take a value-oriented approach to constructing business models. They propose together 3 levels of measures, where level one is about the 'Profitability Measures' which captures the earnings and cash flows. The next level, is the 'Profitability Predictor Measures': profit margins, revenue market share and revenue growth. Finally, at level 3 'Business Model Component Attribute Measures' are found, which are essentially, benchmark questions provided for each business model component.

This model helps the research in framing appropriate questions to evaluate the value dimension in a larger setting, where other industry players and the CE community are also considered.

2.2.7 SWOT analysis

One of the most known and popular frameworks for business models is the Business Model Canvas developed by Osterwalder (2004). Osterwalder describes the rationale of business models as being "how an organisation creates, delivers, and captures economic, social, and other forms of values". It covers a broad range of informal and formal descriptions of the value and how a business model seeks to characterize both value creation and value capture. Osterwalder & Pigneur (2010) outline two types of assessments. Firstly, through their well-known Business Model Canvas (BMC), they provide an assessment and visualization tool. Along with it, a checklist for assessing a business model's strengths, weaknesses, opportunities, and threats (SWOT) and to help evaluate each of the Building Blocks. Both complementary activities are important for the actual evaluation of the company's business model. However, 'Value Proposition' is the central pillar around which all the other elements revolve.

SWOT analysis for a business model helps the company to identify the Strengths, Weaknesses, Opportunities and Threats for each individual business model element. Such tools based on SWOT analysis help create an understanding for the researchers, on how to implement the positive factors and how to control the negative ones. It informs the research on developing a scoring method for each value metric.

2.2.8 A conceptual framework for CE

Lewandowski (2016) put together a conceptual framework in the form of a Circular Business Model Canvas, which extended to the circular economy version of the BMC developed by Osterwalder and Pigneur (2010). In addition to the 9 elements of the BMC, two more elements are factored into this model: 'Take-Back system' and 'Adoption factors'. The design of the take-back management system includes the channels and customer relations related to them. Reverse logistics may require different partners, channels and customer relations. Adoption factors are the internal and external factors affecting adaptation of a business model to the circular economy principles. Factors signalling transition towards circular business model and are supported by

various organizational capabilities and external factors (technological, political, sociocultural, and economic issues). The circular business model canvas combines the sustainability principles from the 'ReSolve framework' (Schulze, 2016) and business model components. One major disadvantage is that its real applicability has yet to be empirically verified.

2.2.9 A value mapping tool

Bocken *et al.* (2015) created a tool to assist companies in embedding sustainability into the core of the business model through an improved value proposition. It supports an iterative process for analysing sustainable value creation opportunities from a multi-stakeholder perspective. The tool introduces three forms of value (value captured, missed/destroyed or wasted, and opportunity) and four major stakeholder groups (environment, society, customer, and network actors). This tool is a well-developed and recent tool for sustainable business model and has helped the researcher better understand a 'sustainability focused' assessment of business models. This model also informs the researcher in selection of appropriate value dimensions to cover a wider scope.

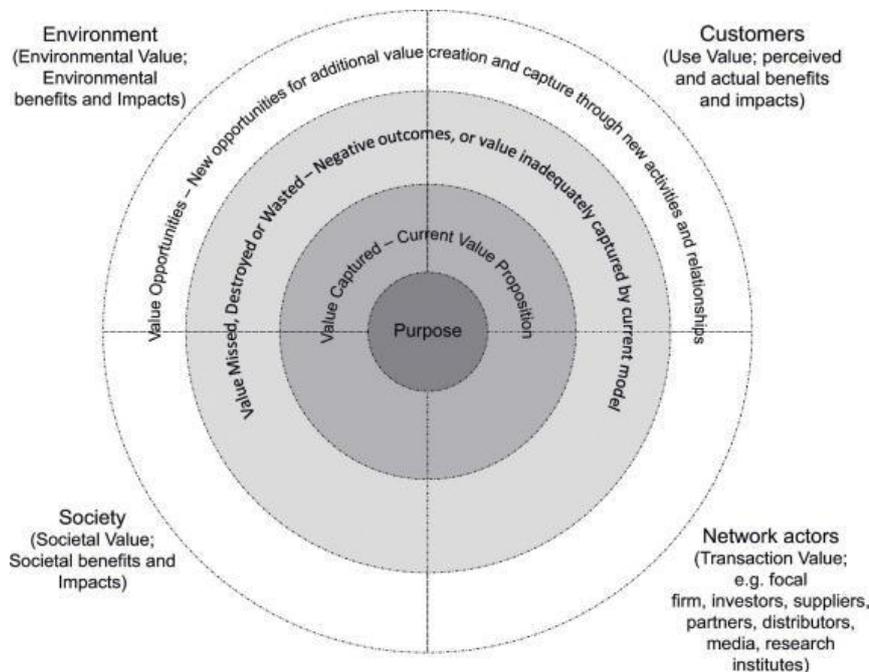


Figure 2-3 Bocken *et al.*'s Value Mapping Tool (Source: Bocken *et al.* 2015)

Summary: Need for value based evaluation tool

To summarize, it is evident that the evaluation of business models has not been sufficiently addressed such that it can be applied to a CBM. However, there is a rising trend in literature to discuss business models and their evaluation process (Alexa, 2014). With the dynamic business environment and introduction of new policies, there is a constant need for new instruments for business developers to assess their performance and adjust their business model in order to become more competitive. Current research on business models is a rather new topic and most research focusses traditional models and therefore not necessarily suitable to business models within the Circular Economy. The next section further describes the concept of value and identifies value dimensions, based on which CBMs can be assessed.

2.3 The Concept of 'Value' in Circular Business Models

The term value has numerous meanings and it can be applied in several contexts. Value creation consists of managing market offerings, new offering realisations, and managing business channels (Anderson and Narus, 2004). Knowledge about customers, especially customer oriented value creation processes in particular, has become an important area in the academic research due to focus shifting to the 'Service-Dominant logic' for marketing and the actual customer value in-use. According to this logic, the customer creates value with suppliers' goods or services. Suppliers aim build value into goods and services as a part of the product development and production processes (Vedel *et al.*, 2012). In the broader field of management, authors present a variance in the 'targets', for which new value is being created and in the potential sources or creators of value. It may be for business owners, stakeholders, employees, or customers (Lepak *et al* 2007).

There is a strong agreement to the relevance of value creation within organizations, found in the existing business model literature. The creation of value is managed through a value stream, which has been referred to as the supply chain or the value chain (Dumond, 2000). Value creation requires a connection between producers and customers, and leads to improvement of performance of the product or the service (Setijono and Sandberg, 2005). Value creation involves active customer participation in product or service production. When cumulative inputs can be stored, aggregated, and made available to other customers, then value can be created.

Lepak *et al.* (2007) identify some common problems that make the concept of value and value creation, a complex issue. Plurality is found first in 'targets of value creation' and secondly in the 'sources of value creation'. Additionally, the process of value creation is often confused with 'value capture' or 'retention'. For example, although an individual may create value by developing a new way to perform a particular task, other parties or stakeholders such as organizations or the society, may benefit in other ways from it, than the creator (Lepak *et al.*, 2007). This is very relevant to the concept of CBMs, where the actions of a company may affect consumers and the society at large in multiple ways.

Value can be classified into direct and indirect components according to Simpson *et al* (2001). Direct value is derived from those activities that can be expressed in a monetary sense, including objective, directly quantifiable benefits, which result in value through a decrease in costs or increased in sales. While indirect value is associated with the less tangible aspects such as communication, trust, and commitment in a channel relationship.

The value streams for an organization influence the viability of business and revenue generation. Hamel (2000) argues that value creation occurs within a value network, which include suppliers, partners, distribution channels, and coalitions that extend the company's own resources. Chesbrough and Rosenbloom (2002) state that a "business model creates value by defining a series of activities from raw materials through to consumers that will yield a new product or service with value being added throughout the various activities". Business model evaluation describes what value any stakeholder receives from the business. The value generated by implementing the circular economy principles will depend on a case-by-case basis and resource use. According to the Ellen MacArthur Foundation (2012), value creation in can occur in 4 ways as illustrated in Fig. 2-3:

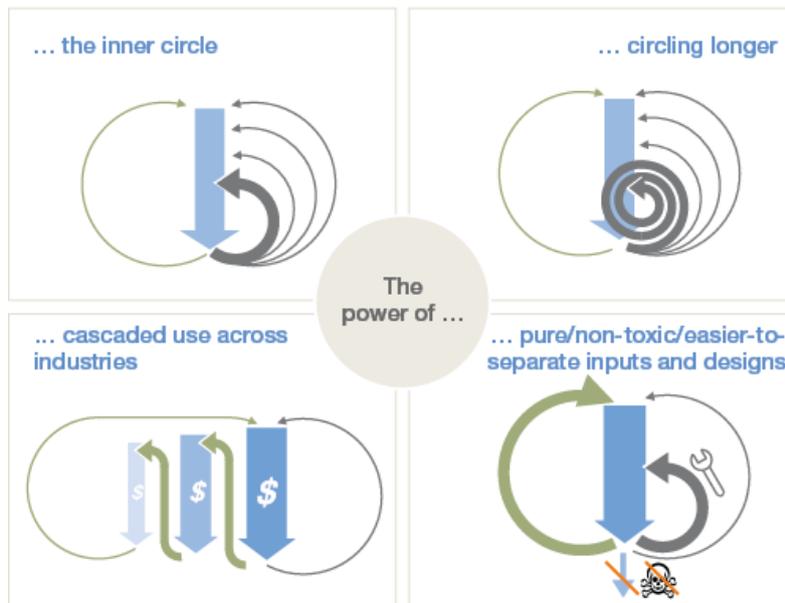


Figure 2-4 Value creation in a circular Economy. Source: Ellen MacArthur Foundation (2012)

1. The power of the inner circle: Greater savings or potential benefits from the hidden cost (e.g. materials, labour, energy and capital) are kept in the products. Strategies for maintenance and repair that preserve products and resources in a tighter loop to the original product, will create the most value.
2. The power of circling longer: Value is created from the ability of assets to maintain the same use for a long period by multiple users, avoiding the need of raw materials to produce new assets, reuse of equipment and through sale in second hand shops.
3. The power of cascaded use across industries: Resources at the end of life of products, becomes “nutrients” for a system, instead of waste. Value is created by avoiding the need of raw material in the new system. For example, using textiles waste in the furniture sector helps reduce use of virgin raw material by- cascading end-of-life products from other sectors.
4. “The power of pure inputs”: Maintaining materials as pure as possible during the lifecycle of the products they are used in or making components easy to disassembly at their end of life. Facilitates reuse, repair and recycling of materials and preserves its high quality.

We need to distance ourselves from material recycling as the only way to close resource loops, if a CE is to be implemented (Stahel, 2010). A CE is envisioned to operate on a very low speed, in terms of material recycling, when compared to short-lived goods. Recycling, in turn leads to faster circular flows and loss of material and energy. Furthermore, according to the ‘Value Hill’ concept (Fig. 2-5), value is added while the product moves “uphill” and circular strategies help keep the product at its highest value, for as long as possible. In a linear setting, value is added by extracting resources from the earth, refining them, manufacturing, then assembling into products and distributing to consumers. However, after the consumer uses the product, its value goes downhill. Alternatively, in a CBM, value is added in every step of the ‘pre-use phase’ (mining, production, distribution etc.) and the product moves uphill. The second phase is the ‘use phase and is represented by the top of the hill, where the value of a product is at its highest. The final phase is the ‘post-use’ phase where, value can be retained by feeding the product or its components back into a previous phase, in a CBM. This could be done by providing second hand products or reusing

materials directly in the use phase. Overall, products are designed to be long lasting and are suitable for maintenance and repair. This slows down resource loops (Bocken *et al.*, 2016).

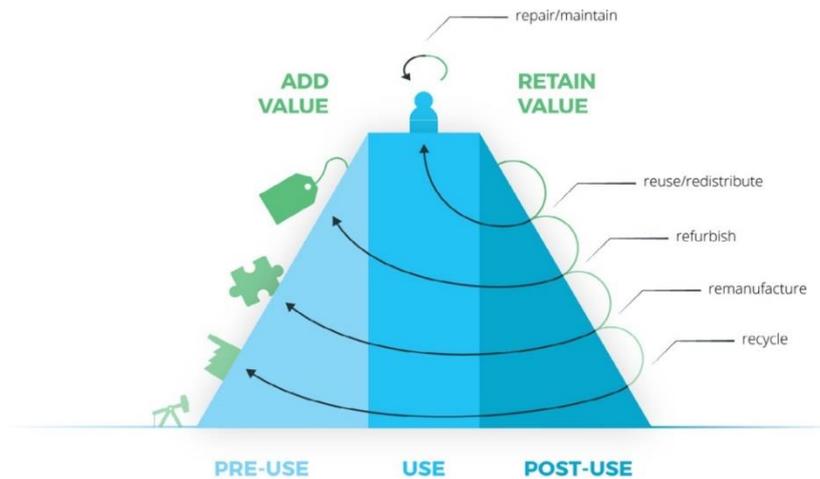


Figure 2-5 The Value Hill: A Circular Business Strategy Tool (source: Ellen MacArthur Foundation)

2.3.1 Value Dimensions

To create a circular business, a holistic view of the value proposition is required. Different ‘dimension of value creation’ have been addressed in the available literature. The upcoming sections provide an overview on the dimensions discussed in literature that can be considered as key dimensions for evaluating the value creation in CBMs.

A prerequisite to any business model is that it must be economically sustainable. According to Schaltegger *et al.* (2011) companies must be able to capture economic value, while generating environmental and social value. Therefore, the first identified value dimension is ‘economic value’. As established before, a CBM is essentially a sustainable business model, which ‘aims to go beyond delivering economic value and include a consideration of other forms of value for a broader range of stakeholders’ (Bocken *et al.* 2015). They have been defined as business models that create competitive advantage through superior customer value while contributing to sustainable development of the company and society (Lüdeke-Freund, 2010). Therefore, the next identified dimension of value creation in a business model is ‘customer value’. Additionally, it must include benefits and impacts on other stakeholders besides customers and the focal company and address concerns to the society and the environment. This makes ‘environmental value’ the next identified value dimension.

Brandenburger and Stuart (1996) observe how any company has competitors, multiple suppliers etc. Therefore, in a traditional market setting, for a company to have positive benefits, it must be different from its competitors. However, according to Lee and Casalegno (2010), due to the interconnectedness between sustainability initiatives, business models may simultaneously compete and cooperate. The success of a business model for sustainability and circularity thus depends not only on its own performance level, but also on the success of other similar business models based on circularity and sharing concepts, and the acceptance of change in ownership methods by consumers in the society (Lee and Casalegno, 2010). Thus there is need for another dimension of value capture - ‘network value’.

In a CBM, various opportunities for information capture exist throughout the value chain. Information exchange through networks can be capitalized upon and monetized, by using

Information technology to optimize the existing processing activities in real time, and providing performance information to suppliers etc. (Roos, 2014). New information technology tools can be used to enable information flow by improved information collection (Schenkel *et al.* 2015) in CBMs. Therefore, the final dimension for the purpose of this research is 'Information value'.

Based on the review above the evaluation scheme developed in this thesis will consider value creation under five categories:

- Economic value
- Environmental value
- Customer value
- Network value
- Information value

The next section discusses the possible metrics that can be used to assess the creation of value within circular business models in further detail. Each metric is developed taking into consideration the available evaluation methods found in literature. Ideas from the previously found analysis frameworks are used to develop the questions to arrive at the possible metric for which a company's value creation potential can be assessed.

In addition to the well known economic and customer value dimensions, others like environmental, network and information value are considered to better balance value creation for all stakeholders. Linder *et al.* (2015) define circularity at the product level as the "fraction of a product that comes from used products (i.e., from closed- or open-loop cycles)". They present a product-level metric, which is specific to measuring the degree of recirculated direct material in the product weighted by direct costs, including material, and labour costs. However, prices and material costs fluctuate quite rapidly.

The metrics for an evaluation scheme, must be chosen with a practical sense, and should be based on information which the industry already collects for other reporting and monitoring purposes. Additionally, a metric must balance the accounting based only on energy efficiency with materials efficiency, to be truly aligned with CE principles. At present, the general tendency is to measure efficiency by energy measurement alone. Indicators must be directly linked to support policy objectives and help drive change towards those policies (Cayzer *et al.* 2017). An overview of different value dimensions and chosen metrics for value creation in CBMs is presented in the following section.

2.4 Value Metrics for Circular Business Model Evaluation

2.4.1 Economic value

A business model describes the basis and the sources of income for the company. Srivastava (2007) points out that with the implementation of product recovery options, companies can retrieve the material content of used and non-functioning products and to reclaim value at the end of their useful life. According to Schenkel *et al.*'s (2015) work, economic value or company value can be divided into three categories: (1) cost reduction; (2) additional revenue generation; and (3) risk reduction. The recovery of returned products helps in achieving savings in material-, production-, operation-, and logistics costs. This is because critical resources, energy and materials are

conserved through closed loop operations, which helps companies in reducing costs and making profits. Reduced lead times are beneficial for improving the process efficiency, resulting in increased savings. Opportunities for revenue generation result from various sources, which include post sale services. A reverse logistics program can be a unique offering and can provide a means of gaining market advantage. This new marketing opportunity builds a loyal customer base and attracts new ones, thus increasing sales. Fluctuating commodity prices are a risk to the company, which can be reduced by recovery of used materials. Additionally, manufacturers can exert control over the secondary market by recovering parts and products (Schenkel *et al.* 2015).

Companies can actively tap into the new “green markets” which target a set of conscious customers. Customers and suppliers can display their environmental consciousness, as the companies can assist in this process by providing them the required information. This could lead to enhanced ‘brand value’. Additional revenue streams from “next life markets” according to IIMSA. Possible metrics for understanding the value creation in CBM are followed by a key question; how does the CBM create value eventually lead to monetary benefits?

Table 2-1 Metrics for Economic Value

<u>EV1: Revenue generation by Access to new markets</u>	Additional revenue generation due to CBM. Benefits derived from tapping into the new “green markets” and “next life markets”
<u>EV2: Cost savings</u>	Difference in expenditure due to recovery of returned products; creates savings in material-, production, operation-, and logistic costs
<u>EV 3: Risk Reduction</u>	Reduced risk of resource scarcity and more resilient against volatile market prices + changing law. Has secure supply due to longer term contracts and network of suppliers contributed to efficiency?
<u>EV 4: Monetary benefits from policy/tax benefits of 'circular economy' initiatives</u>	Direct benefits from supportive policies that resulted in monetary gains
<u>EV 5: Reduced waste disposal costs</u>	Waste stream is directed away from disposal site; monetary benefits from not having to pay for transport of waste
<u>EV 6: Corporate image “leader in the field”</u>	Brand image to attract profit and customers

Source: created by author

2.4.2 Customer Value

Customers are a key to any business. Bounds *et al.* (1994) define customer value as “a combination of benefits and sacrifices when a customer uses a service or product to meet certain needs”. Many factors are influencing the end states which a customer values such as their macro environment (politics, technology, and culture), customer characteristics (psychosocial or lifestyle), the use

process (i.e. find, acquire, transport, store, use, dispose, and stop), and the relationships with supplier organisations (Bounds *et al.*, 1994).

Customer value (CV), as argued by Woodruff *et al.*, takes the organization's customers at the centre and considers what they want and believe that they get from buying and using a seller's product. Customer value is something perceived by customers, rather than objectively determined by a seller and these perceptions could involve trade-offs between what the customer actually receives (such as quality, benefits, utilities) and what the customer sacrifices to acquire/use a product (e.g. a monetary price). Woodruff *et al.* (1997) thus put forward a more customer centric definition of CV as “a customer’s perceived preference for and evaluation of those product attributes, attribute performances, and consequences arising from use that facilitate achieving the customer's goals and purposes in use situations”. This is a preliminary basis for the ‘customer value hierarchy’, which outlines two types of customer value - desired value and received value (Woodruff *et al.*, 1997).

As suggested by Anderson *et al.* the key question is: How do these value elements compare to the next best alternative for the customer. They outline the building blocks of a successful customer value into 3 major types:

- Points of parity: Same performance or functionality as the products alternative
- Points of difference: factors that make it superior or inferior
- Points of contention: factors which the supplier and customer disagree upon with respect to its effect on the products performance.

Çorbacıođlu and Laan (2013) investigate how value is delivered to the customer through a quality framework for Closed Loop Supply Chains (CLSCs). According to Bounds *et al.*'s argument the customer must be the focal point of the ‘quality’ approach and to provide ‘quality’ as a value, the product must conform to customer needs in every way. This is important in closed loop business models, as products returned are impacted by an overall quality. A product which is returned by a customer, ideally fails to deliver any more value to the customer. Quality of the returned product is determined carefully.

Another set of authors define customer value as the “emotional bond established between a customer and a producer after the customer has used a salient product or service produced by that supplier and found the product to provide an added value” (Butz and Goodstein 1996). Therefore, one of the indicators of customer value could be ‘customer trust & support’ towards the company which translates into economic gains. One can easily see that the intangible relationship value created by such a product offering, creates a ‘brand reputation’ or a sense of security for the customers.

Further, Schenkel *et al* narrow down three mechanisms to achieve customer value in CLSCs – a. serving the customer better, b. offering improved product characteristics and c. generating a good corporate image. After-sales services, such as product return and maintenance offerings, can be improved for better service to customers. Finding new ways of providing service and making it feasible or accessible and lower product prices due to reuse and substitution of certain raw materials can be attractive for customers. This gives some identified avenues for value creation in CBMs, listed as metrics for evaluation below.

Table 2-2 Metrics for customer value

<u>CV1: Reduced Lifecycle Costs</u>	Reduced maintenance cost and/or disposal cost for the customer (E.g. design for durability or design for X)
<u>CV2: Customer satisfaction and loyalty/ 'relationship value'</u>	Value derived from an emotional bond created to the brand - valuable to retain customers
<u>CV3: Pricing</u>	Savings company offers for customer in comparison to next best alternative at the time of purchase. (Ideally a lowered price paid for product vs quality)
<u>CV 4: Availability of after-sales services</u>	Post sale services to address the needs of customers
<u>CV 5: Ease of access for the customer/ access to functionality</u>	Options explored to make product or service most accessible to customers
<u>CV 6: Providing 'choice' / alternatives to customers</u>	Enabled customers to choose what is ethical or improve their ecological footprint

Source: created by author

2.4.3 Environmental value

Protecting the environment is one value that can easily be identified as a source of value creation through CBMs. By enabling a change in material flows (by actions such as substituting virgin materials, longer life of products and materials, and operating recycling/refurbishment), circular business models have the potential to enhance resource efficiency and lower the environmental burden. Apart from the economic and customer value, the value generation sources in circular businesses can include the environmental benefits achieved.

Different means of assessment have been suggested in literature to assess how this goal is actually achieved and environmental value is generated. These developed assessments are conducted at different levels. Lewandowski's proposed criteria for evaluation of the business models, the three key CE principles (EMF, 2015) can have several macro level measurements or indicators, such as net value add (NVA) for the 'Principle of Preservation and Enhancing Natural Capital' or other GDP (Gross Domestic Product) related metrics for assessing how it aligns with the 'Principle of optimization of resource yields'. 'Principle of fostering system effectiveness' can be measured along a primary metric of cost of land, air, water, and noise pollution.

However, macro level measurement such as NVA or GDP related indicators are too complex to measure for the purpose of this evaluation scheme. Hence, only micro level or company level criteria will be considered for this research. Criteria for assessing value generation of circular business models must be adjusted to the level of implementation. At the company level these can be simply measuring the 'reduced ecological footprint', 'direct financial value gained through

recovery of materials and assets’, and top line ‘growth through new business models’. Other measurement criteria are ‘revenue directly from repairs, reused parts, refurbished products, recycled material used product value after period X, reduced ecological footprint, times of reuse of resource, technical lifetime value of by-products, by-products used, separable resources, and lesser use of toxic materials and reduced volumes used. Today, environmental logistics are necessary to companies because of the opportunities that have opened up in “green” markets. Companies can cope with the increased consumer demand for “green” products, if they enable the reuse or a more efficient use of products that would otherwise be disposed. Risk management helps avoid fines and clean-up costs, which further reduce legal costs. It is an aid to help express an environmental corporate image. Additionally, the company helps the society to realise its broader environmental goals established by the global community. These could be measured in terms of ‘Energy efficiency’ and ‘Sustainable growth parameters’ relating to sustainable development goals. This adds to helping the nations reach their environmental objectives.

The key question chosen to determine the value elements under environmental value dimension is: What opportunities are available at the company level for creating environmental value? There are two sub questions within environmental value elements. Capturing value from the change in material flows can be classified under ‘value in operations’ (EVO) while elements capturing value from being risk free & compliant can be seen as ‘value in compliance’ (EVC).

Table 2-3 Metrics for environmental value

<u>EVO 1: Substitution of virgin material</u>	The extent to which the primary product offered is made from secondary input
<u>EVO 2: Extent of reuse of a resource</u>	Number of times of reuse of components
<u>EVO 3: Decreased used of toxic materials</u>	Decreased used of toxic materials reduces impact on public health
<u>EVO 4: Waste minimization & less waste to dump</u>	Environmental + economic gains from spending less on handling waste
<u>EVO 5: Energy use reduction</u>	Environmental gains from spending less on energy or using renewable energy
<u>EVC 1: Integration of Eco-design thinking</u>	Attainment of company’s own environmental goals
<u>EVC 2: Green Certifications</u>	Reduced impacts and meeting national sustainability goals

Source: created by author

2.4.4 Network value

Most companies today interact with a complex network of primary and secondary stakeholders, which has direct influence on the value proposition of a company’s business model. Haslam *et al.* (2015) thus argue that stakeholder relations affect the financial viability of a company’s business model value proposition. According to Kothandaraman and Wilson (2001):

The drive to create value requires the assembling of core capabilities beyond the capabilities resident within the company. Putting together a network of firms to build the set of capabilities necessary to build a market offering that delivers high value to the customer becomes a major strategic thrust of the company. One of the main ways that companies assemble this network of companies is through developing strong relationships with key partners who can add value to the market offering.

Meeting the needs of buyers often seems sufficient for creating value. In a traditional market setting, where each company has competitors, suppliers and buyers, to have a positive added value it must be “different” (Brandenburger and Stuart 1996). However, according to Lee and Casalegno (2010), due to the interconnectedness between sustainability initiatives, business models simultaneously compete and as well as cooperate. The success of a business model for sustainability and circularity will depend not only on its own performance level but is influenced by the success of other related business models and the acceptance of change in ownership methods by consumers in the society (Lee and Casalegno, 2010).

‘Expected relationship value’ is a construct, put forward by Hogan (2001), about managing collaborative business-to-business relationships demands and understanding how relationships create value for the company. It is good to understand the concept of Industrial Symbiosis’, for the network value dimension. According to Chertow (2000) is: ‘engaging traditionally separate entities in a collective approach to competitive advantage involving physical exchange of materials, energy, water, and by-products’. This concept has been further defined to include knowledge exchange and value creation, by Mirata and Emtairah (2005) as, “a collection of long-term, symbiotic relationships between and among regional activities involving physical exchanges or materials and energy carriers as well as the exchange of knowledge, human or technical resources, concurrently providing environmental and competitive benefits”.

Collaboration creates additional economic and environmental value by increased monetary value of under-utilised or wasted resources and reduces waste output to the environment. It facilitates the development of efficient, shared solutions and encourages knowledge exchange and innovation. To improve the popularity of such business models, efforts are needed to evaluate the value generated in interconnected business models (Mirata and Emtairah, 2005). Industrial symbiosis potential must be mapped to find possibilities for useful exchanges and as a means for value creation. The key question here is: Is value captured from improved networks that are inherent to CBMs?

Table 2-4 Metrics for network value

<p>NV1: Inter-firm network; To acquire additional resources and capabilities</p>	<p>Strategic partnerships and cooperation with other businesses in value chain to strengthen the entire chain, making partners and focal company, more resilient. Collaborative ventures in action that yielded measurable positive results</p>
<p>NV 2: Intra firm network</p>	<p>Stronger vertical connections within the company due to closed loop cycling benefitting higher efficiency in day to day operations</p>
<p>NV 3: Success and Popularity Of Competitors in the Industry</p>	<p>General popularity of the CBM idea in the market aiding demand for the company's product or service? Access sought to a 'CE network' to add possibilities of symbiosis/exchange Have connections to larger scale CE initiatives and consultancies with access to expertise, helped you grow significantly?</p>

Source: created by author

2.4.5 Information value

According to Schenkel *et al.* (2015) 'Information value' can be seen as an enhancer of the other types of value. Improved processes and product design through knowledge exchange can in turn increase customer, environmental and economic value creation and strengthen networks. Information technologies can be used to for improved information collection (Schenkel *et al.* 2015). Opportunities for improving customer services can be identified. Information exchange through ICT networks can be capitalized upon in a CBM, as Information technology and new materials have opened previously unknown avenues for value creation, including the ability to track and optimize the use of resources along the supply chains (Preston, 2012). A wide range of solutions for energy and resource use control, smart grids, cloud computing and online shopping are available. Furthermore, opportunities for information capture exist throughout the process. The captured information be used for optimising the production activities in real time, by providing performance information to suppliers (Roos, 2014). Thus, a possible metric can be "use of ICT tools for real time feedback" to improve the process and achieve resource efficiency.

Further, product improvement for circularity can be achieved. Collaborative approaches are also emerging in the design and production of products, challenging old manufacturing practices (Preston, 2012). This can be seen as result of enhanced networks due to information exchange. The key question developed to further understand this dimension is 'if flow of information, such as availability of feedback and exchange of knowledge has helped create value in the company's CBM?'

Table 2-5 Metrics for information value

<u>IV 1: Overall increase economic value</u>	Has increased availability of information directly contributed to overall economic gains for the company?
<u>IV 2: Information exchange platform</u>	CE based business make use of social media channels and ICT innovation to create platforms for sharing and selling for enhanced network value
<u>IV 3: Input of consumer behaviour related feedback for product improvement</u>	Consumer behaviour related feedback incorporated into service and product quality to enhance customer value?
<u>IV 4: Real time knowledge on product performance</u>	Product life cycle being better monitored along its supply chain to make operations resource efficient and enable better life cycle management for increased environmental value

Source: created by author

2.5 Presentation of Evaluation Scheme for Circular Business Models

This section presents the first part of the evaluation scheme i.e. the value metric checklist, developed as a result of the literature analysis presented above. The information on scoring and operationalisation of this value checklist is provided in the subsequent sections.

Table 2-6 Value Metric Checklist.

VALUE DIMENSION	METRIC CODE	METRIC	SCORE
ECONOMIC	EV1	Revenue generation by Access to new market	
	EV2	Cost savings	
	EV3	Risk Reduction	
	EV4	Monetary Benefits from Policies/Tax Benefits Of 'Circular Economy' Initiatives	
	EV5	EV 5: Reduced waste disposal costs	
	EV6	Corporate image "leader in the field"	
CUSTOMER	CV1	Reduced Lifecycle Costs	
	CV2	Customer satisfaction and loyalty/ 'relationship value	
	CV13	Pricing	
	CV4	Availability of After-Sales Services	
	CV5	Ease of access for the Customer/ Access to functionality	
	CV6	Providing a 'choice' or Alternatives to Customers	
ENVIRONMENTAL	EVO1	Substitution of virgin material	
	EVO2	Extent of reuse of a resource	
	EVO3	Decreased used of Toxic Materials	
	EVO4	Waste minimization & Less waste to dump	
	EVO5	Energy Use Reduction	
	EVC1	Integration of Eco-design thinking	
	EVC2	Green Certifications	
NETWORK	NV1	Inter-firm network	
	NV2	Intra firm network	
	NV3	Success and Popularity of Competitors	
INFORMATION	IV1	overall increase economic value	
	IV2	Information Exchange Platform	
	IV3	Consumer Behaviour Related Feedback for Product Improvement	
	IV4	Real Time Knowledge on Product Performance	

Source: Created by author

3 Methodology

This section outlines the methodology used to answer each research question in order to realize the research objectives. Figure 3-1 illustrates the step-wise research approach. Given the limited knowledge available on value generation in CBMs found in existing academic literature, an exploratory literature analysis was considered as the right approach to address the first research question. Relevant sources of value generation were identified which were termed as ‘value dimensions’. Following a review of the available evaluation tools for business models in general, this thesis then explores possible metrics under each dimension of value creation in CBMs. As the goal of the thesis is to create an evaluation scheme, as a first step a value metric checklist is prepared. Thereafter a suitable scoring method is selected (explained in section 3.3)

Together with the secondary data from a literature analysis, primary data on the selected case companies is collected through interviews with the companies’ representatives. The insights offered on each value metric are then scored by the researcher to operationalize the developed scheme. The final findings are represented by means of a visual component of this scheme, termed as the ‘Value Circle’.

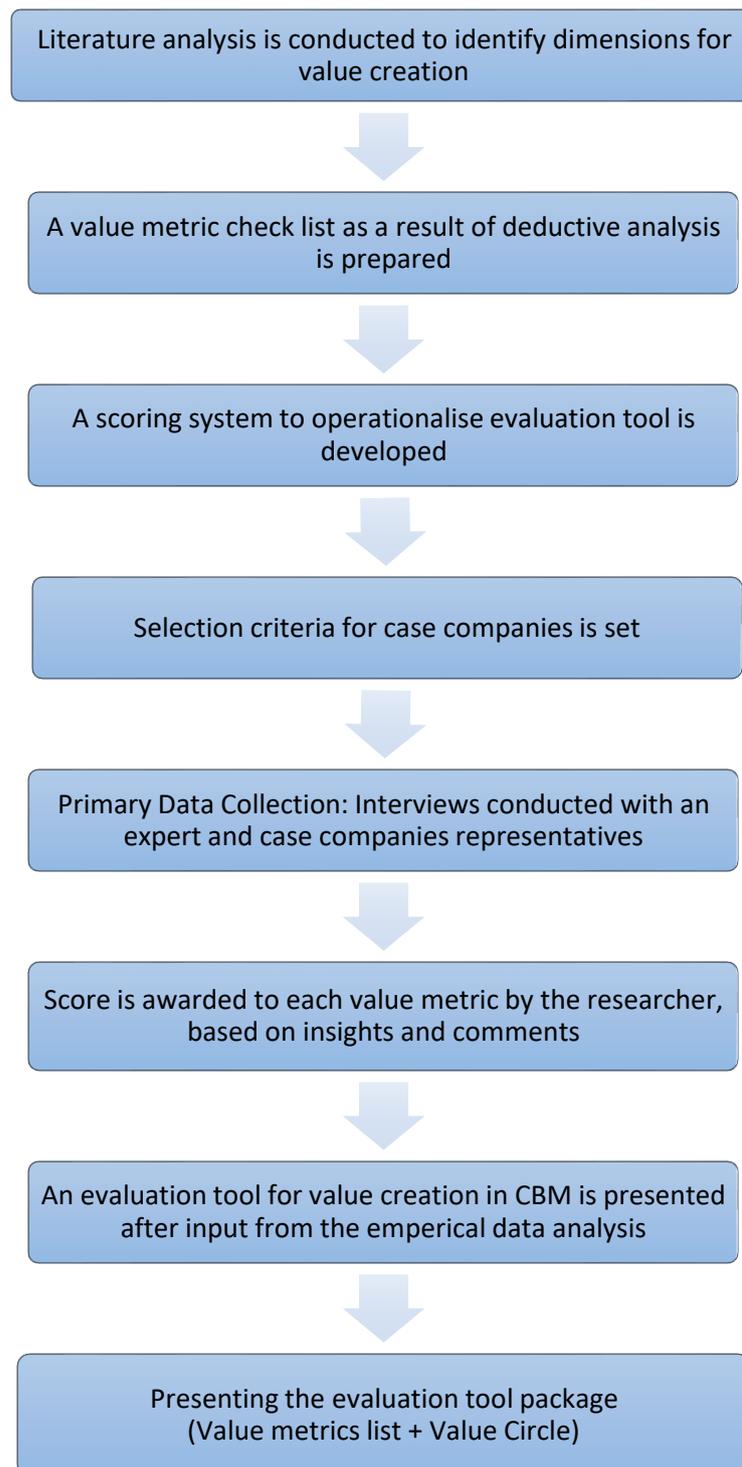


Figure 3-1 Research Methodology flow chart by author

3.1 Literature review and analysis

The literature review was conducted as follows. First, a list of keywords related to the topic of research were generated: circular business models, value creation, value generation, evaluation schemes, analysis frameworks, business modelling tools, closed loop production, resource efficiency strategies. These were then inputted, one by one, into pre-selected academic databases like LubSearch, Ebsco, and Science Direct. The keywords were also inputted into Google Search

engine to locate grey literature, in addition to academic articles. Several screening criteria were used as filters by the researcher, such as, the article had to be written in English language and be cited from credible sources. Finally, for the most relevant articles, and research papers were selected, whose data was entered into a synthesis matrix to grasp the key concepts. All articles, approximately 50 papers and website articles of academic nature and grey literature, were reviewed in detail to meet the objective. First, to discuss the focus on business model CE concepts; second, to analyse the available frameworks and tools for business model evaluation. Thirdly, to define a criteria which can be help to select meaningful metrics for each identified value dimension.

3.2 Empirical data collection method

Case study design

The goal of empirical data collection is to operationalise the scheme and justify the identified categories of value dimensions. Case study method is used as the key method for this study. A case study approach is the most suitable in situations where the main research questions are exploratory (Yin, 2014). In a case study, instead of using sampling methods, the case selection maximizes what can be learned in the period of time available for the study. Multiple cases offer a robust framework for data collection (Remenyi *et al*, 1998) and increase the explanatory power and generalisability of the data collection process (Miles & Huberman 1994).

The key criteria for selection of these cases was that they utilize a resource efficiency strategy by incorporating secondary material to substitute virgin material. Further, the three cases chosen were innovative and young companies, implementing a circular business model. All three companies are small sized with a strong ethic for sustainability and circularity. The three cases represent the general perception of Circular Economy principles being adopted as the central theme in a small scale business. They make a good combination when studied together, as they belong to different industrial sectors – ranging from textiles, real estate and carbon black (materials). As the chosen cases are from a diverse geographical spread and differ in their sector of operation, it enhances likelihood that observations from their comparison will hold valid in the case of other similar companies. The selection of case companies was made according to the following criteria for selection:

Table 3-1 Selection Criteria for Case Companies

Size: Small or medium-sized companies (SMEs)
Resource efficiency strategy: secondary material as a substitute to virgin material
Ethic: A strong ethic for sustainability and circularity
Business model: Enabling circular economy aligned production by reuse of waste material
Location: Geographically varied

Case company interviews and data collection

Between May 1st 2017 and May 16th 2017, data was collected mainly through three 1-hour long interviews and follow up discussion session with the company representatives. Upon prior consent

from the participants, audio recordings were made. A semi-structural research guide was used. However, the session was arranged to be more like an open discussion on opinions, than an interview. The transcripts of the audio recordings were produced by the researcher. In addition to the interviews, secondary data was derived from the company’s presentation material, websites, and other openly available information.

Expert interview

These findings are complemented by business model expert’s insights, in order to develop a deeper understanding of the metrics used for the evaluation scheme. Researcher chooses to deem the expert eligible, if they had 5 years or more experience in working with the business model tools and circular economy initiatives. In order to facilitate the conversation with the expert, a semi-structured interview guide was developed in order to explore issues of particular interest, which arise throughout the interview process. This interview is classified as an open interview, in which the author collected information through an informal discussion. The aim is to gain insight on business modelling activities for CBMs and validate the suggested metrics. According to the insights offered by the expert, the metrics and scoring method is better adjusted to suit the case studies.

Table 3-2 Interviewee Profiles

COMPANY/ORGANIZATION	INTERVIEWEE	POSITION/RESPONSIBILITIES
Case study Polyplank	Annika Ferlund	Board member
Case study Seljakbrand wool	Samantha Seljak	Co-founder & Director
Case study Black Bear Carbon	Clara Song	Finance & Business Head
Expert : Circulab and Wiithaa	Nicolas Buttin	Circular Economy Expert (Workshop Facilitator)

3.3 Scoring method

In order to identify the respondent’s perceptions, each question was subjectively assigned to a score by means of a rating scale. According to Iarossi (2006) this is an effective method to evaluate answers available in the form of opinions and perceptions. To rate how much the respondent agreed to a statement or answered in accordance to a question for each value dimension, the rating scale was divided in a five pointer ranking scales. Typically as it is in a Likert scale (Boone and Boone, 2012), ranging from the company strongly agreeing to “value creation from metric X” to disagreeing with the particular value “considered a negative for value creation”. The questionnaire provided useful inputs for the evaluation of the sources of value generation in the organization’s CBM. The Likert scale was adapted to suit the evaluation scheme as follows:

Table 3-3 Scoring method developed by author

LIKERT SCALE	ADAPTED MEANING (for researcher)	SCORE
STRONGLY AGREE (5):	Focussed efforts made to create and capture value by the company	2
AGREE (4):	Value is somewhat captured; company exploring this dimension	1
NEUTRAL (3):	No value created nor captured –unexplored area	0
DISAGREE (2):	Not found as an area for value capture in the company’s CBM/ no value creation potential seen	-1 (-)
STRONGLY DISAGREE (1):	Considered as a negative activity to value creation	-2 (-)

3.4 Limitations and Scope

The thesis relies on the current body of knowledge in the area and it may fail to cover the latest developments in this fast evolving field of study. Most importantly, limitations stem from the selection of case studies. The companies selected are small in size and rely on mainly one key resource efficiency strategy, they may not be representative of CBMs operating other resource efficiency strategies. This thesis is mainly based on qualitative research methods, such as interviews and discussions, and thus suffers from an inherent bias by taking into account varied subjective perspectives of the researcher as well as the interviewees. Scoring method developed by the researcher has attached with it some biases and risks. To properly award score to the data, one must understand the Likert measurement scale. The numbers assigned to Likert-type items express a ‘greater than relationship’, but it is not implied to define clearly ‘how much greater’ (Boone and Boone, 2012). The researcher has adapted the Likert scale to create a numerical scale from -2 to +2. Awarded scores indicate the extent to which a source of value creation was utilised or explored by the company. A band-wagon effect, which often accompanies Likert scale could make responses biased, as the participants are known to be inclined towards the higher scores on the scale (Knappen, 2014). There may be some obvious differences in the subjective understanding of the researcher awarding the final score and the interviewee’s understanding of the same metric. This has a high risk of being incorrectly translated to suit a number based scoring method. The researcher has tried to address this issue and to minimize their influence by assigning the score based on further in depth discussion and observations from data available on the company website etc. A justification statement is provided along with the score in each case (Appendix C, D, and E).

This thesis aims to be of relevance for business developers, researchers in the field of Circular Economy, business model researchers, as well as policy-makers who are responsible for building the enabling environment for CBMs to thrive.

3.5 Ethical Considerations

This research relies on a literature review, a discussion with an expert and case company interviews for data collection. Therefore, a number of ethical considerations arise. The discussion involving case company representatives was done with prior permission and observed independently by the researcher. The researcher has ensured that the interviews were conducted with the consent of the interviewee. Additionally, the researcher has ensured that their approach to the data is an objective approach to the subject matter and all sources of information have been duly cited and referenced (Purdue, 2016). The researcher has taken measures to ensure that what was observed has been accurately represented in the thesis (Lund University, 2016).

4 Findings

In line with the research approach, findings from analysis of literature have already been presented in the section 2.4 as the value metric checklist. In this chapter, the findings from the empirical data collection are presented. First, results from content analysis of interviews with company representatives are presented in section 4.1, 4.2 and 4.3 as individual cases. Additionally, each company representative shared some general thoughts on the need for business modelling tools, better suited to their CBMs. This is followed by presentation of findings from the expert interview in section 4.4.

4.1 Case study 1: PolyPlank

General Case description

Polyplank produces recyclable composite material, from which planks are made. These planks are assembled to profiles to put into steel frames to stabilize them. Polyplank is a small- size company, with just 20 employees and is largely a B2B type of company. Their main customers include building associations, municipality owned real estate, real estate agencies. One of their biggest unique sales pitch is to provide customers with good pointers for their environmental reporting. They are based in Southern Sweden.

Business Model Information

The case company was familiar with the nature of the study through collaborations with the ongoing research programme, Resource-Efficient and Effective Solutions (REES), which enabled easy access to information. Their product does not include virgin materials, and has a unique patented technology for the composite material used in the plank. They acquire secondary materials from the plastic industry and wood industry waste. All manufacturing and production activities take place in their own premises.



Figure 4-1 Business Model Information for Polyplank

Findings for each value dimension

Economic value: When discussing the economic value sources, Polyplank has not noted any additional revenue generation from access to new markets. It could be due to unavailability of demand for collaboration in Sweden, within the real estate sector. However, they did acknowledge cost savings to be of key importance to their value generation. Risk reduction is a source of value the company representative considers to be of medium importance. Though there is risk reduction from using their own raw materials, but there is added risk due to a narrow and price volatile

market of their secondary materials. Until now, monetary benefits have not been realized directly from policy changes. However, reduced expenditure on waste disposal has been a great source of value to the business. Overall a positive corporate leader image in the market has attracted customers and is seen as a source of value by the company.

Customer value: In terms of Customer value, it can be seen that the company has provided overall reduced life cycle costs to its customers. Customer satisfaction is an area where they are trying to put more efforts to capture the value to its full potential by forming better relationships. At present the company can be given medium range score in this area. Pricing is a tricky area as real estate typically requires benefits to be realized over longer term. The long term customers are more important, but short term benefits are key in order to attract new customers. Availability of services is the area being investigated by Polyplank to see if they can sell the functionality of 'noise barrier' from their planks. They are also looking into ease of access for the customers through new avenues. At the base of it all, lies the sales pitch, by branding the product as an 'environmentally friendly option for conscious consumers'.

Environmental value: Polyplank aims for a 100 percent input of secondary materials at all times. It works well, until there is a shortage from the supplier's side in recycled or waste material from the plastic and wood industry. Decreased used of toxic materials is under attention, as it all depends on materials present in the box or the material from the waste plastic. If they have been stored in old containers then the plastic can be contaminated. As plastic is a complex material, made from thousands of blends, it is not under the company's control. So the keys lies in controlling the origin of the secondary material. Polyplank is working to have a neutral footprint on the energy supply side. Being eco-design friendly has always been part of their work ambition. However, certifications pose an issue as there is a wide range to choose from, especially in Sweden. The company is certified with some of them, but it is not possible to obtain all as it incurs high costs.

Network value: Polyplank has noted extreme difficulties in setting up industrial symbiosis partnerships and believes that Swedish policies must help make symbiosis more accessible for smaller companies, such as theirs. On a company level, they have noted stronger vertical connections within the company due to the nature of operations as well as small size.

Information value: Flow of information has been seen as important in enhancing the other sources of value. As they maintain a dialogue with customers, they try to adjust accordingly and be market friendly by accounting in feedback. Being a part of REES network has helped the company gain additional information resources to improve their business. It has also helped connect with other players and build partnerships on a common information exchange platform.

Table 4-1 Value metric checklist evaluation for Polyplank

VALUE DIMENSION	METRIC CODE	METRIC	SCORE	REASONING (QUALITATIVE OBSERVATIONS)
ECONOMIC	EV1	Revenue generation by Access to new market	0	building connections - no economic benefits yet. Utilise existing traditional markets
	EV2	Cost savings	-1	A circular company by nature - They provide cost savings to customer. don't benefit from it directly
	EV3	Risk Reduction	1	Medium. A risk working with secondary materials as this market is narrow and volatile. But can work with retake of their own raw materials that saves a lot of trouble and the company benefits from use of waster material
	EV4	Monetary Benefits from Policies/Tax Benefits Of 'Circular Economy' Initiatives	0	not known
	EV5	EV 5: Reduced waste disposal costs	2	A large reduction
	EV6	Corporate image "leader in the field"	2	Seen as important
CUSTOMER	CV1	Reduced Lifecycle Costs	2	overall less costs for customer
	CV2	Customer satisfaction and loyalty/ 'relationship value	1	trying to build this and make clients see the long term benefits. 'Medium'
	CV13	Pricing	1	About the overall life cycle cost . only the ones that avail long term Benefits
	CV4	Availability of After-Sales Services	1	not there yet- A different engagement; now Investigating
	CV5	Ease of access for the Customer/ Access to functionality	2	Part of the economic model to look for new avenues
	CV6	Providing a 'choice' or Alternatives to Customers	2	the sales department's core pitch
ENVIRONMENTAL	EVO1	Substitution of virgin material	2	trying to be a hundred percent secondary. buy waste material from the Plastic industry and the wood industry.
	EVO2	Extent of reuse of a resource	-1	uniqueness of material is the composite material. Planks from secondary material but none of them are hundred percent recyclable. more effort, as well as more energy needed
	EVO3	Decreased used of Toxic Materials	1	now investigating - if the market demands, can show is non-toxic but, depends on what has been on the box or material used in the waste plastic from old containers then the plastic can be contaminated
	EVO4	Waste minimization & Less waste to dump	0	NA
	EVO5	Energy Use Reduction	2	working on being footprint neutral on the energy supply side.
	EVC1	Integration of Eco-design thinking	2	always been part of work ambition.
NETWORK	EVC2	Green Certifications	1	Certified with some of them but not all of them. Many in Sweden, hence must choose, as it is costly.
	NV1	Inter-firm network	1	response not good. Existence of monopoly and difficult to put in time and effort for a small business
	NV2	Intra firm network	2	working together in small teams
	NV3	Success and Popularity of Competitors	0	uniqueness of material in composite material planks
INFORMATION	IV1	overall increase economic value	0	feedback mostly informal and undocumented.
	IV2	Information Exchange Platform	2	Part of the REES - increased brain capacity to detect the big problems
	IV3	Consumer Behaviour Related Feedback for Product Improvement	2	maintain good dialogue with customer and try to adjust and be Market friendly and listen to feedback.
	IV4	Real Time Knowledge on Product Performance	1	Not done for composite planks; when that comes in then it will be easier to detect the big issues

4.2 Case study 2: Seljak brand

Seljak Brand makes recycled wool blankets using offcuts from the factory floor of Australia’s oldest mill and is based locally in Tasmania. With only two employees at present, they are active in both business to business and business to consumer orientations. Their circular model allows waste to avoid going into landfills and instead useful blankets.

Business Model Information

Collection of an old Seljak Brand blanket, is followed by sending it to the mill for remanufacturing. The mill shreds factory floor offcuts and old blankets. This shredded waste is then combed out to get the individual fibres which are prepared for spinning. The spinning machine effectively creates yarn and used polyester is utilised for the short, shredded fibres to catch on to. The resulting yarn is woven on a loom into the next Seljak Brand blanket. By providing an end of life solution, Seljak Brand is taking responsibility by creating a viable solution used blankets. Re use of an old blanket ensures the materials in it will retain its value, and eliminate the need to use new, raw resources and reduce the waste sent to landfill. A diagram as seen in Fig 4-2.

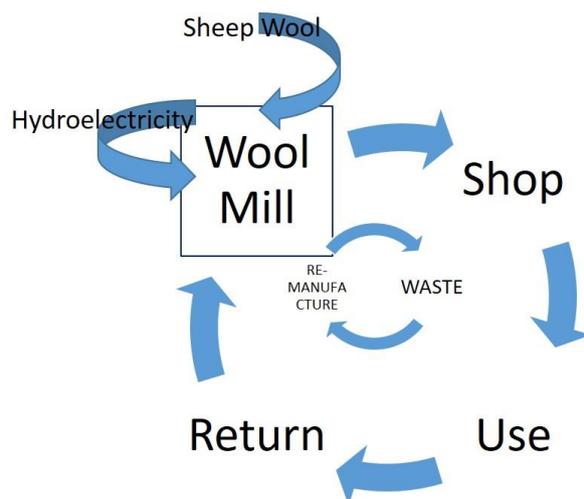


Figure 4-2 Business Model Information for Seljak Brand (Created by author, derived from Seljak Brand’s website)

Findings for each value dimension

Economic value: Seljak Brand has found value through reaching different customer segments that have a mix of people who demand refined and beautiful products, as well as those who are conscious consumers who are aware and want to support closed-loop businesses or companies that are doing more than the status quo. They are also deriving economic value by tapping into market that are more about longevity, not necessarily of sustainability. Cost savings are not very high from their CBM as even though the raw material is of much the lower cost than virgin cloth, but, given that manufacturing is done locally in Australia, the cost of labour is extremely high. They also realise that they share the risk as any other business does and that is not necessarily reduced by having a CBM. As they are based in Australia and registered in Sweden, but they have not received policy related monetary benefits until now. There's no direct cost reduction by reduced need for waste disposal, but their partners the cotton mill derives benefits which can mean lowered costs for them in the long run. Australia's biggest corporate company's approached the company for solutions to textile waste, which they have been able to do as a result of their image as leader in the CE arena.

Customer value: Seljak Brand ensures that the conscious consumers are being served and the overall life cycle cost is reduced for them, by keeping the resource to its highest value in their offering. A loyal relationship with their customers is of utmost value to them. As a recent example, their crowdfunding campaign managed to raise a certain amount of money in just 2 days, against the set target of 30 days. This clearly shows support from their loyal customers. While they do not currently have any after sales services, some ideas like cleaning and mending services for blankets are in the pipeline. Being a business to consumer set up, new channels are being explored, which could add more value in terms of ease of access for their customers. Lastly, they appeal to the customers by providing an environmentally friendly choice, with a product that offers quality over quantity to customers. They also have a social enterprise model which offers a unique selling proposition.

Environmental value: The current production of blankets uses 80 percent recycled wool but the remaining 20 percent is polyester, which is not a reused material. In terms of resource reuse, the company is too recent to determine the exact number of reuse cycles. As blankets are meant to be a long lasting product, it makes it more difficult to determine the exact number of cycles of reuse of the material. In the production process, cloth off cuts can be re used over and over again, Seljak Brand estimates reuse of the same material to occur atleast 4 to 5 times. The company has noted that there is higher demand for un-dyed products or the ones devoid of any toxic materials and chemicals. The company finds value in the fact that their bestselling products are the natural or un-dyed ones, but to remain attractive to a larger customer base, they must provide customers with coloured options. Not much waste left to manage as most is reused. In terms of energy use, they face a lack of options of mills that operate on renewable sources. Their current partner mill uses hydroelectricity and are using poppy seed oil for the production process. currently the company is limited in its options for renewable energy use and does not assess it as an important area to create value. Eco-design thinking has been grounded in the business plans from the beginning and is an important part of their model. Seljak brand places high value in certifications and are currently in the process of applying for 'B- corps' and 'Ethical clothing Australia', which is Australia's certified body for textile Manufacturing and clothing production. Although some certifications are seen as difficult to attain and expensive, but it provides the brand with a sense of legitimacy.

Network value: Seljak Brand holds the opinion that networks are key to their success. General support is available to them and within the ecosystem they have access to key networks which can be utilized for different purposes. In terms of intra-firm network, being a small company they

work very closely believe that it holds high value in attracting the right kind of employees and building the company ethic. Success of similar social enterprises is seen as a positive sign for them.

Information Value: Feedback through social media platforms has helped Seljak Brand interact with their audience and customers to create a space for information sharing. This has helped them with more information flow and thereby improving their sales. They do not currently have access to real time feedback on production and overall lifecycle, but being a requirement for B-corps certifications, they see high value in it. Increased access to information also suits the company's future plans.

Table 4-2 Seljak Brand value metric Evaluation

VALUE DIMENSION	METRIC CODE	METRIC	SCORE	REASONING (QUALITATIVE OBSERVATIONS)
ECONOMIC	EV1	Revenue generation by Access to new market	2	accessing a new customer segment; support closed-loop businesses (conscious consumer) + Get value from refined and beautiful products. A market of quality over quantity and longevity
	EV2	Cost savings	-1	While using waste as a resource is a cost-saving but labour with high wages increases the price. No direct benefits observed
	EV3	Risk Reduction	-1	No lowered risk in comparison to other business. Manufacturing is complex.
	EV4	Monetary Benefits from Policies/Tax Benefits Of 'Circular Economy' Initiatives	1	Seljak does not access any EU/ Swedish govt initiatives. Perception: Sweden is more open to moving to CE. Currently applying to business grants in Skane region, Sweden
	EV5	EV 5: Reduced waste disposal costs	0	mill partner and the supply chain derive benefits. Ultimately implies lower prices for all, but no direct cost reduction seen in the waste management.
	EV6	Corporate image "leader in the field"	2	Few of Australia's biggest corporate company's approached Seljak for Textile waste. As there is a big demand, the image helps
CUSTOMER	CV1	Reduced Lifecycle Costs	2	Keeping the resource to the highest value, the conscious consumers are being served.
	CV2	Customer satisfaction and loyalty/ 'relationship value	2	crowdfunding campaign for the brand had aim of 30 days for a certain amount. But managed to raise in just 2 days, this displays high value from people willing to support.
	CV13	Pricing	1	Considered a very location based issue. Australia based products have the standard Australian products pricing. As the demand is growing, aiming for wholesale prices.
	CV4	Availability of After-Sales Services	2	Ideas in the pipeline; like cleaning and mending services for blankets
	CV5	Ease of access for the Customer/ Access to functionality	1	new channels are being explored through different streams and consultancy
	CV6	Providing a 'choice' or Alternatives to Customers	2	product offers an environmental value, and quality over quantity to customers. Seljak has a social enterprise model - offers a unique selling proposition
ENVIRONMENTAL	EVO1	Substitution of virgin material	1	use about 80 percent recycled wool; 20 percent is new polyester
	EVO2	Extent of reuse of a resource	2	estimate 4 to 5 times / Off cuts can be re used again, a lot of cycles essentially. Company is too recent to firmly state
	EVO3	Decreased used of Toxic Materials	1	bestselling products are not- dyed ones.
	EVO4	Waste minimization & Less waste to dump	2	not much waste left
	EVO5	Energy Use Reduction	1	mill uses hydroelectricity, solar panels could be a future option but the choice of Mills available is limited. Have to settle with what is available.
	EVC1	Integration of Eco-design thinking	2	Eco design thinking behind the business which is grounded in our plans from the start.
EVC2	Green Certifications	2	seeking B corps and applying for 'Ethical clothing Australia' . Certification provides a sense of legitimacy - adds Value. valuable to be a part of the network	
NETWORK	NV1	Inter-firm network	2	mill partners are important and current network is largely grounded in the circular economy initiatives and the textile sector in Australia
	NV2	Intra firm network	2	working together in a small team; attracts the good quality employees
	NV3	Success and Popularity of Competitors	0	. At a Later stage; not at present
INFORMATION	IV1	overall increase economic value	2	information flow in the networks and helped sort potential opportunities which adds to economic gains
	IV2	Information Exchange Platform	2	considered key to Success- participation in conferences because of these Networks
	IV3	Consumer Behaviour Related Feedback for Product Improvement	2	have a good dialogue with a customer - Social media platforms are open + Interactive with audience
	IV4	Real Time Knowledge on Product Performance	2	currently do not use this, as it's a mill's area of concern and they don't have the resources to measure. + a part of B corp certifications procedure, this step fits well with the overall strategy, therefore of high value

4.3 Case study 3: Black Bear Carbon

Black Bear Carbon (BBC) has created an innovative new process to harvest and upcycle the carbon black from end-of-life tires, to a high quality product. With their innovative technology enabling this circular operation, they are a fast growing yet small company, based in the Netherlands. There are not only involved in carbon black sales, but also sell electricity and oil, which is a by-product of their production process. As the electricity and oil market is very different from the carbon black market, knowledge lot of market area is needed to develop their model.

Business Model Information



Figure 4-3 Business Model Information for Black Bear Carbon

Their key product, the carbon black, provides a unique balance of mechanical and dynamic reinforcing characteristics with extremely low PAH. It is a sustainable replacement to other furnace carbon blacks in the market. The Black Bear process uses end-of-life tires in partnership from tyre manufacturers, to produce carbon black and partners with established tire collectors who can use the Black Bear technology to turn this growing waste stream into a valuable raw material. Additionally, the Black Bear process creates more energy in the form of oil and gas, as by products, than it consumes, thereby having a beneficial effect. The process yields important bi-products in the form of high calorific gas and oil. This can be converted to heat, electricity or steam and provide an additional income stream within the business model.

Findings for each value dimension

Economic Value: BBC does not see any value from access of new markets as they largely rely on traditional markets. BBC invests into R&D activities and does not directly benefit from the cost savings. Instead they have noticed a cost saving of nearly 20 percent for their clients. They do not see any imminent risks in the area of availability of raw material and other resources as the sales of cars is increasing. Although not directly benefiting from CE initiatives, the company has noted a shift in the waste disposal trends which can translate into monetary benefits over time. Through recent research, BBC found reports claiming that tyres are carcinogenic and must be recycled in an appropriate manner. As more manufacturers look for alternative ways to recycle, BBC can ensure reduced risk of raw material availability by fostering relationships with manufacturers. Waste disposal is not seen as an area for value generation, as a basic fee for cleaning is required to be paid in any case. BBC's perception of being a leader in the field is that this recognition only aids the first step and is short lived, but eventually benefits can be derived only by delivering quality.

Customer Value: More customers seek ‘green solutions’. However if the quality standards are not matched with the price then it does not fulfil the objectives. BBC offers products with carbon credits to its clients, which leads to a reduction in the overall costing, as the client can reduce its carbon footprint and seek additional benefits such as reduced prices. A very one to one based market has been identified by BBC, where value can be derived from building stronger customer relationships at market price. Furthermore, BBC does not feel the need to offer their products any cheaper than others. Their value proposition lies in offering a ‘cleaner’ carbon black which less PAH level. In terms of after-sales services, BBC offers assistance at every step and is available for solving customer issues. Ease of access for the customers, has been facilitated by being a local company with a multinational presence. On having gained lab based approvals in one country within the EU, they plan to extend operations in the European region, to reach out to more customers. They currently derive high value from providing an eco-friendly alternative in the market.

Environmental value: BBC is exploring more ways to substitute the virgin material input and at present has about 50% secondary input. As their product carbon black, does not deteriorate in quality over reuse cycles, 60 - 70 % material can go on infinitely as estimated. BBC stands well below the EU regulations for use of toxic materials and are looking at FDA regulations. One of the key environmental value created is by reduced energy use by effective use of their by-products. Their process creates gas which is condensed and made in to electricity and then sold. They are currently exploring ways to make the oil sales more circular and create high value products that could benefit other chemical companies. Eco design may not be a central goal of the CBM, but it is embedded in the conscious nature of the company. In terms of certifications, BBC is seeking Cradle to Cradle certification and derives high value from being a certified company as it builds trust in the market.

Network value: BBC value their inter-frim networks and consider partnerships to align well for mutual benefits. While local partner provide local expertise on matters such as permits and legal issues, the company can leverage on that expertise and provide technology and sales solutions in the carbon black market. Within the working team, a strong intra company sentiment is valuable to the company. Claimed to be driven by a passionate millennial generation of workers, they can attract high quality employees, who further impact and uphold the environmental values of the company. Success of competitors in the industry has had beneficial impacts on the company. Their competitors are producing carbon black in the traditional manner. The more competitors leads to good business visibility. It has helped create awareness amongst their immediate customers, making BBC an attractive choice for bigger companies looking for end of life solutions.

Information value: Access to an information exchange platform is seen as a high value generation source by the company. BBC is a part of several Dutch government led initiatives and incubation programs in the technical university of Delft, Netherlands. Consumer behaviour related feedback and interaction are recorded and well utilized by tracking each consignment. They can assist the customers in identifying issues and continuous trouble shooting. Additionally, real time knowledge on the products performance and life cycle has helped them deliver better results. It begins with monitoring the tyres and the kind of material that went in it for the fine texture. So there information flow in real time and it is well integrated in the production process.

Table 4-3 Black Bear Carbon value metric Evaluation

VALUE DIMENSION	METRIC CODE	METRIC	SCORE	REASONING (QUALITATIVE OBSERVATIONS)
ECONOMIC	EV1	Revenue generation by Access to new market	-1	tap into existing markets only
	EV2	Cost savings	-1	provide the cost savings to the tyre collectors or the customers But do not benefit from the cost savings . Invest in R&D for carbon black quality, BBC can offer saving of 20% in their process.
	EV3	Risk Reduction	2	more people are buying cars + toxicity of the certain chemicals in the tyre and is considered to be carcinogenic. + recycling is becoming more and more strictly regulated +continuously looking for alternative is to recycle
	EV4	Monetary Benefits from Policies/Tax Benefits Of 'Circular Economy' Initiatives	1	threats: alternative recycling initiatives, due to new policies. This makes availability of raw material an issue. But, can also be a reason for partnerships
	EV5	EV 5: Reduced waste disposal costs	1	Cleaning fee for activated carbon + Useful by-products
	EV6	Corporate image "leader in the field"	1	about delivering quality. Not just the circular image, but good Quality delivery
CUSTOMER	CV1	Reduced Lifecycle Costs	2	better coverage with the paint made from this carbon black and also the company wants to be a 'green' company - we offer Products with carbon credits. This helps them reduce their carbon footprint and reduced prices
	CV2	Customer satisfaction and loyalty/ 'relationship value	2	have to build relationships in a one to one market
	CV13	Pricing	-1	At market price. BBC - no need to offer any cheaper due3 to recycled material input. value proposition lies in the quality. Additionally, carbon credits may help the customer seek reduction in costs.
	CV4	Availability of After-Sales Services	2	Can be contacted and give checks to solve issues
	CV5	Ease of access for the Customer/ Access to functionality	2	. Locally with a multinational presence
	CV6	Providing a 'choice' or Alternatives to Customers	2	offer Products with carbon credits. This helps them reduce their carbon footprint and reduced prices
ENVIRONMENTAL	EVO1	Substitution of virgin material	1	in percentage we are at 50%. Doing more R&D in association with Climate KIC
	EVO2	Extent of reuse of a resource	2	60 - 70 % of c black can go on infinitely As it does not deteriorate in quality.
	EVO3	Decreased used of Toxic Materials	2	Below the EU regulations and now we are looking at if FDA regulations. Can't go lower than that!
	EVO4	Waste minimization & Less waste to dump	0	Not considered. Pay cleaning fee
	EVO5	Energy Use Reduction	2	The create energy to a by-product is gas and then oil and what remains is gas. Gas is condensed and made in to electricity and we sell back. We are looking at ways to make the oil more circular and make good value products that could benefit other chemical Companies
	EVC1	Integration of Eco-design thinking	0	four factories that are conscious
	EVC2	Green Certifications	1	Cradle to cradle is in process
NETWORK	NV1	Inter-firm network	2	The local partner has local expertise at expertise and they offer our technology and marketing - Well aligned for mutual benefits.
	NV2	Intra firm network	2	work together in a small team. It attractive for employees
	NV3	Success and Popularity of Competitors	0	brings awareness to immediate customers + a demand for clean carbon black from customers it is a unique product. The more competitors equals visibility for the business
INFORMATION	IV1	overall increase economic value	2	information flow in the networks and helped us to sort potential opportunities which helps in economic gains
	IV2	Information Exchange Platform	2	CEO is the board member of Circle Economy + a part of Dutch government led initiatives. The technical university Delft - Incubation programs
	IV3	Consumer Behaviour Related Feedback for Product Improvement	2	have a good dialogue with a customer - monitor every batch that comes in and each hour; barcodes to track it and troubleshooting made easy for customers
	IV4	Real Time Knowledge on Product Performance	2	closed loop information flow real time - well integrated in the process.

4.4 Findings from Expert Interview

As described in section 3.2, the researcher conducted an interview with an expert who had experience in offering consulting advice to companies adopting circular principles in their business models. The expert has previously assisted bigger sized companies in assessing opportunities for circular operations and closing the loop through an interactive tool - Circulab TM serves organizations in different ways, essentially by redesigning the companies' business model into a circular one from a linear BM (Appendix G). The researcher (N. Buttin, personal communication, May 12th, 2017, Appendix F) discussed views and sought input on the selected metrics and value dimensions.

Views on economic value metrics: Cost savings can be calculated by collectively scanning all the assets of the company. Thus, reduced waste disposal costs is a subset of cost savings. In his view, the corporate image may not be a driving factor that all companies seek. However smaller companies, usually has a business offering with the central idea of circular economy or ethics and sustainability, and can place a higher value on this dimension, while bigger companies find more value in cost saving and risk reduction.

Views on customer value metrics: With regards to value creation for customers, attributes like quality, price are key. Companies must find value from new ways to digitalize access to their product in a well-designed manner, but it is important to be very well designed experience for consumers. In a constantly changing environment, the behaviour of customers is a highly important criteria to take into account.

Views on Environmental value metrics: Customers want a 'just - right equation' overall, but the product must not too expensive as a result of getting this balanced equation between planet protection and price (N. Buttin, personal communication, May 12th, 2017).

Views on network value metrics: New services and optimising access to ownership, needs to be created through sharing economy. Bigger companies struggle to share information among each other, but in smaller companies it is easier. As people in bigger companies do not interact with different departments, smaller companies can find value in tighter intra-company networks.

Views on information metrics: Young companies are better aligned to capture value from this understanding of their customers, which is made better through social media channels and better availability of information.

The next section will analyse these findings to draw comparisons among the three cases.

5 Analysis

This section presents an analysis of the findings collected through the value metric checklist in evaluation scheme. A cross-case analysis is presented in sections 5.1 to 5.5, which includes a comparison of the observations from the literature analysis with the empirical data collected. The value metric list is created by a thorough review of literature and selection of easy to use metrics for each value dimension. By merging the different sources of value dimension in one frame, cross case comparison for each dimension can be done. The complete application of the evaluation scheme developed as a result of this thesis is presented in section 5.6.

5.1 Guide to the Value Circle Evaluation scheme

For the purpose of analysis, each value dimension is perceived as a pie chart, representing scope for value generation by a CBM. In addition to the scoring awarded, adjustment is done for useful visual representation (Table 5-1). An ideal type pie chart was created for each value dimension, termed as the 'Ideal Value Circle', which represents maximum value creation possible under each metric (Fig 5-1). As each metric was assigned a score ranging from -2 to +2 by the researcher, it was adjusted to have numerical values fit for creating a doughnut shaped pie chart. Here, the share of slice represented by each metric depicts an opportunity for the company to explore the particular value metric within the specific value dimension. This has been explained further with examples from the case studies in the following sections.

Table 5-1 Adjusted values for Value Circle chart representation

SCORE	Value Circle Adjustment	Scores Awarded	Value metric	Value Circle Adjustment
-2	0.2	0	EV1: Revenue Generation by Access to New Market	0.6
		-1	EV1 (1-EV1)	0.4
-1	0.4	0	EV2: Cost savings	0.4
		1	EV2 (1- EV2)	0.6
0	0.6	0	EV 3: Risk Reduction	0.8
		2	EV3 (1- EV3)	0.2
1	0.8	0	EV 4: Monetary Benefits from Policies/Tax Benefits Of 'CE' Initiatives	0.6
		2	EV 4 (1-EV4)	0.4
2	1	2	EV 5: Reduced waste disposal costs	1
		2	EV 6: Corporate image "leader in the field"	1
		2	CV1: Reduced Lifecycle Costs	1
		1	CV2: Customer satisfaction and loyalty/ 'relationship value'	0.8
		1	cv 2 (1-CV2)	0.2
		1	CV3: Pricing (compared to NBA)	0.8
		1	cv 3 (1-CV3)	0.2
		1	CV4: Availability of After-Sales Services	0.8
		2	cv 4 (1-CV3)	
		2	CV5: Ease of access for the Customer/ Access functionality	1
		2	CV6: Providing 'Choice' or Alternatives to customers	1

An ideal type pie chart was created for each value dimension, termed as the 'Ideal Value Circle', which represents maximum value creation under each metric. An example is presented for the economic value circle in fig 5-1. In this, each metric is assigned a full value of 1, thus giving an equally sliced pie chart, which represents well explored area for value generation. In comparison, the value circle representing the scores from the evaluation of economic value dimension in Polyplank (case company 1), lighter coloured spaces are representing scope for exploration of value generation.

Economic Value Circle- Polyplank

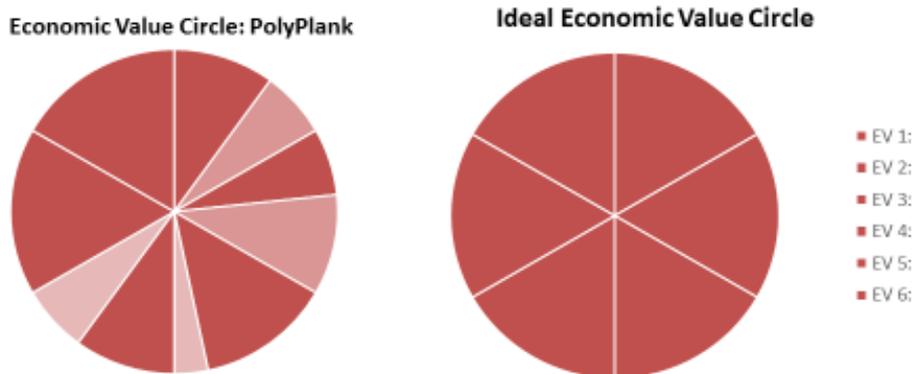


Figure 5-1 Value Circle example; Economic value for Polyplank (created by author)

5.2 Economic value

Economic value was first assessed from the metric 'access to new markets' (EV1). The potential for this was observed to be different for all three cases. While Polyplank (PP) has not seen any benefits from alternative markets, they are in the process of exploring such avenues. Existing markets remain the key focus, in case of Black bear carbon (BBC). However in case of Seljak brand (SB), the company derives benefits from a new customer segment, consisting of consumers who are conscious about the 'longevity of the product'. Thus, this research found that indeed some of the analysed CBM generated and captured economic value from accessing new markets. Yet, all of them also needed to compete in the traditional markets. Facilitating the development of new markets could be supported by government policies that aim to aid the transition towards a CE.

Cost savings (EV2) have been observed in all three cases. Yet, not all of the companies directly benefitted from cost savings. Instead cost savings in some form have been possible among their partners and clients. Thus, they did not place much importance to cost savings. For example, SB partners with a cotton mill who derive benefit from production process. While SB benefits from using waste material as a raw material source, but accessing locally based labour with high wages increases their overall expenses. No direct benefits are seen from cost savings on account of being a CBM, as several other factors impact the cost of operations.

The 'Risk Reduction' metric (EV3) presents varied results. While SB did not place much value from using used material, as manufacturing process was still complex and suffered from the same risks as any other businesses. However, BBC assessed risk reduction to be higher as using used tyres as a raw material offered benefits and there was no risk of lacking availability. PP places this value proposition metric at a medium level, as working with secondary materials offers its own risks in a narrow and volatile market. Overall, risk reduction can vary in a CBM and is not necessarily embedded in the assumption that using secondary input or closed loop production can reduce risk in all cases. Benefits derived from CE related policies or initiatives (EV4) were not observed in any of the case companies. However a shift in the waste disposal trends that could impact their CBM was noted by BBC. This implied less value assigned to CE initiatives for economic benefits.

Reduced waste disposal costs (EV5) were not of much importance for BBC in terms of additional value. SB deals with partners who use all material offcuts in new products and can thus reduce waste disposal costs. But, PP, which has its own manufacturing operations, noted a significant positive value in reduced costs from waste disposal. Thus, depending on the scale of operation and partnerships established, value derived from waste disposal reduction can vary to a large extent.

Corporate Image (EV6) was rated as a highly important criteria for all three CBMs, to leverage upon and create more opportunities. Smaller companies, usually centred on the idea of circular economy and sustainability, can place higher value on this dimension, as understood by experts in the field. Seljak brand claimed to have received attention from the bigger companies in the country due to their market image, as a solution provider for their waste. However, BBC claims that quality offered has more value than a corporate image on its own. Thus it can be an area of high value for CBMs to build a 'leader' image and to find new opportunities, while maintaining their standards.

5.3 Customer value

Reduced overall lifecycle cost in terms of maintenance or disposal for the customer (CV1) was a key offering in each of the CBM and they derived high value from this. Customer satisfaction and loyalty (CV 2) to build on a 'relationship value' was an important factor for all companies. In case of SB, the trust and customer relations translated into monetary gains, due to popularity in alternative fund raising techniques, such as crowdfunding. This adds a new layer to value proposition especially for small sized CBMs that work with circularity at the heart of their operations and business ideals. It is also an example of how one value dimension (customer) can contribute to a different value dimension (economic).

Empirical data reveals that price of the offering (CV3) may not necessarily be an area for high value creation, as it is impacted by other factors like costs of producing locally with expensive labour (as in case of SB), and having to deal with a volatile market for raw material as in the case of PP. Additionally, BBC does not need to offer a lower price and instead offers a better 'quality' product with competitive market price.

Providing post sale services was an attractive area to explore, as it is a source of value for the company's customers. Since all the CBMs under study are designed to enable the reuse of waste material in their production, there is more opportunity for the companies to explore new avenues of providing post sale services, which can add considerable value (CV 4).

CBMs can derive more value by enabling easier access to functionality (CV 5) of their offerings. In all three cases, new channels were being explored. SB wishes to engage with new clients which can derive benefit from the 'longevity aspect' of their offering. Similarly, PP is exploring ways to sell noise proofing service in addition to their product offering. However, in case of BBC, an additional effort to add more value to their products was observed, wherein the carbon black provided better function to the clients. Providing 'choice' and environmentally friendly alternatives (CV6) to customers was also seen as a key value for all the CBMs. While aiming to serve conscious customers, SB provides products to a market segment who values 'quality over quantity'. Polyplank and BBC see ability to provide a choice as an opportunity to attract customers seeking 'greener solutions'.

5.4 Environmental value

From value creation opportunities in 'operations', it is obvious from the nature of the CBMs selected, that each company assigned a high value to 'Substitution of virgin material' (EVO1) and is making concentrated efforts to reach a hundred percent secondary input, if not already attained.

However, placing high value to the extent of reuse of a resource was not feasible for all the models. This is because the current technical process did not permit a hundred percent recycling in the composite material of PP. Thus in many cases, there could be a trade-off between the intention of the business model and technical process in use. BBC and SB were too young to exactly determine the number of cycles their product could be reused (EVO2), but placed high value on this metric.

The metric for decreased use of toxic materials (EVO3) showed interesting results across the three CBMs. BBC placed very high value to this metric due to the nature of the product offered. BBC claimed to be performing well below the acceptable EU limits for toxic materials presence in their product. PP was in the process of better monitoring the use of waste plastic used as raw material to ensure its non-toxicity. However, when dealing with secondary input it can be difficult to control all aspects. In case of SB, they noted higher sales in their 'un-dyed' blankets, essentially colour free products. But could not take out all options of dyed products due to market demands.

Waste minimization and transportation cost to dump sites (EVO 4) was not very high on the priority for the CBMs. This in turn indicated that either not much waste was left to dispose in the end or waste was being entirely used in the production process. Alternatively, by-products were being well utilised. The metric on energy use reduction (EVO5) was very highly valued by the three companies. While BBC was creating more energy than it consumed, they did so by effectively utilizing their by-product into gas that was made into electricity. The other by-product, oil, was under research to derive more value from. PP has made concentrated efforts to have a neutral footprint on the energy supply side. However, SB did not have control over this metric arising from a lack of options to merge production with appropriate partners who used renewable energy. This also showed variation due to the geographical differences.

Capturing value from being risk free and compliant with environmental certifications was seen to be important for all the three cases. Eco-design (EVC 1) was imbedded in both PP and SB's working principles while BBC saw no additional value from eco-design thinking. Certifications (EVC2) had a similar value for the three cases but largely differed due to the sector of operation. While considered to be too expensive, especially in case of SB, applying to B-corps was seen to add additional value as it helped with overall business modelling for their young business to gain guidance and credibility.

5.5 Network value

Literature claims that collaboration with external partners creates additional economic and environmental value by utilizing under-utilized or wasted resources and reduces waste output to the environment. While BBC derived positive value through partnering to gain local expertise on matters of laws and permit, they found new opportunities for value creation by offering technology and marketing skill our sales of the carbon black in exchange for local expertise, this is an example of mutual benefits through inter firm networks (NV1). However, while inter-firm networks allow the development of efficient, shared solutions, in case of PP it has proven to be difficult to receive response from partners as it is difficult to put in time and effort being a small set up. This could also be due to country specific factors, related to ease of establishing industrial symbiosis.

Intra firm network (NV2) proved to be of medium value at the present scale for the three companies as smaller teams enabled closer relations. However, they considered it of value to attract good quality of employees and retain smooth working condition for the staff. Success and popularity of competitors in the industry (NV3), as outlined in the literature review must ideally contribute to the success of CBMs. But the three cases under consideration did not see much value in this metric or considered to be of relevance at a later stage, although it did contribute to awareness of their unique model among immediate consumers.

5.6 Information value

Different aspects of capturing information at all the steps adds value, as predicted by the literature analysis, but differs in each case. Access to an information exchange platform (IV3) is seen as a source of high value generation by all the companies, as it enables access to information to seek economic opportunities (IV1). Opportunities for improving customer services can be identified by receiving better feedback through new channels (IV 3). Further, product improvement for circularity can be achieved through real time information, as noted by the case companies. Real time information availability (IV 4) was pursued by two of the case companies, while the third one (SB) did not have the capacity at present, but all of them assigned high value to such information for achieving process efficiency in the future. Information value is also key to seek compliance approvals and certifications by the company, as it monitors the input in the overall process.

5.7 Working of the Evaluation Scheme

The value circle evaluation scheme assists companies in operating their CBM through an improved understanding of their potential to create value, from a multi-stakeholder perspective. The steps involved in using this evaluation scheme are as follows (Fig 5-2).

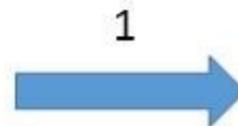
- a. A company representative can work with the provided 'Value Metric List' (Table 2-6) to understand the relevance of each metric.
- b. Award a score from -2 to +2 according to the scoring guide (provided in table 3-2) to each value dimension metric.
- c. Following this simple assessment, the scores are inserted into the Excel sheet and converted to appropriate numerical values for representation as a Value circle (fig 5-1).
- d. This visual representation shows gaps in the pie chart, representing opportunities for value creation that can be further explored by the company. An ideal value circle is available for a reference and comparison.

Within each of these value dimension, the scoring awarded to each value metrics is presented as a share of the pie chart. The goal is achieve an equally sliced 'value circle' as seen in Figure 5-1, which represents maximal value creation for each metric. The aim of the evaluation scheme is to help a company understand which value dimension holds room for improvement. This can aid in setting goals to reach the 'ideal value circle' which has equal slices, representing maximum effort to capture value under each value metric.

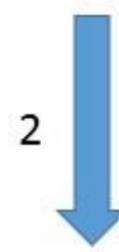
This visualisation can also aid complementary value metrics to be seen together and how a company may facilitate the increase in creating value in a particular dimension, by leveraging opportunities from the other dimension. One example could be aiming for more information capture to track customer behaviour, which can aid the reuse of materials over multiple cycles and thus facilitate value creation in the environmental dimension. Additionally, as found from the data collected by the researcher, access to a larger network adds to economic value by introduction to new opportunities. It could complement the 'access to new markets' (EV1) metric if new channels are created through enhanced networking (IV1) by the companies. However this aspect of the evaluation scheme needs to be developed upon, in later stages as it lies beyond the scope of this thesis.

Working of the Value Circle Evaluation Scheme

VALUE DIMENSION	METRIC CODE	METRIC	SCORE	REASONING (QUALITATIVE OBSERVATIONS)
ECONOMIC	EV1	Revenue generation by Access to new market	0	building connections - no economic benefits yet. Utilise existing traditional markets
	EV2	Cost savings	-1	A circular company by nature - They provide cost savings to customer, don't benefit from it directly
	EV3	Risk Reduction	1	Medium. A risk working with secondary materials as this market is narrow and volatile. But can work with retake of their own raw materials that saves a lot of trouble and the company benefits from use of waster material
	EV4	Monetary Benefits from Policies/Tax Benefits Of 'Circular Economy' Initiatives	0	not known
	EV5	Reduced waste disposal costs	2	A large reduction
	EV6	Corporate image "leader in the field"	2	Seen as important
CUSTOMER	CV1	Reduced Lifecycle Costs	2	overall less costs for customer
	CV2	Customer satisfaction and loyalty/ 'relationship value	1	trying to build this and make clients see the long term benefits. 'Medium'
	CV3	Pricing	1	About the overall life cycle cost. only the ones that avail long term Benefits
	CV4	Availability of After-Sales Services	1	not there yet- A different engagement; now Investigating
	CV5	Ease of access for the Customer/ Access to functionality	2	Part of the economic model to look for new avenues
	CV6	Providing a 'choice' or Alternatives to Customers	2	the sales department's core pitch
ENVIRONMENTAL	EVO1	Substitution of virgin material	2	trying to be a hundred percent secondary. buy waste material from the Plastic industry and the wood industry. uniqueness of material is the composite material. Planks from secondary material but none of them are hundred percent recyclable. more effort, as well as more energy needed
	EVO2	Extent of reuse of a resource	-1	now investigating - if the market demands, can show is non-toxic but, depends on what has been on the box or material used in the waste plastic from old containers than the plastic can be contaminated
	EVO3	Decreased used of Toxic Materials	1	
	EVO4	Waste minimization & Less waste to dump	0	NA
	EVO5	Energy Use Reduction	2	working on being footprint neutral on the energy supply side.
	EVC1	Integration of Eco-design thinking	2	always been part of work ambition.
NETWORK	EV2	Green Certifications	1	Certified with some of them but not all of them. Many in Sweden, hence must choose, as it is costly.
	NV1	Inter-firm network	1	response not good. Existence of monopoly and difficult to put in time and effort for a small business working together in small teams
	NV2	Intra-firm network	2	
INFORMATION	NV3	Success and Popularity of Competitors	0	uniqueness of material in composite material planks
	IV1	overall increase economic value	0	feedback mostly informal and undocumented.
	IV2	Information Exchange Platform	2	Part of the REES - increased brain capacity to detect the big problems
	IV3	Consumer Behaviour Related Feedback for Product Improvement	2	maintain good dialogue with customer and try to adjust and be Market friendly and listen to feedback.
	IV4	Real Time Knowledge on Product Performance	1	Not done for composite planks; when that comes in then it will be easier to detect the big issues



SCORE	Value Circle Adjustment	Scores Awarded	Value metric	Value Circle Adjustment
-2	0.2	0	EV1: Revenue Generation by Access to New Market	0.6
-1	0.4	-1	EV1 (1-EV1)	0.4
0	0.6	1	EV2: Cost savings	0.4
1	0.8	2	EV2 (1- EV2)	0.6
2	1	1	EV3: Risk Reduction	0.8
		2	EV3 (1- EV3)	0.2
		0	EV 4: Monetary Benefits from Policies/Tax Benefits Of 'CE' Initiatives	0.6
		1	EV 4 (1-EV4)	0.4
		2	EV 5: Reduced waste disposal costs	1
		2	EV 6: Corporate image "leader in the field"	1
		2	CV1: Reduced Lifecycle Costs	1
		1	CV2: Customer satisfaction and loyalty/ 'relationship value'	0.8
		1	cv 2 (1-CV2)	0.2
		1	CV3: Pricing (compared to NBA)	0.8
		1	cv 3 (1-CV3)	0.2
		2	CV4: Availability of After-Sales Services	0.8
		2	cv 4 (1-CV3)	0.2
		2	CV5: Ease of access for the Customer/ Access functionality	1
		2	CV6: Providing 'Choice' or Alternatives to customers	1

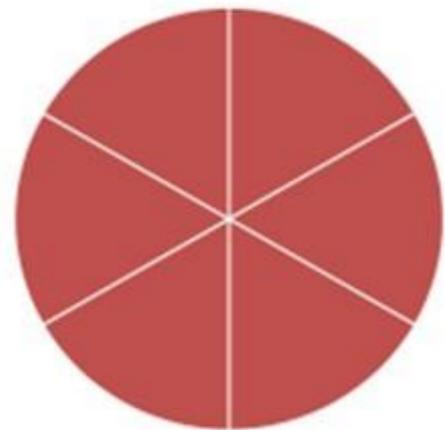


Economic Value Circle- Polyplank

Economic Value Circle: PolyPlank



Ideal Economic Value Circle



- EV 1:
- EV 2:
- EV 3:
- EV 4:
- EV 5:
- EV 6:

Figure 5-2 Working of Value Circle evaluation scheme (created by author)

6 Discussion

The aim of this chapter is to critically analyse the findings, methodology and discuss the development of the evaluation scheme presented in this thesis.

6.1 Discussion on Research Questions

This thesis set out to identify value generation sources in CBMs and create a simple evaluation scheme for value assessment. To guide this research, two questions are formulated:

1. *What are the different dimensions of value creation offered by circular business models?*
2. *What possible metrics can be used to build a simple evaluation scheme for assessing the identified value dimensions*

In order to answer the two research questions, a literature analysis was done, followed by the empirical validation of the identified metrics for value generation. As per the intended outcome of the research, the first research question was addressed by means of an analysis of literature on value generation, business model analysis frameworks and CBMs. As the final goal of the thesis is to come up with a simple value assessment scheme for CBMs, the second question focuses on finding the most appropriate metrics for this. The answer to the first part of the second research question is thus presented in the form of a 'Value Metric checklist'. This checklist forms the first step to a developing the 'Value circle' assessment scheme. The final scheme is used and presented to the reader in section 5.6. Overall, it can be concluded that this thesis was able to address the two research questions and met their intended outcomes, while leading way for future research.

6.2 Discussion on Methodology and Data collection

When reflecting upon the research methodology, the researcher wishes to highlight that the approach taken in this thesis is exploratory. As a first step, an extensive literature review, broadly based on the theme of value creation, evaluation of business models and circular business models, has been done in order to identify value dimension and come up with suitable metrics. The available tools and frameworks found in literature are used as guiding notes to develop an evaluation checklist with appropriate metrics.

The chosen method for the data collection was interviews. The data gathered for the three cases benefited from an open interview conducted with company representatives. However a key drawback was the unevenness in the interview quality given that interviewees had a differing depth of knowledge and time available for interviews. Moreover, observation of each company's operations was not possible due to time and resource constraints. The interviews were designed to be semi-structured that were at least one hour long, allowing the interviewees to go into sufficient detail. Consequently, there is the possibility that some information might be biased and the discussions are likely to have omitted confidential data.

On analysing the interview with the expert, the author gained the general impression that the company representatives from SMEs have, regarding business models and value generation, will differ from larger companies who may place higher importance to other areas. This is another source of bias which has been duly acknowledged throughout the data collection process.

Since available literature provided only a basic understanding of what value based evaluation metrics can be for CBMs, the content analysis required an approach of deductive category assignment for value dimensions. The researcher went back and forth during the process of development of metrics and revised the process repeatedly with new input.

6.3 Discussion on Case studies

CBMs which enable reuse of secondary material to substitute primary material input are selected. This keeps the scope of the work limited to a particular CBM type and enables higher comparability and a focused analysis of the data. Due to similar characteristics of the chosen case studies, the visual representation offers almost similar assessment for each value dimension across the three cases.

- **Size: Small or medium-sized companies:**
This evaluation scheme was applied to small or medium-sized companies. But the same metrics to assess value creation might differ in bigger company set up. For example, the high cost of certifications presented a barrier in the cases analysed for the SMEs. This could be given less or more importance in a larger company.
- **Resource efficiency strategy: Secondary material as a substitute to virgin material.**
This evaluation scheme would probably deliver very different findings for a CBM operating a remanufacturing strategy or a Product- Service-System model. This is because metrics related to value generation from the different dimension might be assessed differently, and given much more or less importance.
- **Ethic: Companies with a strong ethic for sustainability and circularity.**
Chosen cases for the empirical study were companies that included circular economy principles and sustainability in their company vision. In discussion with N. Buttin (Expert interview personal communication 12th may 2017), it was concluded that the key ethic or central idea of a company, plays an important role in available opportunities for value creation. The company may rate certain value dimensions differently based on this non tangible factor. For example, the metric 'integration of eco-design thinking' scored highly in these cases. This may differ in other cases.
- **Business model: Enabling the circular economy by reuse of waste material by substituting primary material input and selling the complete ownership of the product to the customers.**
The manner in which the customer value dimension is perceived, could differ from other CBMs, where more emphasise may be on 'access' over ownership, i.e. Product Service system (PSS) models (Tukker, 2004).
- **Availability of raw material: An issue which affects the different CBMs differently, based on its final offering.**
Recycling directives from the government for tyres may be a potential threat for BBC, as their raw material is directed away to recycling centres. On the same note, Seljak brand receives a better response from the bigger companies to offer solutions for textiles waste as recycling regulations get more stringent. Moreover, legislation could play a role in altering the assessment carried out over time. As the legislation targeted to optimize reuse before recycling as well as assigning more responsibility to producers (e.g. Extended Producer Responsibility) could further change the score assigned to each value dimension in the evaluation scheme presented.

- **Location:** The case studies selected from different geographical regions. This was an attempt to capture an overview of value generation in CBMs operating under different geographical and/or political settings. The value creation opportunities remain similar across the different regions, but some places were more conducive to derive more value. For example, Seljak Brand is currently looking for alternative solutions for energy use reduction. However, it is limited in the availability of suitable partners operating on sustainable energy sources in Australia. Polyplank does not assign a high value to symbiotic relationship with other firms as it has had to face barriers and received low response within the Swedish system. However, Black Bear Carbon in Netherlands regards inter-firm networks to have a high potential for value creation. This could be due to its smooth relations and higher involvement with university partners, government initiatives and industry networks.

Thus, it is clear from this discussion that the results would greatly differ if the researcher would have selected other types of companies. The evaluation scheme developed in the thesis, presents flexibility in assigning scores to each metric, based on a company's key features like size, strategy, location and ethics. It is safe to assume that the findings presented here are applicable to SMEs operating in developed countries with a particular resource efficiency strategy. However it may not be extended to companies with very different characteristics. Finally, taking more case studies for comparison and analysis can strengthen the validity of this work.

6.4 Discussion on Metrics Selection and Scoring Method

The metrics are derived after a review of available business model analytical frameworks and tools. A combination lenses used in these frameworks, was used to develop the value dimension metrics. The literature review revealed some frameworks that used SWOT analysis techniques, made use of performance indicators, while some others had a multi stakeholder analysis focus. The metrics for this evaluation scheme were developed after setting a key question under each value dimension, using the approach from the NICE model (section 2.2). For example, the 'Network value dimension' metrics were chosen if they fit into the key question "Is value captured from improved networks that are inherent to CBMs?" Here the chosen metrics were, 'inter-firm networks', 'intra-firm networks' and 'success of competitors'. These were found to be inherent to most CBMs and the researcher enquired if these 'network elements' had indeed been a source of value for the company.

In order to adequately assess value generation, the researcher reasoned that indicators must give a holistic picture and include a range of intangible aspects, such as benefits from collaboration and competition in networks, leadership in the field and value creation through use of available information. However, bias must be accounted for when developing such qualitative metrics. It is inherent to the definition of qualitative information, that it is incomparable and individual judgement unavoidably introduces subjectivity. Ultimately, this raises questions on the validity of qualitative metrics for value evaluation. Neither literature analysis nor experts have yet provided a clear and tangible definition for qualitative indicators with regards to value generation, therefore further research is needed in this field.

Scoring method development accompanies its own biases and risks. To analyse data, one must understand the Likert measurement scale. The numbers assigned to Likert-type items express a "greater than" relationship, but, how much greater is not implied (Boone, 2012). The researcher has adapted the Likert scale of 1-5 numerical, to instead have scores from -2 to +2. Each indicate the extent to which a source of value was seen to be utilised by the company. A band-wagon effect, which often accompanies the Likert scale could make responses biased, as the

participants are known to be inclined towards the higher scores on the scale. The researcher has tried to address this issue and to minimize their influence by assigning the score based on further in depth discussion and observations from data available on company website etc. A justification statement is provided along with score in each case (Appendix C, D and E).

Overall, findings from the empirical study support the importance of the value dimensions identified during the literature analysis. By integrating the above mentioned findings, a scheme for evaluating value generation sources is created by the researcher. The “Value Circle” evaluation scheme consists of two components – a ‘value metrics checklist’ with a scoring method and visual representation through ‘value circle’ pie charts. Within each of these value dimension, the scoring awarded to each value metrics is presented as a slice of the pie chart. It is a simple method which assists companies in operating their CBM through an improved understanding of value generation from a multi-stakeholder perspective. With scoring and visualisation, companies can identify value generation sources that can be explored further. The value metrics checklist allows for all the value dimensions to be seen together and how a company may increase value generation in a particular dimension, by leveraging opportunities from another dimension.

However, the evaluation scheme requires further development as it suffers from several shortcomings. The scoring method may be interpreted differently by people of varying levels of knowledge on the subject, even within the same company. For example, a business developer’s assessment may differ from the assessment carried out by the environmental manager. Additionally, some metrics maybe considered redundant or not applicable in certain cases. This would present difficulties in the final visual representation and would require a different approach. Furthermore, the usability of this tool may be enhanced if the assessment is carried out by an external person who can combine the opinion of the different departments within a company or organisation. Finally, analysis of more literature, studying value creation strategies and the impact of national and international policies, could help in expanding the list of metrics.

7 CONCLUSION

In light of the emerging business models aligned with the circular economy principles, some research gaps were identified in this thesis. The need for evaluation tools suitable for CBMs has been highlighted. This section revisits the research questions to ensure that they have been answered and outlines the major conclusions of the literature analysis. Based on the literature analysis and results presented above, it further explains the relevance of this thesis within the field of knowledge and provides recommendations and suggestions for future research.

7.1 Revisiting the Research Questions

This thesis set out to devise an evaluation tool for value generation in a CBM. Two research questions were set in order to find appropriate value generation sources and consequently create a simple tool for value assessment in CBMs. The research follows a two-step approach to answer these questions. A summary of answers to the research questions is presented below.

RQ1. What are the different dimensions of value creation offered by circular business models?

For the RQ1, a literature analysis identifies the different sources of value generation, available for businesses to explore. They are categorised into five dimensions of value creation, after a thorough discussion on the concepts of business models for CE and value. These five categories go beyond those found in linear business models and include, environmental value, information value, and network value, in addition to customer value and economic value.

RQ2. What possible metrics can be used to build a simple tool for assessing the identified value dimensions?

A list of relevant metrics was produced as a first step for the evaluation tool. A review of currently available business evaluation frameworks and tools was conducted, and used as guidance to develop a value metrics checklist. The researcher then engaged in semi-structured interviews with company representatives from selected case companies to gain an in-depth insight on the case company's efforts towards value generation in each dimension. Each value metric was given a score, according to a simple scoring scale. Each metric was discussed in detail, to provide support for the scoring awarded. In consultation with an expert, the value metric checklist is revised to check for inherent biases that may arise.

7.2 Contribution to Research

This thesis contributes to the Resource-Efficient and Effective Solutions (REES) project based on circular economy thinking. With a goal to assist companies with devising better circular business models, researchers need to understand how CBMs are designed and which tools are used as well as what companies are missing. The "Value-Circle" evaluation tool consists of a value metric checklist and a pie chart based visualisation method. It forms a simple approach to assist companies in operating in a CBM, through an improved understanding of the areas of value generation. It explores how CBMs can assess the different sources of value generation available to them and create new opportunities.

The implication of the results delivered by this thesis can be seen from four perspectives:

- From a theoretical perspective, the outcomes of an extensive literature review show that the tools available for evaluation of business models are not sufficient for measuring value generation in CBM. The findings give a starting point for further research in this area and indicate a research gap, which is explored in the thesis.

- As a practical implication, the findings show that some value dimension metrics which are identified, are more suitable than others, depending on the type of CBM. Due to size of the firm or the resource efficiency strategy adopted in the CBM, the scores assigned to the value metrics will vary.
- Although there are no direct implications for policy, the findings of the interviews showed that legislators must look at value generation opportunities in CBMs to offer incentives for businesses to adopt the Circular Economy. For example this could include better facilitation for inter-firm networks to overcome barriers, which includes introduction of new legal bodies and incentives.
- The method for evaluation is based on a two-step procedure, consisting of a checklist and a pie chart. This approach is simple which can be adapted for further research on creating evaluation tools and frameworks, not only for value generation in CBMs but for any other business development tools. The simple evaluation scheme created in this thesis needs to be worked upon for better user interaction and wider application.

7.3 Recommendations for Future Research

This thesis identifies several knowledge gaps that could be addressed through future research. One of the first recommendations is to study related consumer behaviour. Since this thesis is based on interviews with companies and industry experts, it limits the incorporation of customer viewpoints. By observing consumer behaviour some additional indicators would need to be studied, which could give better insight on value creation. Finally, expansion on this work by further studying literature on value creation strategies and the impact of national and international policy, could be added to strengthen the validity of this work. In conclusion, academia and practitioners must come together to develop new assessment tools, which can help companies enable a Circular Economy.

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Appendix A: Value metric checklist

VALUE DIMENSION	METRIC CODE	METRIC	SCORE
ECONOMIC	EV1	Revenue generation by Accesss to new market	
	EV2	Cost savings	
	EV3	Risk Reduction	
	EV4	Monetary Benefits from Policies/Tax Benefits Of 'Circular Economy' Initiatives	
	EV5	EV 5: Reduced waste disposal costs	
	EV6	Corporate image "leader in the field"	
CUSTOMER	CV1	Reduced Lifecycle Costs	
	CV2	Customer satisfaction and loyalty/ 'relationship value	
	CV13	Pricing	
	CV4	Availability of After-Sales Services	
	CV5	Ease of access for the Customer/ Access to functionality	
	CV6	Providing a 'choice' or Alternatives to Customers	
ENVIRONMENTAL	EVO1	Substitution of virgin material	
	EVO2	Extent of reuse of a resource	
	EVO3	Decreased used of Toxic Materials	
	EVO4	Waste minimization & Less waste to dump	
	EVO5	Energy Use Reduction	
	EVC1	Integration of Eco-design thinking	
	EVC2	Green Certifications	
NETWORK	NV1	Inter-firm network	
	NV2	Intra firm network	
	NV3	Success and Popularity of Competitors	
INFORMATION	IV1	overall increase economic value	
	IV2	Information Exchange Platform	
	IV3	Consumer Behaviour Related Feedback for Product Improvement	
	IV4	Real Time Knowledge on Product Performance	

Appendix B: Interview Guide for company representatives

KEY INFORMATION OF CASE COMPANY:

Please fill in the following:

- Company size (<10, 10- 100 or more than 100 employees):
- Company age, (in years):
- Customer orientation (business to business/consumer)
- Sector(s) of operation:

Information on their business model:

- Acquisition of secondary materials:
- Potential offer to supplying company:
- Key resources to enable acquisition:
- Products produced:

Interview questions:

1. Has any framework been utilized by your company for business model development process?
 - No Framework used
 - Self developed Framework
 - Standard BMC (business model canvas) or any other Theoretical Framework
2. What is the Company's Insights on using the results from BM analysis activities? Do you feel the need better tools to evaluate?
3. What are your thoughts on; the need for a holistic approach to assess the overall impact of Circular BMs, that go beyond economic and customer values?

Table: Value Dimensions and Key Questions

Economic. How does the CBM create value elements which add to the company's performance and monetary benefits?

Customer. How does your CBM provide value, compared to the next best alternative for the customer?

Environmental. What are some company level opportunities for creating environmental value? (In operation + compliance)

Network value: Is Value being captured from improved networks inherent in your CBM?

Information value: Has information flow, feedback and exchange of knowledge helped create value in your CBM?

Appendix C Interview transcript for case study1: PolyPlank

Interview with: Annika Fjernund (Owner)
May 8th, 2017

INFORMATION OF CASE COMPANY:

- Firm size (no. of employees): 20 employees
- Firm age (in years): 20 years

Other information:

- Customer orientation (business to business and/or business to consumer):
Business to Business
- Sector(s) of operation: real estate

Key activity: Produces recyclable composite material, from which planks are made.

PolyPlank is producing noise barriers and also engaged in the real estate sector.

BM Interview questions:

Q.1. Did you use any frameworks or the standard BMC during planning?

- No Framework used
- Self developed Framework
- Standard BMC (business model canvas) or any other Theoretical Framework

No it is only common sense. We had a very foreseen model. The people who started the business started it as, the first idea was to be able to do something with plastic waste. One of the founders voice working with recycling the plastics, And he contacted the other start up person who was an expert on plastics. It all started with a very circular business idea. But no other frameworks or canvases were used. It underlines everything we do as it was the first idea, based on experience so people involved.

Q2. What is the Firm's Insights on using the results from BM analysis activities? Do you feel the need better tools to evaluate?

I am not sure as we are so small and as long as we are the board is not necessary, in the long term. We don't know how much knowledge and competence there will be regarding circular economy so it always Good to try and document things although you never know what will be used or not used. So not at present.

There is future potential can be seen If something happens to the people engaged in the business right now.

Q3. Your thoughts on; the need for a holistic approach to assess the overall impact of Circular BMs, that go beyond economic and customer values?

We use as our biggest unique selling point and provide our customers with a good writing text material for environmental reporting and it's a good thing. Also its a big commercial value for them for them to be able to show that they are forerunners in the circular economy. We can try that a bit with the BMs

VALUE BASED METRICS

SECTION 1. VALUE DIMENSION: Economic

How does the CBM create value elements which add to the company's performance and monetary benefits?

Revenue generation
(by Access to new market)

Additional revenue generation due to your CBM. Such as benefits derived from tapping into the new "green markets" or "next life markets"

Annika: Not really, well they don't are any markets in Sweden Right now and they are building up and Gathering trying to build platforms and networks but I don't think we are there yet. It's slightly but coming. We are trying to explore it and we have been contacted by some parties to join their Networks to connect people with the same values but we have not seen the economic benefits yet. We have committed to it, but it is far from our Core Business right now

Cost savings

Difference observed/calculated in what is being spent now versus what would have been spent without going circular. E.g. recovery of returned products for achieving savings in material-, production-, operation-, and logistic costs

Annika: yes much larger.

Risk Reduction

secured business from risk of resource scarcity;

How resilient do you feel against volatile market prices and changing laws?

Annika: Medium. Because it is also a risk working with secondary materials as this market is also very narrow and volatile. But now we that can work with retake of our own raw materials that saves a lot of trouble.

Monetary benefits from policy changes /tax benefits of 'circular economy' initiatives

Have you noted benefits from supportive policies that resulted in noticeable monetary gains

Annika: not that I know of. But is there? Can be read about in policy changes.

Reduced waste disposal costs

If part of the waste stream directed away from disposal site? Monetary benefits from not having to pay for transport/treatment of waste

Annika: yes definitely large reduction

Corporate image as a leader in the CE field

Has this brand image helped attract profit and customers?

Annika: yes definitely

SECTION 2. VALUE DIMENSION: Customer

reduced lifecycle costs

Reduced maintenance Cost and/or disposal cost for the customer offered through your CBM. (egg, designed for durability or design for X)

Annika: yes

customer satisfaction and loyalty/ 'relationship value'

Value derived from an emotional bond created to the brand - valuable to retain customers

Annika: we are trying to build this and make them see the long term Benefits of a long-term relationship and if we are engaging in industrial symbiosis and tighten the relationships. But, we are at medium heart right now. It takes time.

Price (ideally lowered price paid for product vs quality)

Communicating savings your firm has offered for customer in comparison to next best alternative at the time of purchase

Annika: It's about the life cycle cost and that is why only the phones that can see long term Benefits can be. As in real estate can only long term scope can work. But on the industrial symbiosis we have a couple of short life cycle customers as well and that's where we the 'take back' of the material and we recondition or re make them if they are damaged,

Those customers are more interested in... But with them all so we can show them a lower cost on the long term as they do not have to pay for the reconditioned product. The long term customers are mainly important but short terms are key too.

We have been here only 20 years while the product guarantee is 25 years or even more so we don't know.

Availability of after-sales services *post sale services an attractive value for customers?*

Annika: We are not there yet as it is a totally different engagement. For Real estate if we would just sell the noise barrier function that would Change our business model so much to work with Services than with products. That we are now investigating but it will take a long time or so we have some availability now because now we take back materials from the industry so that is one service... but we have a long way to go.

ease of access for the customer/
better access to functionality *Has your firm explored all options of making product or service best accessible to customers*

Annika: Yes definitely it's a part of the economic model that you develop a new service. You need new avenues.

Providing 'choice' or env.
Friendly alternatives in the market *Has your firm enabled customers to have the possibility to choose what is ethical or better in terms of their ecological footprint?*

Annika: That's what we try to do and we tried several different strategies. On our homepage, what the story the sales people can tell. We started an year ago with the core pitch is That we provide our customers to reach their environment goals. And that is the main pitch for selling in our business, and we are trying to retell the story and to see what the market is ready to receive.

SECTION 3. VALUE DIMENSION: Environmental

Substitution of virgin material *To what extent does your primary product have secondary input*

Annika: We are trying to be a hundred percent secondary, we buy this recycled or waste material from the Plastic industry and the wood industry. But when there are none to buy then

we are forced to buy new material to be able to deliver, which is a very big problem. Right now there's no problem as we have a couple of different suppliers. But when I started the main suppliers from Netherlands went broke and we had a problem. But, now we are trying to spread out the risk and find many suppliers.

Extent of reuse of a resource

Number of times of reuse of components/ number of cycles can be increased?

Annika: I have been thinking about it, maybe actually composite firms could maybe use on material but they would have to put in glues and combiner that we don't use. That's why the uniqueness of our material is there many people can make composite material planks from secondary material like us, but none of them become a hundred percent re recyclable. This is because the put in glues, and can't use it in the same way we can. This is our uniqueness and it is why we get into more expensive as it is a more tricky way of doing it and to get the process right you have to put in more effort, as well as more energy.

Decreased used of toxic materials

Decreased used of toxic materials impact on public health is reduced.

Annika: I would say too little. We are having some test on emissions etc. but I am not really sure what kind of emission test has been done. So, this is something we are now investigating as well as we now one to use these panels inside for example in laundry rooms so if the market demands we can show is non-toxic in the long run. It all depends on drama that has been in the box or material or the waste plastic from old containers then the plastic can contaminate it. So it is more about controlling the origin of the secondary material or plastic we buy. As long as we can guarantee that it is only polyethylene and nothing is then it is not a problem. But plastic is I don't know how many millions are thousands of blends. (complex)

waste minimization (less waste to dump)

Environmental + economic gains from spending less on waste disposal

none

energy use reduction

Environmental + economic gains from spending less on energy

Annika: every change of colour or dimension means die menschen long start up hours. we reuse or recycle waste on the resource side, so it is not the problem. But that is a problem on

the energy side. We are working on that footprint neutral on the energy supply side. We are not there yet - an are we can improve. Need to be more sustainable here.

integration of Eco-design

Attainment of company's own Environmental Goals

Annika: I would say as the start idea was eco design friendly, it has been an always been part of our work ambition. And as we have a more expensive material it is a very important criteria to be shown to our customers. (One well explored area)

Green certifications compliance

reduced impacts and reaching national sustainability goals

A lot of suppliers in Sweden require that you have the different certifications and there are plenty of different certifications in Sweden. We are dealing with it all the time and we are certified with some of them but not all of them. As it is costly, and you have to choose.

Section 4. Value Dimension: Network

inter-firm networks utilized : To acquire additional resources and capabilities

Strategic partnerships and cooperation with other business in the value chain to strengthen the entire chain, making all partners + focal company, more resilient. collaborative ventures in action that yielded measurable positive results

Annika: I find it really hard to deal with this in Sweden. This is something that Sweden needs. If the state helps us in gathering the firms interested together. It would help. The response was not that great and there is some sort of monopoly and difficult to put in time and effort.

intra firm networks in place - that have led to higher efficiency in operations

stronger vertical connections within the firm due to closed loop cycling

Annika: As we are so small I would say no but we are just 20 people so it might be a case for a bigger firm as they can benefit with inter firm we are small so there is not much of a difference as we are working together mostly.

success of competitors in the industry

Has the general popularity of your idea in the market helped popularize your product or service? Have you sought access to a 'CE community or network' that can add possibilities of symbiosis/exchange.

Has your Connection to larger scale CE initiatives and consultancies with access to expertise helped you grow significantly?

SECTION 4. VALUE DIMENSION: information

4.1 overall increase economic value due to increased availability of information:

We are working on it as it is a part of retelling the story but so far the feedback has mostly been informal and undocumented. One of my main intentions in the board here is to record information and feedback so we can show that as a part our story, to our customers.

4.2 information exchange platform

*CE based business make use of ICT innovation to create platforms for sharing and selling (**enhanced network value**)*

Annika: Amazing to use all the available brain capacity. Students give us the capacity to work as we don't otherwise have the money for such work.

We are now building connection with stora enso for them to see that we can do it again. They were not involved before. We did it in 2009 was too early but maybe the market are getting ready. We can engage in more student work. It would be exciting to be able to get some kind of industrial symbiosis going

consumer behaviour related feedback and interaction recorded and used

*consumer behaviour related feedback HAS BEEN incorporated into service and product quality to **increase customer value***

Annika: We have a good dialogue with a customer and they are all the time trying to adjust and be Market friendly and listen to feedback. And this definitely increases the customer value to have this channel open all the time.

Real time Knowledge on product performance

*ICT enabled leasing out can be monitored to make the service more resource efficient and better life cycle management (**increased environmental value**)*

Annika: So since we are a part of the REES then we have many students calculating the LCA now in the composite plank Department. We have not yet done it before for composite planks, when that comes in then it will be so much easier to detect the big elephants that we have to work with.

Appendix D Interview transcript for case study 2: Seljak

Interview with: Samantha (Owner)

May 8th, 2017

INFORMATION OF CASE COMPANY: SELJAKBRAND

- Firm size (no. of employees): 2 employees
- Firm age (in years): 1year (founded 2015)

Other information:

- Customer orientation (business to business and/or business to consumer):
Business to Business and business to consumer
- Sector(s) of operation: textiles
- Product sales/ Market share/ Annual turnover: not to be shared

Key activity: recycled merino wool blankets in Tasmania out of offcuts from the factory floor. They are made in Australia at the oldest wool mill.

Additional: 'Social enterprise' local production of blankets and for every 10 blankets sold, one to the asylum seekers centre.

BM Interview questions:

Q.1. Did you using any frameworks or the standard BMC during planning?

- No Framework used
- Self developed Framework
- Standard BMC (business model canvas) or any other Theoretical Framework

SAM: Nothing much, we just worked on the tools available for value proposition etc. since then we haven't looked into this.

Q2. What is the Firm's Insights on using the results from BM analysis activities? Do you feel the need better tools to evaluate?

SAM: We are in the process of applying for B corps certification so, it's a pretty stringent process and a very good way to map your progress in a sustainable business, also your value and impact. It is extremely difficult to get through and get the certification. In terms of Evaluation tools, that has definitely been a big help for us to see areas we need help in improving on. But also it is a paid certification, so it would be helpful and amazing to have a framework that is more readily available to us.

Q3. Your thoughts on; the need for a holistic approach to assess the overall impact of Circular BMs, that go beyond economic and customer values?

Sam: Most firms that are following business models like I would want to reject the current paradigm of take break to a truly sustainable way of doing business which obviously includes the environmental and social aspects and also just responsible consumption and production. So, we don't want to sell any products that we don't have an end of life solution for I want to promote responsible consumption, so we are creating products that have a really long life-span like our blankets that outlive the owners basically. The product itself will last a very long time and we are using renewable resources wherever possible. Every part process Including

production and marketing is from a holistic perspective in including the environment and the society and of course the economic perspectives.

VALUE BASED METRICS

SECTION 1. VALUE DIMENSION: Economic

How does the CBM create value elements which add to the company's performance and monetary benefits?

METRIC	<i>Explanation</i>
Revenue generation (by Access to new market)	<i>Additional revenue generation due to your CBM. Such as benefits derived from tapping into the new "green markets" or "next life markets"</i>

Sam: Just from the past year that we have been doing business, we had about 30 Publications in Australia and around the world that have featured our product and we are accessing a whole lot of new customers and there is definitely more and more aware people want to support closed-loop businesses. So, customer segments both have people Get value from the very refined and beautiful products as well as those people who are conscious consumers and don't want to waste their dollar and support those companies that are doing More than just the status quo. We also tap into Market that are more about longevity, not necessarily of sustainability Market, but a market of that is about quality over quantity. I think that is another one that has added value

Cost savings	<i>Difference observed/ calculated in what is being spent now versus what would have been spent without going circular. E.g. recovery of returned products for achieving savings in material-, production-, operation-, and logistic costs</i>
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Sam: Since the material is at least productive can save by the lower cost than virgin cloth, but, given we are manufacturing in Australia, the cost of Labour is extremely high. So made in Australia is important for us Because we know the worker safety rights are of really high standards and that is really important to us. Compare to production that is going to China or India that will involve an accredited or certified third party etc., to ensure people get paid properly. While using waste as a resource is a cost-saving but labour with high wages does increase the price of our Product quite significantly then if we were to produce it overseas. (Reaching other objectives). A lot of people, see the value in the product being made locally and want to invest in that, so that has not been so far a setback for us.

Risk Reduction	<i>secured business from risk of resource scarcity; How resilient do you feel against volatile market prices and changing laws?</i>
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Sam: I don't think that there is lowered risk than other businesses because we are manufacturing in a complex way so it is not like everything is available readily suppliers, there are people who cannot for some reason manufacturer for us anymore. So, we share the risk as businesses with a different, not a circular business Model.

Monetary benefits from policy changes / tax benefits of 'circular economy' initiatives

Have you noted benefits from supportive policies that resulted in noticeable monetary gains

Sam: No. based in Australia the company, we manufacture in Australia. Seljak does not access any EU or Swedish govt. initiatives.

Perception: I know Sweden is more open to moving to CE. Just right now, have not seen anything yet here. But applying for some business grants etc. from Region Skane. They are interested but not as yet achieved any particular benefits

Reduced waste disposal costs

If part of the waste stream directed away from disposal site? Monetary benefits from not having to pay for transport/ treatment of waste

Sam: we do not own the manufacturing facility so waste management is not our responsibility. But I know that the mill that we are working with will derive benefits, the supply chain that we work with will also benefit. But we don't I think that ultimately it would imply that they can Provide us with lower prices. So it would you know, trickle down to what we pay them but there's no direct cost reduction in the waste management.

Corporate image as a leader in the CE field

Has this brand image helped attract profit and customers?

Sam: yes definitely we had some of Australia's biggest corporate company's approach us for Textile waste. So there is a big demand in the area so there it helps.

SECTION 2. VALUE DIMENSION: Customer

reduced lifecycle costs

Reduced maintenance Cost and/ or disposal cost for the customer offered through your CBM. (e.g. designed for durability or design for X)

Sam: We take care of the Keeping the resource to the highest value then we see that the conscious consumers are being served.

customer satisfaction and loyalty/ 'relationship value'

Value derived from an emotional bond created to the brand - valuable to retain customers

Sam: absolutely! In fact we had a crowdfunding campaign for our brand and we had aim of 30 days for a certain amount. But we managed to raise it within just 2 days, this says something for us that the people are willing to support us.

Price (ideally lowered price paid for product vs quality)

Communicating savings your firm has offered for customer in comparison to next best alternative at the time of purchase

Sam: I think that this a very location based issue. Since we have Australia based products we have the standard Australian products pricing. Of Course these products cost higher than the offshore produced products, but as the demand is growing we are trying to introduce wholesale prices.

Availability of after-sales services

Post sale services an attractive value for customers?

Sam: We don't anything right now but there are some ideas in the pipeline like cleaning and mending services that we want to be able to offer as we grow, maybe.

ease of access for the customer/ better access to functionality

Has your firm explored all options of making product or service best accessible to customers

Sam: We are both a B 2 C company which is largely online, and then we have B2B connections both through wholesalers and through corporates mainly. But yes sure, new channels are being explored we have different streams we are looking at through some consultancy etc.

Providing 'choice' or Env. Friendly alternatives in the market

Has your firm enabled customers to have the possibility to choose what is ethical or better in terms of their ecological footprint.

Sam: yes the product offers an environmental value and as I said quality over quantity to customers. We also have a social enterprise model which offers a unique selling proposition for us.

SECTION 3. VALUE DIMENSION: Environmental

Substitution of virgin material

To what extent does your primary product have secondary input

Sam: We use about 80 percent recycled wool but 20 percent is polyester. Although this still is coming from the existing stock of the mill of polyester.

Extent of reuse of a resource

Number of times of reuse of components/ number of cycles can be increased?

Sam: I think we are too young to tell plus this is a long lasting product. We estimate 4 to 5 times. Also we imagine that customer segments to change. Off cuts can be used and re used again so there's a lot of cycles essentially.

Decreased used of toxic materials

Decreased used of toxic materials impact on public health is reduced.

Sam: We aim to make more of un-dyed products but still as there is a demand. We need to provide our customers with choice and so as you can see on the online menu there is blue and other bright colors but some of the bestselling products are not dyed ones.

waste minimization (less waste to dump)

Environmental + economic gains from spending less on waste disposal

All the Off cuts can be used and re used again so there's a lot of cycles essentially and not much waste left to deal

energy use reduction

Environmental + economic gains from spending less on energy

Sam: The mill we work with uses hydroelectricity and are using poppy seed oil for the process. In fact solar panels could be a future option but it really depends on the choice of Mills available is limited. We have to go with what is out there in Mills.

integration of Eco-design

Attainment of company's own Environmental Goals

Sam: we kind of started with sense of eco design. My sister did a degree in fashion at university with business and Design so can we. The University waste free pattern making. So we had the thinking behind it in our business which is grounded in our plans from the start.

Green certifications compliance

reduced impacts and reaching national sustainability goals

Sam: Apart from B corps we are applying for 'Ethical clothing Australia' - Australia's certified body for a textile Manufacturing and clothing production. But for small businesses, certifications are really expensive. So it's difficult to walk out if it's valuable or not, but it does provide a sense of legitimacy so we do find Value in it. Also valuable to be a part of the network and proving what you are saying you are doing.

Section 4. Value Dimension: Network

Is Value being captured and created from improved networks?

inter-firm networks utilised : To acquire additional resources and capabilities

Strategic partnerships and cooperation with other business in the value chain to strengthen the entire chain, making all partners + focal company, more resilient. collaborative ventures in action that yielded measurable positive results

Sam: Our network is largely grounded in the circular economy and the textile sector in Australia. And social Enterprise Network as well as sustainable business Network we have a lot of little Networks in ecosystem which can be utilized for different reasons. Networks are really Key to Our Success so there is a lot of chance to speak at conferences because of these Networks. In day to day to operations not sure of their impact, but general support is available.

intra firm networks in place - that have led to higher efficiency in operations

stronger vertical connections within the firm due to closed loop cycling

Sam: Given that we are such a Tiny team, this question is not relevant for us. But as we grow we would like to apply those kind of principles to our organisational structure. I think it depends on the culture of the business and it could work in many different ways, whether in a circular business model or not. Employees impacted by attracting the kind of people who will work here.

success of competitors in the industry

*Has the general popularity of your idea in the market helped popularise your product or service. Have you sought access to a 'CE community or network' that can add possibilities of symbiosis/ exchange.
Has your Connection to larger scale CE initiatives and consultancies with access to expertise helped you grow significantly?*

Sam: I wouldn't say that we use an external expertise except for a our partners like the mill to help out. I would say that the network did not help us stop the business but are helping us to grow the business. Later stage.

SECTION 4. VALUE DIMENSION: information

4.1 overall increase economic value due to increased availability of information:

Yeah we definitely have a lot of information flow in the networks and helped us to sort potential opportunities, which helps us in economic gains

4.2

consumer behaviour related feedback and interaction recorded and used

*consumer behaviour related feedback HAS BEEN incorporated into service and product quality to **increase customer value***

Sam:

Most of our feedback has been positive. Our Social media platforms are very open and so we have in been very Interactive with our audience and customers. Which means more space for information sharing. And we have more information.

4.2 information exchange platform

*CE based business make use of ICT innovation to create platforms for sharing and selling (**enhanced network value**)*

Sam: our network is largely grounded in the circular economy and the textile sector in Australia. And social Enterprise Network as well as sustainable business Network we have a lot of little Networks in ecosystem which can be utilized for different reasons. Networks are really Key to Our Success so there is a lot of chance to speak at conferences because of these Networks. In day to day to operations not sure of their impact, but general support is available.

Real time Knowledge on product performance

*ICT enabled leasing out can be monitored to make the service more resource efficient and better life cycle management (**increased environmental value**)*

Sam: We would like to have but we don't currently use this. It's a mill's area and they don't have the resources to measure that. We would like that as it is also a part of the B corp certifications and fits well with the overall strategy.

Appendix E Interview transcript for case study 3: Black Bear Carbon

Interview with: Clara Song (FINANCE & BUSINESS Head at BBC)

INFORMATION OF CASE COMPANY: Black Bear Carbon (BBC)

- Firm size (no. of employees): 16 employees
- Firm age (in years): officially started in 2010, but commercial in 2014 (a joint venture)

Other information:

- Customer orientation (business to business or business to consumer): Business to Business
- Sector(s) of operation: carbon black (chemical industry), oil and electricity (mixed)

Key activity: transform used-tires into high quality carbon-black and other by products

Questions on business modelling activities at the firm

Q.1. Did you using any frameworks or the standard BMC during planning?

Clara: We did a lot of things but it is like the business model is continuously changing and at One point we were not so much focused on establishing a business model But focusing on the business itself, such as Focusing on the technology and getting it started etc. recently, I conducted a general SWOT analysis, break-even analysis etc. and recently heard of subsidies from climate KIC. So we created business model canvas recently as a case proposal for them. Made use of traditional business modelling tools.

Q2. What is the Firm's Insights on using the results from BM analysis activities? Do you feel the need better tools to evaluate?

Clara: For us, it's not about the business model as you can see the we already have on your of customers .and From a lot of different markets that have a lot of different operations. Not only carbon black but we also sell electricity and oil Which is a by-product. The Oil Market is very different from the carbon black market so we need a knowledge of a lot of markets. As carbon black is a completely different product group which complicates the whole process. So now we are looking to partner and some joint ventures with tyre collectors. And they also are in a way our former customers in a way. So it's an appeal to them to tell them this is way to get high returns. And so then they are in kind of customers as well but within this web we need to understand that in the traditional business model that is a limitation because once we move out we will have customers all over the world. Dealing with MNCs Located everywhere and even have a row plant located where the tires are and then you find us everywhere with different partners. So now our BM is suddenly expanded by 10 times and then a 100 or a 1000 times so we see a limitation in current model to see it on scale.

Currently what do business model does for us is to help us reinforces what we knew anyway. We are very communicative anyway with just 6 members so it is very open. The BMC Helps us visualize it & put it down on paper.

Q3. Your thoughts on; the need for a holistic approach to assess the overall impact of Circular BMs, that go beyond economic and customer values?

I'll be the Devil's advocate here. you see, Unless you are economically viable and you actually have a successful company, and to be a successful Supply Company most companies are doing that you can get by the bare minimum social and environmental requirements and there's a general stigma on being 'green' by being so circular. So it gets difficult to convince customers because of the stigma attached to Circular and I feel like most companies are doing that.

It should be like operating like any other company and do away with this stigma.

VALUE BASED METRICS

1. ECONOMIC

Revenue generation

(by Access to new market)

Additional revenue generation due to your CBM. Such as benefits derived from tapping into the new "green markets" or "next life markets"

Clara: No, we tap into existing markets. We have a Sales based commission fee on the carbon black sales.

Cost savings

Difference observed/ calculated in what is being spent now versus what would have been spent without going circular. Eg. recovery of returned products for achieving savings in material-, production-, operation-, and logistic costs

Clara: we are CE based company by nature. And we provide the cost savings to the tire collectors or the customers But do not benefit from the cost savings that they do. It's an offering if u compare the cost of producing carbon black from our process than the traditional way of producing carbon black which is a huge market 40 million tonnes per year. So coming from crude oil, if you compare the same tonnage with our carbon black with that carbon black, then there it is much cheaper to produce it with our technology. Then they can sell the carbon black at the same price with considerable returns for the tyre collector.

For the customer, because we also do a lot of R&D for carbon black and post production process like better quality of ink and paint for better blended colour from. We do a lot of R&D To ensure that when we add carbon black into a water borne paint then it disperses very well. So our customers who mix the paint don't have to put a lot of energy and time and cost into dispersing The carbon black so we can offer them of saving of 20% in their process.

Risk Reduction

secured business from risk of resource scarcity.

How resilient do you feel against volatile market prices and changing laws?

Clara: it is not a scarcity issue for us, As more and more people are buying cars so the, Availability of Tyres is not seen as a problem. Furthermore, we think there is challenges to recyclers. I mentioned 2 ways of recycling: mainly one they ship it abroad, but that is becoming more and more strictly regulated. And a lot of people have considered the toxicity of the certain chemicals in the tyre and is considered to be carcinogenic. There was a lot of concern of tires in playgrounds and football fields and now that is considered a health hazard for human contact. So that Market has been reduced too in the past years, both US and Europe.

Energy recovery is also another problem which is not showing up because there are Chinese and Russian tires that Have entered the market that are cheaper have a higher Quantity of this toxic chemicals called PAH. Because of this they exceed the chemicals level. So they are not able to use them as a source of fuel anymore. So the alternative metal recycle is slowly dying out. They are now continuously looking for alternative is to recycle.

Monetary benefits from policy changes /tax benefits of 'circular economy' initiatives

Have you noted any benefits from supportive policies that resulted in noticeable monetary gains

Clara: they could be a policy. They are tied to a waste tyre market that is connecting us. the only realistic threat is there are recycling initiatives out there. They have not reached a same technical level that we have but they may be able to deplete some of resource that we have. But our business model of partnering with the tires recyclers is quite unique in the market. It means that they have a secondary Reason to also partnership with us.

Not only do they have a long term supply contract, but there is benefit of return on investment in this joint venture. So that is how we hope to counteract that.

Now for carbon black Pricing Is however very much pegged to crude oil prices. The waste tyres too are slightly pegged to crude oil prices. so this area is tied to crude oil prices. But because we are not producing crude oil, it has a rising waste tyre prices is only a small part. Even if the prices are strongly volatile it meet up only a very small part or say less than 20 percent of the whole total production market for us. But In the traditional Market, it is literally a one to one correlation and it is directly in line with crude oil prices. Then the costs are competitive in the carbon black market. If oil prices go up then our Margin for us goes up.

Reduced waste disposal costs

If part of the waste stream directed away from disposal site? Monetary benefits from not having to pay for transport/ treatment of waste

Clara: The only thing we have is a cleaning which is needed with activated carbon. There is a cleaning fee and that's it.

Corporate image as a leader in the CE field

Has this brand image helped attract profit and customers?

Clara: general corporate image has helped us get our foot in the door. A lot of CEOs who are our advisors like Shell etc. it has helped us get there. But In the actual customer Market that we work with It is about delivering quality. It is a very traditional market and we have to do a lot of testing before it is approved. So there it works

not because of the circular image but because of the quality that we offer. Sure it is green but not just the circular image that helps. More and more customers are looking for green but if you can't match with the quality and the price then it doesn't work.

SECTION 2. VALUE DIMENSION: Customer Value

reduced lifecycle costs

Reduced maintenance Cost and/or disposal cost for the customer offered through your CBM. (e.g. designed for durability or design for X)

Clara: There is better coverage with the paint from this carbon black and also the company want to be green. So we offer Products with carbon credits to The really like that we Help them reduce their carbon footprint and reduced prices.

customer satisfaction and loyalty/
'relationship value'

Value derived from an emotional bond created to the brand - valuable to retain customers

Clara: : yes It is a very one to one market so we have to build relationships . the R and D team, sales team etc. All the sales manager etc. need at least 10 -15 years of experience before they can actually sell the carbon black and need experience for such a technical sale. So they really bring in a 'relationship element.'

Price (ideally lowered price paid for product vs quality)

Communicating savings your firm has offered for customer in comparison to next best alternative at the time of purchase

Clara: Its at market price. We don't feel that we need to offer any cheaper just because we are recycled and that is our value proposition is such. Also another factor is that people are looking for more and more clean carbon black which less PAH level, because of the process. So customers look for that which offers them more. For the CE model, in general circular business models must achieve at par with traditional models.

Availability of after-sales services

Post sale services an attractive value for customers?

Clara: If they have any problems then we can be contacted and we give checks to see how we can solve it and we can understand where our problems come from. So its nit just an additional value But when you sign a contract And you want them to buy from you next month, then you have to make sure that you are providing the right quality at that price.

ease of access for the customer/ better access to functionality

Has your firm explored all options of making product or service best accessible to customers

Clara: Yes. We have. Locally as we are multinational. Once you are approved with one and if in the European region, with partners in countries like Germany, France etc. If you have an approval from one lab, then it is easy to get it in another lab. The smaller producers can trust you.

Providing 'choice' or env. Friendly alternatives in the market

Has your firm enabled customers to have the possibility to choose what is ethical or better in terms of their ecological footprint?

Clara: yes. Of course as we talked.

SECTION 3. VALUE DIMENSION: Environmental

Substitution of virgin material

To what extent does your primary product have secondary input

Clara: In terms of our technical view, in percentage we are at 50%. Yes with climate kick more R and D in this area.

Extent of reuse of a resource

Number of times of reuse of components/ number of cycles can be increased?

Clara: if only look at the tyres, then once it is done it is done. but if you look at them going into waste stream then they are 60% of carbon black market; in relation to tires it U can say 60 - 70 % of c black can go on infinitely As it does not deteriorate in quality.

Decreased used of toxic materials

Decreased used of toxic materials impact on public health is reduced.

Clara: We are Below the EU regulations and now we are looking at if FDA regulations. Can't go lower than that!

waste minimization (less waste to dump)

Environmental + economic gains from spending less on waste disposal

Clara: ---

energy use reduction

Environmental + economic gains from alternate energy source

Clara: The create energy to a by-product is gas and then oil and what remains is gas. Gas is condensed and made in to electricity and we sell back. We are looking at ways to make the oil more circular and make good value products that could benefit other chemical Companies and if we have a higher volume then we can see explore it can be feasible for them. But for now the volume is low and is not really feasible. We will be exploring.

integration of Eco-design

Attainment of company's own Environmental Goals

Clara: we do not follow it as such but total aim is to have our factories that are conscious in the way we work the nature of our company. No strict regulations as such. But we have a modular set up which aligns to it overall environmental benefits.

Green certifications compliance	<i>reduced impacts and reaching national sustainability goals</i>
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Clara: Cradle to cradle. Waiting For the final process/

Section 4. Value Dimension: Network

Is Value being captured and created from improved networks?

inter-firm networks utilised : To acquire additional resources and capabilities	<i>Strategic partnerships and cooperation with other business in the value chain to strengthen the entire chain, making all partners + focal company, more resilient. collaborative ventures in action that yielded measurable positive results</i>
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Clara: Guess we don't have to waste time on what we are not good at and they don't have to waste time on board they are not good at. If The local partner has local expertise on the permit and we can leverage on that expertise and They depend on us for our technology marketing, our sales about the carbon Black. Which not a n area everyone wants to enter into. I believe that partnering is very well aligned for mutual benefits.

intra firm networks in place - that have led to higher efficiency in operations	<i>stronger vertical connections within the firm due to closed loop cycling</i>
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Clara: yes. We have group WhatsApp and we are like a family. Passionate millennial generation of workers, the work can be tiring but people are driven by values and are into it. Also attracts employees that we attract. Millennial generation that is not only about money but also impacts on environmental values etc. equal opportunity employers. We work as a team. We have people with special needs in the team

success of competitors in the industry	<i>Has the general popularity of your idea in the market helped popularise your product or service. Have you sought access to a 'CE community or network' that can add possibilities of symbiosis/exchange. Has your Connection to larger scale CE initiatives and consultancies with access to expertise helped you grow significantly?</i>
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Clara: Yes it brings awareness to our immediate customers about our company. And makes it Attractive to the customers of our customers such as Tesla Ikea. These are contacting us because they are interested in it as their end customers are interested. There are public campaigns that we take part in as it is in Almost everything around you in your mascara in your t-shirt in your clothes in the flyers in the newspapers and almost everywhere. Including glass frames etc, some years ago there was a public Drive in Korea regarding the carcinogenic nature

of the ink in credit card payments and it led to a demand for clean carbon black from customers. We want cleaner products and this helps us.

Our competitors are producing carbon black are not doing something we are which is unique. The more competitors we have it is good for the business to create visibility

SECTION 4. VALUE DIMENSION: information

4.1 overall increase economic value due to increased availability of information:?

Clara: yes yes.but.what do you mean? (Explanation given)

4.2 information exchange platform

*CE based business make use of ICT innovation to create platforms for sharing and selling (**enhanced network value**)*

Clara: yes definitely. Our CEO is the board member of Circle Economy here. We are a part of Dutch government led initiatives. The technical university here in Delft has Incubation programs and we like to increase on network there. We have people contact us like you.

consumer behaviour related feedback and interaction recorded and used

*consumer behaviour related feedback incorporated into service and product quality to **increase customer value***

Clara: The monitor every batch that comes in and each hour. We know exactly what we shipped to them because we have barcodes to track it and we had helped a customer identify where he went wrong after he came up with an issue he had not experienced before. Helps in troubleshooting.

Real time Knowledge on product performance

*ICT enabled leasing out can be monitored to make the service more resource efficient and better life cycle management (**increased environmental value**)*

Clara: The box it is supplied in, are very big bags of about 1000 kilograms. so each bag we delivered out you can track it down so if the customer has any feedback to us . then we can track the process parameters that there were. Such as What temperature the kilns is at what kind material went in it for the fine texture in , down to microns. What tyres went in and who was operating it. We need to offer this to our customers. So there is closed loop information flow real time and is well integrated in the process.

Appendix F Expert interview transcript: Circulab

Researcher: What has been your experience working with companies on circular business planning?

Nicolas: The discussion usually starts with as clarifying what is a circular economy means as some companies only create as merely recycling activities.

Researcher: What is your experience with smaller companies as my tool, is looking particularly at the smaller start apply companies which are enabling circular economy

Nicolas: We usually work with bigger companies like Ikea and L'Oréal. However, I would say if it is a young company and at an early stage, even they usually use the business as the most popular. And are used in incubators and business schools. It makes it easy to measure your value proposition and marketing and how you will distribute it. See also used it to beginning of a starter but we also said that it was limited to look at the different aspects that are concerned with the circular economy. The BMC focuses on economy but no environmental and social aspects.

In my experience that small or medium sized companies, 10-20 years old, sometimes I do not think they know about the underlined to be helped out.

We are not targeting them that strongly. It will take a lot of time and they have smaller budgets. But we do see that they are willing to change and you can go fast and quite deep.

We don't have our marketing team to do this to find out such companies but what we do is that we have the "Circulab Board", for free it is open source. So it can be used for education and teaching material. But for Regional smaller companies we decided to create this network so we can reach out even if they are working in their own territories, and we can reach the hidden smaller companies. But we aim at the bigger ones, who are in the capital city (Paris). Sometimes the teams can help out, in the network.

Researcher: Could you share your View on the developed metrics?

Nicolas: sure.

ECONOMIC: Thumbs up economic we look at Cost savings because our tools is good to look at the company's assets. We collectively look at the company and scan their assets. So we need a collective /collaborative audit. It already has value by sharing knowledge within the company, o sometimes it is a struggle within the bigger companies to share information among themselves maybe smaller companies it is easier. As people each other People don't even know the different departments and the people. Do we have the broad picture to see the real costs in the whole process. Also makes the process smoother. We look at how to optimise the time and space of the assets like renting out rooms of the firm to others when not used.

Risk: You can look at supply chain. And specially see the resources coming in, so when they realise in the material aspect and intellectual property, then they see they can open up to new ideas to avoid redundancy.

Reduced waste disposal costs is the same as cost savings.

The corporate image is just a cherry on the cake they are not necessarily looking for it. But maybe smaller Companies are looking at bad because usually they are created around that idea of circular economy or ethics / sustainability. But sometimes bigger ones like H&M. but mainly they look at cost saving and risk reduction.

Nicolas: CUSTOMERS value

May not necessarily care about CE. Thy care about quality, price and if it is good for planet? Working for 5 years in the field I realised, no one is looking for all happy is not always. But yes People see if it is prepared in the Attic away without using poor child labour in developing countries. They want a right equation overall but not too expensive at the end

RESEARCHER: On creating new ways of doing business through networks:

Nicolas: If people can find a new way to digital tools to access their product and it is a very well designed for them, and if prices are cheaper, people will move to that. But it is Important to be very well designed and well though experience for consumers. Need to understand the deeper psychology behind it to design any after sale services too.

The constant changing environment and the behaviour of people is very important you and the company's do not know how to deal with it and not so skilled to work with it.

Big companies have a lot more time invested so makes it tough to change, for example car companies have a product which begins 5 year old before it is launched. But I feel that start-ups are popping up which have this ability to capture all these things and understand the customers better.

Researcher: Views On NETWORKS metrics:

Nicolas: New services and optimise access to ownership, it needs to be created through sharing economy too. Because when I started, sharing economy was the new thing. But it is the ultimate stage of CE. And cultural evolution, relationships, and connections with people just about

Researcher: Views on information metrics?

Nicolas: circulab and wiitha network for information exchange

Appendix G: The Circulab Board

A tool accessed from [circulab website](http://circulab.eu/en/tools/) (17th May 2017) with prior permission from Circulab and Wiitha network <http://circulab.eu/en/tools/>

