Understanding Circular Business Models based on the Value Conceptualisation of Circular Collaborative Actions

NADINE LEDER

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Logistics and Operations Management Section
Cardiff Business School
Cardiff University

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Abstract

The transition to a Circular Economy (CE) is considered the biggest revolution of environmental production and consumption methods. A successful transition requires systems change. Circular Business Models (CBMs) can foster this transition through their ability to decouple economic growth from extensive resource usage and consumption. Previous research focused on establishing the meaning of circularity and explored the variety of CBMs. However, it is important to understand how value is conceptualised in the variety of CBMs. This study contributes to the circular movement by understanding the value conceptualisation of CBMs. In doing so, the study examines the facilitation of circular actions in CBMs in the light of the contextual factors of policy, collaboration, and technology.

The study follows a qualitative abductive approach. A theoretical framework is developed based on the findings of expert encounters and focus group discussions. The theoretical framework underlies Social Capital Theory (SCT) and is further developed throughout the empirical research phase. The empirical phase comprised a case study approach based on semi-structured interviews with organisations following different CBMs.

Key findings highlighted the wide interpretation of circularity amongst different CBMs and grouped the influencing factors for organisations to join a CBM. The study demonstrated the importance of collaborative actions facilitated by the three contextual factors of collaboration, technology, and policy. It identified the role of technology, as well as a willingness for collaborative networks, e.g., to collaborate with competitors. Furthermore, the study identified the values achieved in CBMs and merged them with the triple bottom line (TBL), demonstrating that social value is a topic of growing interest. In addition, a variety of value measurement tools were identified, aiding in the conceptualisation of circular value.

The study contributes to theoretical knowledge by merging Osterwalder and Pigneur's (2010) business model canvas with the TBL values and applying SCT, which is a rarely applied theory in CE research. Managerial contributions emerge as the study closes the lack of empirical research claimed to be existent by aiding in a better value understanding in CBMs. Therefore, collaborative partners, value measurement tools, and the role of technology amongst different CBMs, were investigated.

Acknowledgements

“A good beginning needs enthusiasm; a good ending requires discipline”
[original aphorism: ”Ein guter Anfang braucht Begeisterung, ein gutes Ende Disziplin“]
(Prof Dr Quadbeck-Seeger)

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Nadine Leder
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This thesis is dedicated

In memory of
my mother, Waltraud Leder

In recognition of the values, you have taught me!

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Abbreviations

AI	Artificial Intelligence
annot.	Annotation
B2B	Business-to-Business
B2C	Business-to-Customer
BM	Business Model
BSI	British Standards Institution
CBM	Circular Business Model
CBMI	Circular Business Model Innovation
CE	Circular Economy
CLSC	Closed-loop Supply Chain
CSR	Cooperate Social Responsibility
cont.	Continued
C2C	Customer-to-Customer
DBS	Deposit-return-scheme
DEFRA	British Department for Environment, Food and Rural Affairs
DRS	Deposit Return Scheme
EMF	Ellen MacArthur Foundation
EMT	Ecological Modernisation Theory
EOL	End of life
EPR	Extended Producer Responsibility
EU	European Union
FG	Focus Group
GSCM	Green Supply Chain Management
HRM	Human Resource Management
ICT	Information and Communication Technology
IE	Industrial Ecology
LARAC	Local Authority Recycling Advisory Committee
LBM	Linear Business Model
LCA	Life Cycle Assessment
N/A	Not applicable
NGO	Non-profit Organisation
NHS	National Health Service
OEM	Original Equipment Manufacturer
PLEBM	Product Life Extension Model
PSS	Product Service Systems
RBV	Resource-Based View
RFID	Radio-frequency Identification
RQ	Research Question
SC	Supply Chain
SCM	Supply Chain Management
SCT	Social Capital Theory
SDG	Sustainable Development Goal(s)
SE	Social Enterprise
SME	Small and Medium-Sized Enterprise
TBL	Triple Bottom Line
UN	United Nations
WRAP	Waste and Resource Action Programme
WSP	Waste Service Provider

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1 Introduction

Chapter aims:

a) To provide a foundation for this study based on relevant published literature
b) To provide background information on this study and introduce relevant terminologies
c) To pose the research questions and set aims for this study

1.1 Chapter overview

This chapter aims to provide an overview of the study and the research topic. Hence, this chapter provides an introduction and background information to the wider topic of Circular Economy (CE) and the motivation of the researcher, followed by an overview of the research questions, and aims, before outlining the structure of the thesis.

1.2 Research motivation and background

"*If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits of growth on this planet will be reached sometime within the next one hundred years*."

(Meadows, 1972; Club of Rome)

Industrialisation, continuous development, and a strong drive towards optimisation of supply chains have led to an ongoing transformation of products and their market sectors. This increase in global trading has fostered the linear growth model (Weetman, 2017), a model that is based on the principles of take-make-dispose, relying on single-use materials, the immediate production of demanded products, and their fast distribution to the end consumer. As a result, consumers discard products that reach their end of life (EOL) and buy new products without hesitation (Lacy and Rutqvist, 2015).

However, a change in this thought process has been noticed in recent years. Public focus and interest have shifted towards sustainability issues, such as plastic pollution, climate change, natural destruction, and resource depletion (Weetman, 2017; Charter, 2019), and discussions have begun to foreground the idea of:

Circularity and the Circular Economy

With the establishment of the Ellen MacArthur Foundation in 2010 and the announcement of the UN Sustainability Goals (SDGs) five years later, a general push for greater sustainability and circularity in academic research emerged. Research has identified unsustainable production and consumption methods of economies around the globe (Velenturf et al., 2018). Methods of decoupling economic growth from resource consumption and developing circular solutions have been suggested by a variety of scholars (EMF, 2010; Millar et al., 2019). Geissdorfer et al. (2018) argued that *"the influence of a better understanding of the relationship between the Circular Economy and sustainability and their influences over the performance of supply chains, business models, and innovation systems."* (p. 767) is essential. Previous research has focused on establishing what circularity is (Geissdoerfer et al., 2018). However, research has slowly started to look into the different Business Models (BMs) that can be established in circular solutions. Urbinati et al. (2017) argued that companies still face challenges in establishing or adopting CBMs. Therefore, research calls for a deeper exploration of CBMs to understand how they create value and contribute to the economy.

CBMs fascinate the researcher by their depth and variety. They are designed to keep materials in a loop for as long as possible by making use of methods such as upcycling, valorisation, refurbishment or refill and repair (EMF, 2014; Elia et al., 2017). CBMs require a radical change in production methods and consumer behaviour, but eventually lead to a higher level of sustainability and well-being at minimal material, energy, or other environmental costs (Ghisellini et al., 2016).

Facing a transition phase, from linearity to circularity, and managing the successful implementation of holistic and cost-effective circular solutions (Lacy and Rutqvist, 2015; De los Rios and Charnley, 2017) are argued to decouple business growth from extensive resource usage and resource consumption and provide benefits on all business and society levels (Weetman, 2017; Charter, 2019). To manage this transition phase, it is important to understand and combine all available tools, including policy tools, such as the SDGs, and practical tools provided by the EMF. Being a part of this sustainable development and contributing meaningful research to a field that is of importance for future generations motivated the researcher from an academic point of view.

From a personal perspective, the researcher had the following motivation:

First, the researcher's personal background and interest in sustainability. The researcher was born and raised in a country that always had one of the world's highest recycling rates. As of today, 66% of the municipal waste in Germany is recycled (Statista, 2021). Hence, recycling and caring for the environment are habits instilled in the researcher since childhood. This interest continued throughout the researcher's studies when pursuing a Master's degree in Operations Management at Cardiff University and selecting Sustainable Business and Transport as an optional module. Selecting this module raised first interest in combining sustainability with supply chain activities and in understanding how sustainable actions can be implemented in supply chains.

Second is the growing push by governments and institutions around the globe for sustainability. In particular, the announcement of the UN Sustainability Goals and the general push from society towards wider sustainable actions motivated (and still motivates) the researcher to be part of this circular movement, being able to contribute to this movement and helping to maintain an intact environment for our future generations.

In a small-scale environment, circular activities such as bottle return schemes were already known to the researcher. However, the establishment of the Ellen MacArthur Foundation and getting to know the fascinating diversity of reusing material (for instance, using shellfish waste as tarmac) motivated the researcher to investigate the idea of value creation in circular actions.

Third, the researcher's personal experience and confrontation with waste and sustainability issues in developing countries have strongly shaped the motivation to contribute to the sustainability and circular movement. The researcher was fortunate enough to work and live for long periods in various countries around the world. Two experiences were particularly defining to begin this sustainability journey.

The first experience took place in Central America while living for six weeks with a local family in the Dominican Republic. Living in a household in which water is only available in the mornings, seeing local beaches covered in plastic rubbish, has strongly influenced the researcher's mindset about the impact we could have on sustainable development and how we could reduce the amount of waste produced. The second experience was the time spent doing an internship in Shanghai and realising the amount of plastic being used daily. Motivated by these experiences, the researcher aims to contribute to general sustainability efforts and hopes to contribute to a better and more environmental future for our upcoming generations.

1.3 Research questions and objectives

The research focus developed and progressed over time. The literature review informed the research and provided a basic understanding on the topic of CE. Focus group discussions further deepened already gained knowledge on the idea of circularity and waste exchange. These discussions aided in defining the topic of CBMs. Additional exchange with academic- and industry experts in the field of circularity aided in identifying the contextual factors of policy, technology, and collaboration. Based on this process, the following three research questions, and respective objectives, are posed:

Research Question 1: How do influencing factors facilitate the implementation of Circular Business Models?

Objective 1: To identify influencing factors in joining Circular Business Models

Identifying the influencing factors that attract organisations to be part of a CBM aids in the delivery of circular actions. Furthermore, knowing the influencing factors supports the development of a framework that highlights the value conceptualisation in CBMs.

Research Question 2: How do contextual factors contribute to the implementation of Circular Business Models?

Objective 2a: To explore the role of collaborative partnerships in Circular Business Models (including challenges and benefits)

Objective 2b: To explore the role of digital technology in CBMs

Objective 2c: To investigate the effectiveness of political guidelines and support available to organisations being part of a Circular Business Model

As the influencing factors for CBMs have been identified in RQ1, the focus is shifting towards contextual factors. In every discipline, context shapes the effectiveness of knowledge implementation and fosters improvement processes (Coles et al., 2017). Contextual factors aid in reflecting on a unique context. In doing so, this RQ reflects and explores the contribution of contextual factors to the implementation of CBMs.

Research Question 3: How is value conceptualised and measured in Circular Business Models?

Objective 3a: To identify value perspectives in Circular Business Models and their connection to TBL

Objective 3b: To gain a greater understanding of the value measurements in Circular Business Models

RQ1 and RQ2 set the scene by identifying influencing factors and looking at the contextual factors contributing to individual CBMs. RQ3 uses this knowledge to identify how value is conceptualised and measured in CBMs. It identifies the value perspective and the Triple Bottom Line (TBL) values accompanying CBMs before merging both value characteristics as part of the investigation to further understand the value conceptualisation in CBMs. Furthermore, identifying applied value measurements helps to better understand the application of current value measurements in CBMs.

1.4 Thesis structure

The structure of the thesis is displayed in Figure 1.1. It consists of eight chapters in total, divided into an introductory chapter, followed by three theoretical chapters and three empirical data analysis chapters, and ending with a conclusions chapter.

As the research was conducted over several years, some chapters were developed from the researcher's conference papers or publications. It is acknowledged that external feedback and exchange can strengthen research quality. Nonetheless, this thesis solely includes the input that emerged from the researcher, and the text has been largely rewritten to avoid self-plagiarism.

Chapter 1 introduces the study by outlining the research topic, background and motivation, as well as posing the research questions and the thesis structure.

Chapter 2 examines the relevant literature by applying a systematic and narrative review process. In doing so, the chapter follows the structure from the broad to the specific and identifies the research gaps, as well as posing the research questions and outlining the aims. The systematic and narrative review processes were presented at the following conferences:

- Leder, N., Kumar, M., Sanchez Rodrigues, V. (2018). Circular Economy – an approach which depends on innovative considerations. *5th International EurOMA Sustainable and Operations Forum*, 5-6th of March 2018, Kassel, Germany.

- Leder, N., Kumar, M., Sanchez Rodrigues, V., (2018). Circular Business Models – Enhancing Quality and Sustainability in Business Processes: A Systematic Review. *21st QMOD-ICQSS Conference*, 22-24th of August 2018, Cardiff, UK.

Chapter 3 is the second of three theoretical chapters and looks at the development of the conceptual framework via expert encounters and focus group discussion design. The results of the focus group discussions, as well as an early-stage version of the conceptual framework, have been published as follows:

- Leder, N., Kumar, M., Sanchez Rodrigues, V., 2020. Influential factors for value creation within the Circular Economy: Framework for Waste Valorisation. *Resources, Conservation & Recycling* 158.

And presented at the following conferences:

- Leder, N., Kumar, M., Sanchez Rodrigues, V., 2019. Waste Valorisation in the Circular Economy Movement: Framework and Future Research Directions. *6th International EurOMA Sustainable and Operations Forum*, 18-19th of March 2019, Gothenburg, Sweden.

- Leder, N., Kumar, M., Sanchez Rodrigues, V., 2019. Aspects of Quality and Technology in the Circular Economy Strategy of Waste Valorisation – Development of a Framework. *22nd QMOD-ICQSS Conference*, 13-15th of October 2019, Krakow, Poland.

Chapter 4 is the last theoretical chapter, looking at the methods applied in the thesis. It reveals the philosophical stance of the researcher, including the research approach, strategy, tools, and techniques. In addition, a detailed layout of the case organisation is provided.

Chapter 5 is the first empirical chapter and clarifies how organisations understand and interpret circularity in different industry sectors and identify the influencing factors for organisations to join a CBM.

Chapter 6 is the second empirical chapter, looking at the identified contextual factors of collaboration, technology, and policy, and their influence in implementing CBMs.

Chapter 7 is the last empirical chapter, focusing on value conceptualisation in CBMs. In doing so, it explores the value perspective and the TBL values, as well as the value measurements currently used by organisations.

Chapter 8 is the final chapter, representing the findings, including the research contribution and limitations to the research.

The thesis is supported by the following appendices:

Appendix A – Example Expert Encounter Notes

Appendix B – Summary Post-it Notes Focus Group Discussion

Appendix C – Interview Protocol

Appendix D – Research Ethics

- **Appendix D1** – Ethics Application
- **Appendix D2** – Approval Letter
- **Appendix D3** – Ethics for Focus Group Research
- **Appendix D4** – Project Brief for Research Participants
- **Appendix D5** – Informed Consent
- **Appendix D6** – Consent Form

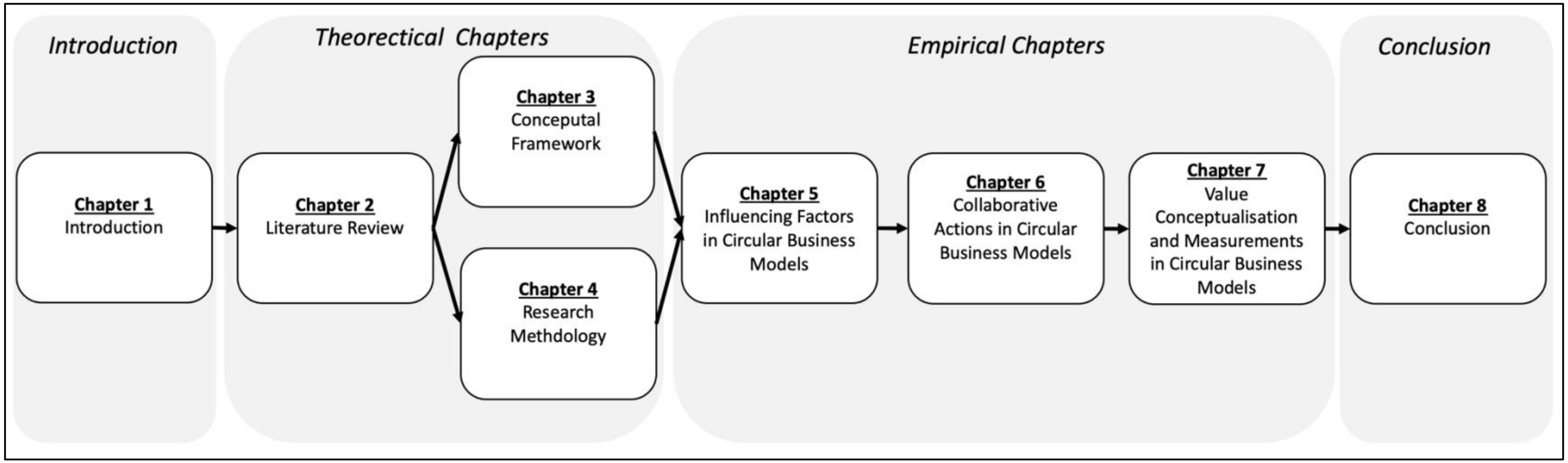

Figure 1.1 Structure of thesis (Source: Author)

1.5 Chapter summary

This chapter introduced the research topic of CE. It explained the research background and the motivation of the researcher and revealed the research questions. In addition, the reader has been familiarised with the structure of the thesis. Any academic work (publications and conference papers) that contributed to this research has been listed.

2 Literature Review

Chapter aims:

a) To provide a foundation for this study based on relevant published literature
b) To provide background information on this study and introduce relevant terminologies
c) To pose the research questions and outline the aims for this study

2.1 Chapter overview

This chapter, together with Chapters 3 and 4, are the three main theoretical chapters that underpin and support this study. It consists of a systematic and narrative literature review and provides the foundation for this study.

Literature reviews are established and inevitable scientific tools for exploring new and emerging research fields. They aim to identify and elaborate on the existing state of knowledge before signposting new ways forward (Fink, 1998; Booth et al., 2012). A literature review can either guide the reader from *the specific to the general* or vice versa (Saunders et al., 2009; Bryman and Bell, 2011).

This review will guide the reader from the general idea of circularity towards specific CBMs and their value perspective. First, the literature review explores the historical background of circularity in Section 2.3, before familiarising the reader with the CE paradigm, its principles, and concepts in Section 2.4. This section also serves as a starting point to understand how circularity is supposed to work in supply chain networks and to identify the influencing factors on the road to circularity.

Section 2.5 takes a deeper dive into the topic of BMs and specifically explores CBMs addressed in the literature. As the transition from Linear Business Models (LBMs) to CBMs requires innovative thinking, the review highlights current Circular Business Model Innovation (CBMI) processes and their use of (digital) technology. As BMs centralise the idea of value, the review further explores the value perspective in the context of CBMs.

While conducting the review, a variety of contextual factors accompanying the transformation from LBMs to CBMs were identified. Section 2.6 focuses on the identified contextual factors and discusses their roles and impacts. In Section 2.7, the research gaps and the respective research questions and aims are identified.

Figure 2.1 illustrates the approach *from general to specific* for this literature review chapter and serves as a visual guide for the reader.

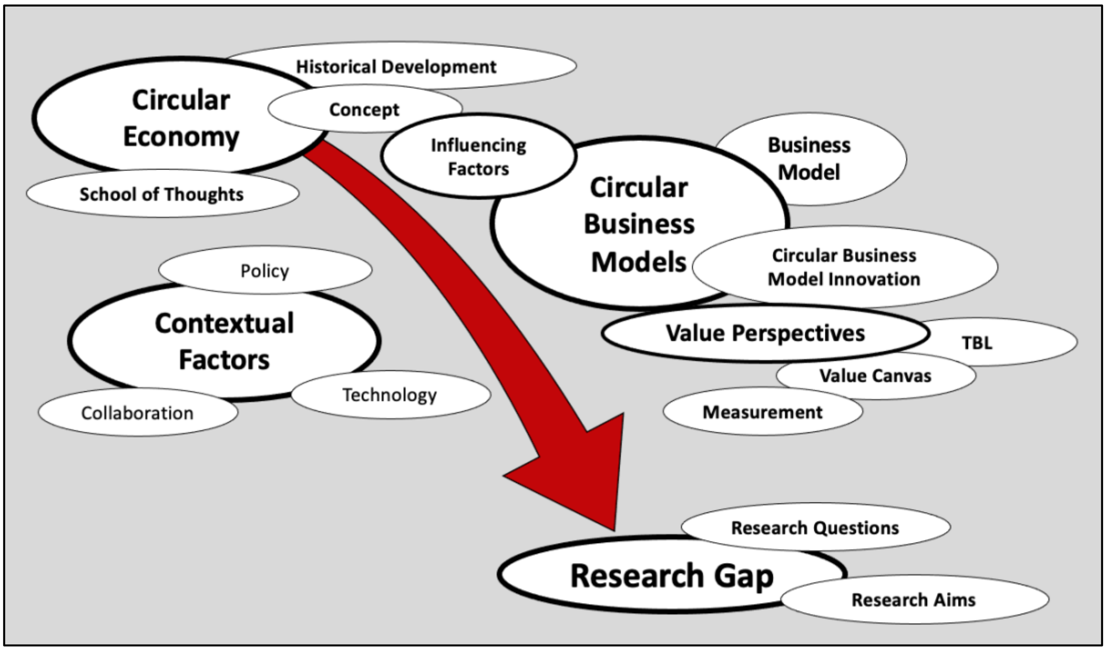

Figure 2.1 Overview of literature review (Source: Author)

2.2 Literature search and review

"A research literature review is a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners."

(Fink, 2010, p. 3)

Literature reviews are based on different levels and serve a variety of purposes. This includes identifying how individual scientific contributions are related to one another or fit into the subject under review. Literature reviews avoid duplications and signpost the way forward for upcoming research (Booth et al. 2012). They also indicate a researcher's awareness in the search for and final interpretation of existing knowledge (Easterby-Smith et al., 2015).

To identify contradictions and gaps in existing knowledge and create such an analytical summary of existing knowledge, a critical reading skillset is required (Jesson et al., 2011; Easterby-Smith, et al., 2015).

To conduct the literature review for this study, the researcher was inspired by the five skills recommended by White (2011), as well as the seven steps suggested by Onwuegbuzie and Frels (2016). Table 2.1 provides insights about the skills and abilities (White, 2011) and steps (Onwuegbuzie and Frels, 2016) considered and applied in relation to this study.

Skills & abilities	Steps	Relation to this study	Aims
Skill 1: Defining what literature means	**Step 1.** Exploring the beliefs and topics	The ground was set by defining separate literature review questions. These are outlined as follows: – What are the main arguments related to the research problem? – What key concepts have other researchers identified as important? – What key frameworks, if any, have other researchers developed?	To define the boundaries for the literature search
Skill 2: Access to literature	**Step 2.** Initiating the search	The search process began as a systematic review on the broad topic of CE in established data banks, followed by a narrative review based on CBMs, influencing factors, collaboration, value and digital technology.	To familiarise the reader with the broader topic of CE, and narrow the topic down
Skill 3: Critical appraisal of the literature	**Step 3.** Storing and organising information	All data were stored and organised in the data software Endnote. Furthermore, Excel data extraction sheets, to summarise the main content and characteristics of the articles, were created to guarantee a quick retrieval of information throughout the research progression.	To be able to retrieve information quickly
	Step 4. Selecting / deselecting information	Specific inclusion and exclusion criteria were applied for the systematic review, as well as semantic criteria in terms of the content of the included articles. Those included: – ABS-ranked journals only – English only – Timeframe 2007–2017 – Semantic context to circularity	To enhance the quality of research by identifying high-quality articles
	Step. 5. Expanding the search	Besides academic literature, grey literature was used to inform the research. The range of grey literature included industrial, consultancy, and political reports, as well as reports from non-profit organisations (NGOs).	To enhance the quality of research by broadening the views
Skill 4: Structure of literature	**Step 6.** Analysing and synthesising information	Academic and grey literature was analysed based on systematic and narrative literature reviews. A thematic analysis accomplished the reviews.	To write the literature review chapter

Table 2.1 Steps of literature search (Source: adapted from White 2011, Onwuegbuzie and Frels, 2016)

Skills & abilities	Steps	Relation to this study	Aims
Skill 5: Integration and justification of literature	Step 7. Presenting the report	Findings of the literature are presented in Chapter 2. These findings were revisited and updated throughout the research process.	

Table 2.1 continued Steps of literature search (Source: adapted from White 2011, Onwuegbuzie and Frels, 2016)

Since the study was conducted over five years (2016–2021), the literature review process was done in two parts (see Figure 2.2 for details). As a starting point, a systematic review was conducted. This review aimed to familiarise with the concept of circularity, review key concepts and explore the variety of CBMs. In doing so, it aided in narrowing the research focus to CBMs. The narrative literature review (Part 2), contextualised CBMs in operations management, sustainability and general management. This required a narrative approach from the perspective of value creation, sustainability, policy and influencing factors. In the following section, details of the two literature reviews are introduced.

Part 1: Systematic Review
Activities & Aims – Reviewing the concept of circularity – Exploring the nature of CBMs

↓

Part 2: Narrative Review
Activities & Aims – To contextualise for CBMs – Identification of contextual factors and their further investigation

Figure 2.2 Literature review process (Source: Author)

The literature search began by exploring the wider topic of CE and its existing beliefs and assumptions (see Step 1, Table 2.1). Separate review questions were posed for this activity, as recommended by Maylor and Blackmon (2005):

- What are the main arguments related to the research problem?
- What key concepts have other researchers identified as important?
- What key frameworks, if any, have other researchers developed?

In the following section, both parts of the literature are introduced in further detail.

Part 1: Systematic Review

The systematic review process aimed to familiarise the researcher with the topic of CE. Therefore, a systematic literature search around the topic of circularity was conducted. As the research started in 2017, the selection criteria have been limited to publications from the last ten years (2007-2017) for this first part of the review. This allowed providing a snapshot of publications and emerging circularity topics around the founding year of the Ellen MacArthur Foundation in 2009. Further inclusion criteria included, amongst others, English language only, peer-reviewed journals and publications from leading journals in the field of sustainability, and circularity. In addition, the search was widened to leading journals in the logistics, SCM and Operations Management fields, which resulted in the additional inclusion of 13 papers. Hence, the first review part identified 59 articles. A detailed research protocol is provided in Table 2.2.

Research protocol	
Databases	Data bases: – ScienceDirect – Emerald Insight – Wiley – Scopus These four databases cover a wide range of peer-reviewed journals; to fulfil the requirement of a comprehensive review.
Publication type	Peer-reviewed journals only
Language	English only
Data range	2007-2017
Search fields	Search fields were applied to 'Title, Abstracts and Keywords'
Search terms	In the first part of the search process, the primary search terminology is 'Circular Economy'. To ensure a clear connection and reference to the CE paradigm, the search string was extended by an 'AND' with another relevant keyword (either: SCM; Logistics, Remanufacturing; Innovation; End consumer; End of life cycle; GSCM; Green; Sustainability; Change management; Closed loop; or reverse logistics).
Deselection criteria #1 Semantic relevance	The first deselection criteria refer to the semantic relevance to the research topic. These results are because words can have different meanings in other contexts. For instance, 'Economy' often refers to economics-related papers.
Deselection criteria #2 Relevance to the review question	Most papers clearly stated their relevance to the research question in the title or abstract. However, with papers related to CLSC, the relevance was determined by reviewing the whole paper. A significant number of papers in this specific area only focused on, for instance, CLSC, but neglected to address the CE paradigm.
Deselection criteria #3 Ranking & impact factor	The criteria are to include only articles that have been ranked in the ABS list 2015; However, an exception has been made for two journals (*Journal of Cleaner Production* and *Journal of Resources, Conservation and Recycling*). Both journals revealed a significant number of articles (22 and nine, respectively); and provide a high-impact factor (*Journal of Cleaner Production*: 5.715, and *Resources, Conservation and Recycling*: 3.313, as of 2017)

Table 2.2 Search protocol (Source: Author)

Part 2: Narrative Review

The systematic review was followed by a narrative review, which aided in identifying the themes guiding the study and concluded in identifying the research questions. To store and organise the literature and the respective information gathered (see Step 3,

Table 2.1), the identified literature was categorised into 15 different topics. These topics also aided in setting up the narrative of this chapter. For further details about the topics, see Table 2.3. In addition, the main content and information of influential articles were summarised in Excel data extraction sheets to secure quick data and information retrieval throughout the research process.

Throughout the literature search process, but particularly during the stage of the systematic review, specific search criteria were applied (Step 4, Table 2.1). With further progression of the research, it was necessary to expand the literature search (Step 5, Table 2.1) and to include policy reports at the United Nations (UN), European Union (EU) and national levels, as well as industrial and NGO reports. The analysis (Step 6, Table 2.1) and findings of the literature search (Step 7, Table 2.1) are revealed in full detail in the following sections of this chapter. The chapter was updated throughout the entire period of study.

Categories of Narrative Literature Search
Main Literature
Waste Valorisation Models
(Circular) Business Models
CE in general
Closed-loop SC
Policy articles
Innovation and Technology
Industrial Symbiosis
Industry Reports
Sustainability
Value
Resource Efficiency
Collaboration

Table 2.3 Categories of Narrative Literature Search (Source: Author)

2.3 Historical Development and Origin of the Circular Economy

“*The circular economy gives us the opportunity to build a system that can run in the long term, and the time is right for it to reach scale.*”

(Ken Webster, Head of Innovation at the Ellen MacArthur Foundation)

The evolution of environmental awareness dates to the eighteenth century, when economists and researchers began to consider the environment. For the first time, sustainability and resource efficiency approaches were seen when Europe suffered a shortage of timber in 1713. Tax accountant *Hans Carl von Carlowitz* argued that trees would not be able to grow as fast as entire woodlands were chopped down. Despite using the wording sustainability only once, his writings coherently described today’s sustainability context (McElroy and van Engelen, 2012).

In 1798, economist *Thomas Robert Malthus* focused on environmental awareness and possible consequences. In his work, Malthus claimed, if the world’s population continues to grow, it will lose its ability to feed itself (McElroy and van Engelen, 2012; Becchetti et al., 2019). Malthus’s work was followed by British economist *John Stuart Mill*, whose publications addressed the common problem of today’s linear economy. In his writings, he thematised society’s wasteful consumption of finite resources without thinking about possible future consequences. It is said that with the synthesis of his work, he developed the first ideas for a sustainable development approach based on justice and solidarity (McElroy and van Engelen, 2012; Pfister et al., 2016).

The twentieth century was predominantly defined by the appearances of economic expansion, technological and population growth. Neither of the three appearances was considered particularly problematic. On the contrary, economic growth was assumed to be the natural state of things. Nonetheless, scholars and economists have begun to raise fundamental questions about the existence of humankind in these times of economic boom. How long could it take until economic growth reaches its limits? And what are the limits regarding resource scarcity, population growth, and its ensured sustenance (Bardi, 2011)? Already in these times, economists, such as John Stuart Mill, envisioned a progressive state whose resources are consumed in a controlled manner (McElroy and van Engelen, 2012; Becchetti et al., 2019).

Closer towards the end of the century, an established organisation of individuals, called the *Club of Rome,* began to actively seek answers to questions about the future of humanity and its existence on Earth. The Club's team of scientists researched natural resources, their possible depletion and finiteness. This reached an immense level of popularity in sustainability research and is today known as *'Our common future'*, or more commonly, the *Brundtland Report*.

In the report, sustainable development was defined as *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (Brundtland, 1987, p. 16). It concluded that if the world continues to follow its current system, the limits will be reached in the foreseeable future (Meadows et al., 1972; Bardi, 2011; Lacy and Rutqvist, 2015). Reaching such limits would bring ecological constraints to global development. Researchers warned that tackling such constraints could lead to a decreased quality of living for the 21st-century population (Meadows et al., 2012).

Despite attracting various criticism for not offering guidance towards practical actions (Banerjee 2003; Montiel and Delgado-Ceballos, 2014), or even not defining the context of what a need might imply (Starik and Rands, 1995; Starik and Kanashiro, 2013; De Angelis, 2016), the Brundtland Report was used as a foundation to develop the UN's Agenda 21 at the UN Summit in Rio 1992 (European Commission, 2021). This application acknowledges its importance in sustainability and circularity development. Most notably, despite being written in 1987, the Brundtland Report already addressed today's key topic of circularity. It emphasised that society should reduce its waste and provide future generations with the possibility to live in an intact nature (Brundtland, 1987).

The 1970s are considered the starting point for the circular movement. Scholars noticed imminent negative aspects caused by global industrialisation. It became evident that the social responsibility of organisations was purely based on maximising shareholders' returns while sticking to rules predefined by the market (Friedman, 1979). As a consequence, scholars began to shift their focus towards sustainability and took the first steps away from linearity (De Angelis, 2018).

Considerable steps in the circular movement were taken by economist and systems theorist *Kenneth Boulding* (Kraaijenhagen et al., 2016). Boulding's work investigates open and closed-loop systems concerning resource usage and the economy. In other words, society should approach the Earth as a cyclical ecological system (Kraaijenhagen et al., 2016; Geissdoerfer et al., 2017). Another leading scientist in the development of circularity has been *Walther R. Stahel*. Stahel and Reday-Mulvey (1981) were the first to introduce features of what is today commonly understood as CE and circularity.

The first predecessor in the circular movement was applied in small-scale projects. One of these is Denmark's Kalundborg Eco-Industrial Park, a favourable model for industrial symbiosis, which aided in consolidating circular thinking in Europe. European governments started to pass laws (i.e. the Closed Substance Cycle and Waste Management Act) to ensure closed-cycle waste management systems (Su et al., 2013).

The actual breakthrough for CE took place in 2010. Yachtswoman Ellen MacArthur realised the real meaning of resource scarcity while sailing solo around the world. Since then, her foundation, the *Ellen MacArthur Foundation* (EMF), has stimulated discussions about circularity, recycling, and remanufacturing ideas amongst various institutions and industries (Stahel, 2016). By now, EMF is firmly established and well-esteemed in the business and research world. A variety of global players and institutions work collaboratively to achieve progress towards a world comprising zero waste (EMF, 2013; Stahel, 2016).

2.4 The Circular Economy Paradigm—Principles and Concepts

"*Sciences advances, not by the accumulation of new facts, but by the continuous development of new concepts*."

(James B. Conant, American Chemist and President of Harvard University)

The literature agrees that CE, at its core, unites various concepts and ideas to ultimately close material and production loops (Geissdoerfer et al., 2017). The following sections introduce some of these core concepts and ideas.

2.4.1 School of thoughts

Lead thinkers began to use new jargon when speaking of new, sustainable business concepts (Weetman, 2017). Hence, scholars claim that the entire circularity movement, in its core idea, is not new. Instead, it has been influenced by so-called schools of thought (Kirchherr et al., 2017; Weetman, 2017). Table 2.4 summarises these schools of thought, their main idea, and respective lead authors (Geissdoerfer et al., 2017; Weetman, 2017).

Retrospectively, *industrial ecology* and *industrial symbiosis* had the greatest influence on circularity (Weetman, 2017; Homrich et al., 2018). Hence, the following section will briefly elaborate on these essentially influencing concepts before moving on to the CE paradigm and its principles.

School of Thought	Key authors
1. Cradle-to-cradle *Applies a systems approach in which materials are treated as biological or technical nutrients to ultimately extend the usage period, respectively close the (material-) loop*	*McDonough and Braungart (2002)*
2. Industrial Ecology *Aims to establish industrial ecosystems that focus less on resource extraction and waste emission*	*Jelinski et al. (1992;) Graedel and Allenby (1995)*
3. Industrial Symbiosis *Mergers of (at least) two industry entities aiming to get optimal access to material by exchanging material, respectively waste*	*Ayres (1989;) Renner (1947)*
4. Biomimicry *Aims to solve human challenges by mimicking nature's organisms, biological processes, and ecosystems*	*Benyus (2002)*
5. Natural capitalism *New industrial revolution in which environmental and economic interests overlap. As a consequence, organisations improve economic benefits while equally being able to solve environmental problems*	*Lovins et al. (1999)*
6. Performance economy *Applies a more performance-based rather than ownership approach, in which specific services or products are offered for renting rather than selling.*	*Stahel (2010)*
7. Blue economy *Makes use of nature's system of cascading nutrients and energy. Created byproducts are used, and waste does not exist.*	*Pauli (2010)*
8. Regenerative design *Based on the process-oriented systems theory, it considers a future co-existence of human beings and other species on the planet; hence, the approach aims to fulfil fundamental human needs by designing cyclical material and production flows.*	*Lyle (1996)*
9. Laws of ecology *Applies the principles of the four laws of ecology:* *I. Everything is connected to everything else.* *II. Everything must go somewhere.* *III. Nature knows best.* *IV. There is no such thing as a free lunch.*	*Commoner (1971)*
10. Permaculture *Systems thinking approach, originally designed to mimic natural forest ecosystems; now used to design perennial ecosystems with low input and productive landscapes*	*Mollison and Holmgreen (1978)*

Table 2.4 Overview Schools of thoughts (Source: adapted from Weetman, 2017; Hormich et al., 2018)

Industrial Ecology had its breakthrough in the late 1980s and was first mentioned in Fischer's and Gallopoulus's work in 1989 (Despeisse et al., 2017). It foregrounds material and energy flow in natural ecosystems (Gregson et al., 2015) by emphasising the design and development of complex industrial systems (Zhu et al., 2007). In the *industrial ecology* movement, industrial systems should not be considered individually or in total isolation from their surrounding systems. Instead, it is vital to look at them from a systems perspective, in which one seeks to optimise the other (Graedel and Allenby, 1995; Chertow, 2000).

In industrial ecology, *'exchange'* is highly regarded. *There are two major exchange options: technosphere exchange*, indicating exchanges in industrial systems, and *ecosphere exchanges*, indicating exchanges with natural systems (Despeisse et al., 2012; Leigh and Li, 2015). Based on these exchange modes, the literature refers to three main exchange models, which indicate parallels to circularity.

First, linear *industrial ecology models* have the most significant negative impact on the environment. Second, quasi-cycle *industrial ecology* models, which have reduced usage of external resources and a much higher recycling rate. Third, a cyclic-resource-flow *industrial ecology* model shows parallels to circularity (Leigh and Li, 2015).

Industrial symbiosis emerged as a sub-field of industrial ecology (Boons et al., 2017; Fraccascia et al., 2017). The terminology symbiosis is predominantly used in the specific context of the biological or chemical evolution of organisms. Hence, biologists define it as *"an association between two or more different species of organisms"* (Paracer and Ahmadjian, 2000, p. 3).

Like its biological kindred spirit, industrial symbiosis follows the basic idea of building a mutually beneficial collaboration between two dissimilar organisations by exchanging material (Chertow, 2000; Ehrenfeld, 2004; Fracasccia et al., 2017; Bansal and McKnight, 2009). It is commonly described as a collective approach involving the exchange of material between at least three business entities (Fracasccia et al., 2017). Hence, it encourages collective approaches and linkages between originally separated industries, fosters competitive advantage, and involves the physical exchange of material, energy, water, and/or byproducts (Chertow, 2000, p.313). The implementation of symbiotic activities in the industry has taken many forms. A popular example of the successful realisation of industrial symbiosis is the Danish Kalundborg Eco-Industrial Park. The park fosters industrial symbiotic transactions by enabling close business relationships between all the entities in the park. (Kalundborg Symbiosis, 2021).

Interestingly, these industrial symbiotic transactions are not bound to a specific industry or resource. *Industrial symbiosis* (and industrial symbiotic transactions) is applicable in a variety of industry sectors. The literature states a variety of cases in the pharmaceutical and manufacturing areas, as well as cases in the food and agriculture industry and many more (Bansal and McKnight, 2009). Scholars are convinced that industrial symbiotic activities contribute towards open-loop solutions. In doing so, they support the realisation of the circular movement (Marchi et al., 2017).

Three different symbiotic transactions have been identified. Firstly, the sharing of infrastructure, utilities, or access to services. This is mainly present in the context of the sharing economy; secondly, cooperation on issues indicating common interests; and thirdly, byproduct exchanges between organisations (Marchi et al., 2017). As the latter two symbiotic transactions (cooperation and by-product exchange) are important for this study, their influence on CBMs and this research will be discussed in Section 2.5.

2.4.2 Evolution of the Circular Economy Diagram

The academic literature on sustainability quickly incorporated the ideas distributed by the EMF (Stahel, 2016). To the present day, EMF is one of the main organisations promoting CE principles in industry. Its continuously growing reputation has resulted from increasingly popularising the retention of embedded value in production processes by promoting behavioural change and product longevity (Despeisse et al., 2017). In doing so, EMF does not purely attribute itself to the individual idea of CE and its paradigm (Ghisellini et al., 2016). Moreover, it ascribes itself to the variety of *schools of thought* of cradle-to-cradle, blue economy, biomimicry and performance economy to further refine and develop the idea of CE (EMF, 2013; Ghisellini et al., 2016).

As of today, scholars have not agreed on one common **definition of CE**. Instead, the literature states the existence of over 114 definitions (Masi et al., 2017). An overview of the most relevant definitions from 2006–2017 is provided in Table 2.5, noting that there is a wide interpretation of CE in the individual definitions.

Circular Economy Definitions 2006–2017	
Year	Definition
2006	"Although there is no commonly accepted definition of CE so far, the core of CE is the circular (closed) flow of materials and the use of raw materials and energy through multiple phases" (Yuan et al., 2006)
2009	"The concept of CE has the same essence as industrial ecology, implying a closed loop of materials, energy, and waste flows […]. It presents a new concept of more sustainable urban economic and industrial development." (Geng et al., 2009) "To solve the contradiction of limited resources and the increased consuming desire of human being(s), and to make use of natural resources rationally to achieve sustainable ecological development, the circular economic development mode follows the pattern of ecological circulation and is based on the recycling of material resources." (Chen, 2009)
2010	"The Chinese CE policy originated with the IE policy and is built upon the concept of industrial supply chain loop closing." (Park et al., 2010)
2011	"In an attempt to mitigate these difficulties, however, China's general strategy is one of sustainable development — promoting comprehensive resource conservation and efficient utilization, and clean production: the circular economic model." (Li and Yu, 2011)
2016	"[The CE] is an industrial system that is restorative and regenerative by intention and design… [and] aims for the elimination of waste through the superior design of materials, products, systems and business models." (Hobson, 2015)

Table 2.5 Circular Definitions from 2006–2017 (Source: adapted from Masi et al., 2017)

Circular Economy Definitions 2006–2017	
Year	Definition
2017	"The Circular Economy is an economic model wherein planning, resourcing, procurement, production and reprocessing are designed and managed, as both process and output, to maximize ecosystem functioning and human well-being." (Murray et al., 2015) "The core of the circular economy refers to three activities: reuse at the production level (such as 'repair' or 'refurbishment'); reuse at the component level (e.g. 'remanufacturing'); and reuse at the material level ('recycling')." (Zink and Geyer, 2017)

Table 2.5 continued Circular Definitions from 2006–2017 (Source: adapted from Masi et al., 2017)

Despite the vast variety, the definition framed by the EMF is considered the most renowned definition:

> *"A circular economy is one that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles."*
>
> *(EMF 2015, p. 19).*

EMF also created today's popular CE systems diagram, commonly known as *the butterfly diagram* (Geissdoerfer et al., 2017). The development of this pioneering model has been, and still is, momentous in the circular movement. Its importance is acknowledged in the number of research works that refer to it. Most research either revisits, gives credit, or is based on the fundamental idea of said model. Hence, the researcher sees the necessity of further elaborating on this model. For visualisation purposes, the original model is displayed in Figure 2.3.

The **butterfly model** is based on the idea of a restorative industrial system and replicates an ideal circular environment. It consists of two main cycles: a *biological cycle* and a *technological* cycle.

The left side of the diagram indicates the *biological cycle.* It focuses on deeper biological processes by addressing the circulation of biological nutrient-based products through the economic system. Such biological circulations can, for instance, refer to the extraction of the biochemical feedstock of used chemicals and substances in a circular system, as is often the case with valorisation models in the food or chemistry segment (EMF, 2013; Despeisse et al., 2017).

The right side of the diagram replicates the *technological cycle* and sets its focus on the inorganic side of products. This refers to the physical creation of products and their resource-protective journey through the economic system (EMF, 2013; Despeisse et al., 2017).

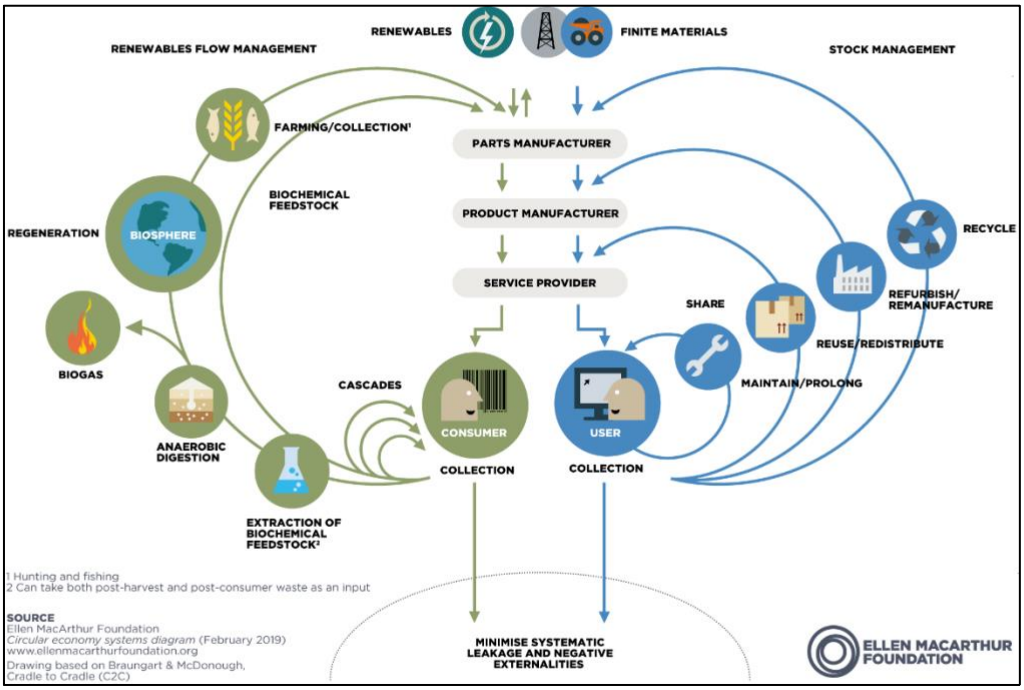

Figure 2.3 Circular Economy Butterfly Model (Source: EMF, 2013)

Each main cycle has different inner circles. These inner circles indicate the different options of circularity in the ecosystem. All inner circles are important, although their appearance can differ according to CBM, industry sector, or service provided. For instance, the technological cycle could focus on four important circles, which are addressed as the domains of *maintenance*, *reuse/distribution*, *refurbishment/ remanufacturing*, and *recycling* (EMF, 2013).

Irrespective of the number of inner circles or the amount and sort of material circled in them, the inner circles are said to have the potential to create value when being set up based on the four aspects announced by EMF. These four aspects refer to the following statements:

– The closer the inner circles are linked with each other, the higher are the cost savings.
– The longer organisations manage to keep material circling in the inner circles, the more value is created.
– Products should be cascaded across different product categories and
– The material circling in the inner circles should preferably be pure, non-toxic, or at least easy to separate (EMF, 2013).

Recent research sets the butterfly model in the wider context of CBMs, the supply chain, and particular remanufacturing processes (Vegter et al., 2020). As the butterfly model indicates the two circular material flows (biological and technological) from sourcing, production until reuse, the CE paradigm closely connects to reverse logistics processes (Bernon et al., 2018). This connection is visualised in the model by setting the 'spine of the butterfly' in context with forward logistics processes and the outer parts as reverse logistics processes (Bernon et al., 2018). Hence, a strong coherence between reverse logistics and the wider paradigm of circularity is acknowledged (Bresannelli, 2018; Sehnem et al., 2019; Mishra et al., 2022). Moreover, reverse logistics is considered as a *"driving force for the circular flows of materials as they promote the return of products in the supply chain for value extraction"* (Julianelli, et al., 2020, p.2).

2.4.3 Concepts, Strategies, and Principles of Circular Economy

The concept of CE is being praised as the solution to harmonising the co-existence of economic growth and environmental protection in business processes (Lieder and Rashid, 2016). To fulfil these, circularity needs to be developed as a multidimensional concept, stressing closed material flows, waste prevention strategies, and resource efficiency strategies (Loiseau et al., 2016; de Jesus and Mendonça, 2018). Successful implementation relies strongly on a variety of unified concepts.

One of these concepts refers to the **waste hierarchy**, which aids in developing versatile waste strategies applicable in every industry sector (Veleva et al., 2017). Generally, waste strategies consider the material life cycle and refer to the best environmental outcome. The different waste strategies (prevention, reuse, recycling, recovery, and disposal) are combined under the umbrella of the waste hierarchy pyramid. This hierarchy is visualised as a bottom-up pyramid. Since disposal should comprise only a very small amount of material, it forms the tip of the pyramid (Scottish Government, 2017).

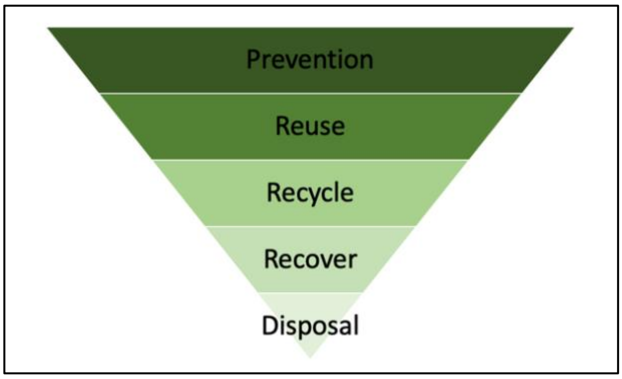

Figure 2.4 Waste Hierarchy (Source: adapted from Scottish Government, 2017)

To support such a variety of concepts and strategies, circularity focuses on both reverse and forward supply chain processes. Furthermore, claims have been made to incorporate the design stage of products and services in circular thinking to further support the variety of waste strategies (Veleva et al., 2017). However, in enabling such a width, CE follows a set of **guiding principles** introduced as follows:

- *The first principle* is considered a principle that defines the entire idea of CE. It refers to the thought of *designing out waste.* In other words, waste simply does not exist. Products and services need to be designed to join the disassembly cycle at any point in the life cycle (EMF, 2013).
- *The second principle* pleads for a strict separation of consumable and durable products. In other words, biological nutrients should be returned to the biosphere, whereas technical nutrients should be reused infinitely.
- *The third principle* approaches the energy required to fuel circular cycles. It aspired to change energy usage mainly to renewable energies, decreasing resource dependence and fostering a resilient system (EMF, 2013; Veleva et al., 2017).

To support the implementation process, EMF (EMF, 2015) has translated the three guiding principles into a framework, consisting of six specific business actions named *Regeneration, Share, Optimise, Loop, Virtualise and Exchange (ReSOLVE framework).* All six actions individually and collaboratively provide different opportunities to fulfil circularity. Their mutual goal is to offer guidance and support in developing and implementing circular strategies and growth initiatives (EMF, 2015). The following Table 2.6 contains detailed information about the individual components of the *ReSOLVE framework* and a practical example for better visualisation.

ReSOLVE Framework	
Regenerate *Move towards the usage of renewable material and energy; prioritise to reclaim, retain and regenerate ecosystems and return biological resources to the biosphere*	*Practical Examples* *Investments from organisations in renewable energy represent USD 650 billion from 2004–2013*
Solve *Maximisation of product usage via sharing (i.e., peer-to-peer sharing, public sharing or sharing of privately owned products); provide the chance to trade second-hand products; exceed product lifetime/durability by design, repair and maintenance actions*	*Practical Examples* *Carpooling, as well as bike-sharing.* *Second-hand products and products made of recycled material*
Optimise *Remove waste equally in production as well as supply chains; continuously improve the performance and efficiency of the product.*	*Practical Examples* *Lean principles applied in companies*
Loop *Aim to keep the products in the closed-loop system; shift focus towards the inner circles*	*Practical Examples* *CBMs that keep the products in closed or open loops, such as scrap steel or byproduct exchange*
Virtualise Deliver utility in a virtual way to dematerialise resource usage.	*Practical Examples* *eBooks, music on-demand, online shopping*
Exchange *Replacing old materials with advanced non-renewable; usage of new technologies.*	*Practical Examples* *i.e. 3D Printing*

Table 2.6 ReSOLVE Framework (Source: adapted EMF, 2015; Jabbour et al., 2017)

Besides the guidance provided by the three main principles and the *ReSOLVE framework*, successful implementation requires incorporating strategies in daily production and consumption processes (Su et al., 2013). Popular, in that regard, appears to be the ***3R strategy***, which has expanded over the years to a *9R strategy*.

The *3R strategy* stands for *reduce, reuse, and recycle*, and is now firmly established in the industry to form circular material cycles (Sakai et al., 2011). Over time, researchers have further developed and optimised the *3R strategy*. Hence, some literature refers to advancements, such as *4R-strategy*, which consists of the elements *reduce, reuse, recover and recycle* (Murray et al., 2017) or *6R-strategy*, which consists of the elements *reduce, reuse, recover, redesign, remanufacture and recycle* (Govindan et al., 2015). Recent literature has developed the idea of the *9R strategy* (Kirchherr et al., 2017). Details about the components of the *R-Strategies* are summarised in Table 2.7.

R-strategies		
Smarter product use and manufacture	R0	Refuse
	R1	Rethink
	R2	Reduce
Extend the lifespan of a product and its parts	R3	Reuse
	R4	Repair
	R5	Refurbish
	R6	Remanufacture
	R7	Repurpose
Useful application of materials	R8	Recycle
	R9	Recover

Table 2.7 R-Strategies (Source: adapted from Kirchherr et al., 2017)

Notably, empirical research based on *R-Strategies* does not aim to investigate all Rs of a single strategy in an individual piece of research. Prevailing in research is to focus on one or two elements of an *R-strategy*. For example, one publication focuses only on the *recycling* element of the *R-strategy*, neglecting to explore the *reduction* and *reuse* aspects in the research. In the literature, a preference towards the element of *remanufacturing* and/or *recycling* is observed (Saidani et al., 2018).

Independent of the different principles and strategies, circular research can always be classified based on the **level of intervention**. These levels are called *micro, meso*, and *macro levels*, and intertwine logically with each other (Ghisellini et al., 2016; Elia et al., 2017).

The *micro level* is the first level and explores circularity in the boundary of an organisation. EMF is very active at this level, proposing circular toolkits for organisations (EMF, 2015) or indexes measuring material circularity and aiding organisations, industry sector independent, to approach and implement circularity (Ghisellini et al., 2016). The wide variety of academic literature equally focuses on the said level.

Second, the *meso level* refers to the boundary of eco-industrial parks and makes use of industrial symbiosis-related approaches to support the implementation of CE in industrial parks (Ghisellini et al., 2016). The famous example of the Kalundborg Eco-Industrial Park was already introduced. Regarding circular measurement, research has started to develop a variety of different index methods to measure the level of circularity at the meso level stage. However, these index methods are very specific in the research action taken and industry sector examined (Ghisellini et al., 2016; Genovese et al., 2017).

The third level is called the *macro level* and explores CE in the larger context of entire cities, communities, or national regions (Ghisellini et al., 2016; Elia et al., 2017).

Figure 2.5 provides a summarising visualisation of the different levels and principles. This indicates the hierarchy of the different levels, as well as that the principles of circularity are applied at all levels. It also displays the support and framing of the role of the RESOLVE framework.

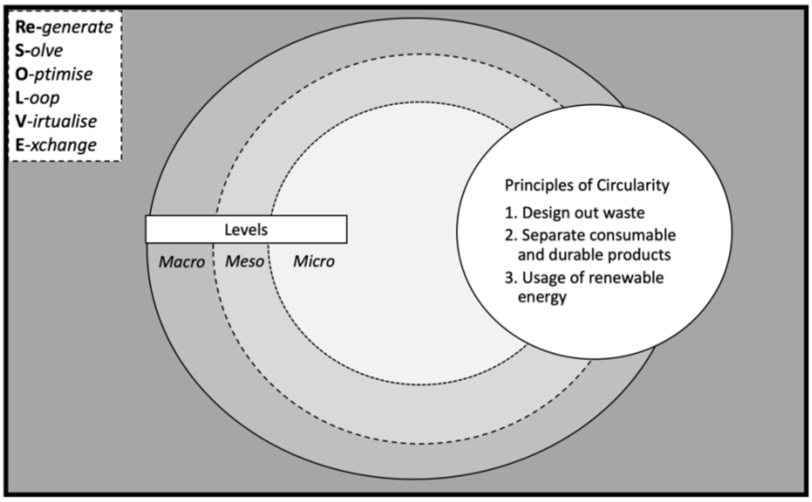

Figure 2.5 Overview of CE principles and -levels (Source: Author)

As the concept of CE and its variety of strategies and principles are explained, the following section (Section 2.4.4) will look at the influencing factors that aid in implementing circular actions.

2.5 Business Models in a Circular Environment

"*You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete*."

(Buckminster Fuller; Systems Theorist of the 20th century)

Recent global developments are about to transform economies and their current BMs. Our globalised way of thinking has fabricated SCs that connect thousands of (inter-) continental miles. This globalised working and living environment has made consumers more contemplative and reflective of the currently discussed climate crisis our planet faces. Changes in their viewpoints are apparent and have consequences for the economy (Baldasarre et al., 2017). The traditional relationship between selling and buying products has been altered by various influencing factors (see Section 2.4.4). The idea of a regenerative economy puts a strong focus on new concepts of product ownership (Baldasarre et al., 2017; Guldmann and Huulgaard, 2020). Hence, organisations are urged to change their concepts (Bocken et al., 2016) and adapt emerging sustainable patterns and innovation pathways (Baldassarre et al., 2017).

This development leads the discussion toward the general set-up of BMs. In the future, business entities are required to explore new ideas and innovations with new concepts of BMs and investigate the consumer's acceptance of such new models (Wells and Seitz, 2005; Teece, 2010; Elzinga et al., 2020). Focusing on innovative, sustainable ideas brings more thorough, long-term, and radical solutions (Baldassarre et al., 2017). However, in particular, the implementation of CE at the micro level, including any transition process to CBMs, also called Circular Business Model Innovation (CBMI) processes, are claimed to be under-researched (Ghisellini et al., 2016; Blomsma and Brennan, 2017; Franco, 2017; Lieder and Rashid, 2017; Urbinati et al., 2017). This creates a lack of knowledge about the frameworks for CBM (Urbinati et al., 2017).

The following sections will aid in understanding the transition from LBMs to CBMs. Therefore, Section 2.5.1 provides necessary background information on the general topic of BMs, followed by a closer look at innovative processes fostering the transition from LBMs to CBMs (Section 2.5.2), before a deeper dive into the world of CBMs by looking at the variety of CBMs in Section 2.5.3, and highlighting the value perspectives of CBMs in Section 2.5.4.

2.5.1 Business Models

BMs have always maintained a crucial role in trading and economic behaviour. With the invention of the Internet in the mid-1990s marking a new era, science increased notations on this topic (Zott et al., 2011). Despite the growing popularity of research focusing on the concept of BMs, an explicit or unified definition was missing. Instead, the business community identified a variety of interpretations for BMs, which included simplified interpretations, such as *a statement, a description*, as well as more complex views, for instance, *an architecture, a conceptual tool, a framework, or a method* (Shafer et al., 2005; Zott et al., 2011). Table 2.8 provides a summary of the interpretations. Across these interpretations, researchers have discovered various components and patterns that can compose BMs and indicate the complexity around a BM. In the following section, a variety of these developments will be introduced.

A business model can be interpreted as…
... a statement *(Steward and Zhao, 2000)*
... a description *(Applegate, 2000; Weill and Vitale, 2001)*
…a representation *(Morris et al., 2005; Shafer et al., 2005)*
… an architecture *Timmers, 1998; Dubosson-Torbay et al., 2002)*
… a conceptual tool or model *Osterwalder et al., 2004; George and Bock, 2009)*
…a structural template *(Amit and Zott, 2001)*
… a method (*Afuah and Tucci, 2001)*
…a framework (*Afuah, 2004)*
…a pattern (*Brousseau and Prenard, 2006)*
…a set (*Seelos and Mair, 2007)*

Table 2.8 Interpretation of Business models (Source: adapted from Zott et al., 2011)

Shafer et al. (2005) established 42 elements that compose a BM. Based on this perception, an affinity diagram was created to group the components into the following: (1) Strategic Choices, (2) Value Network, (3) Create Value, and (4) Capture Value. Figure 2.6 provides further details regarding the individual elements in each group. Noteworthy is the influence of the variable *value* at this early stage in BM research.

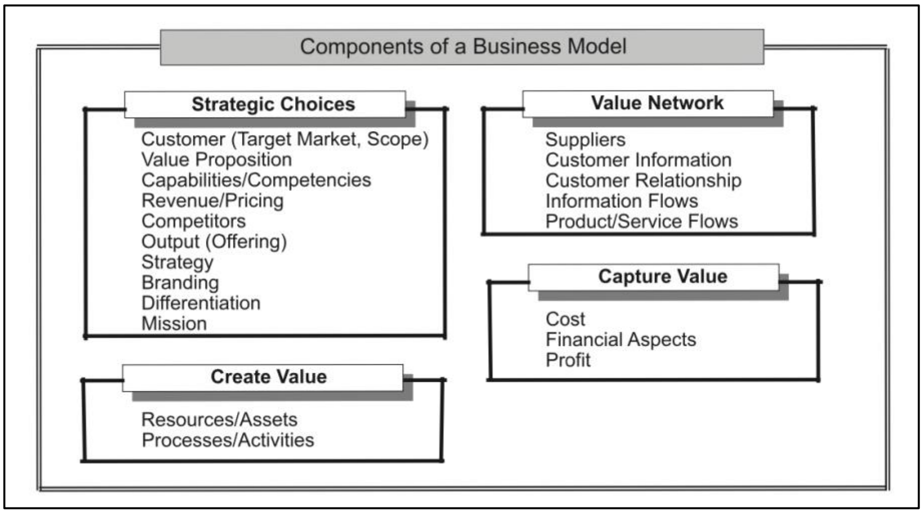

Figure 2.6 Business Model Components (Source: Shafer et al., 2005, p.202)

David J. Teece (2010) was another scholar focusing on BMs, their elements, and their definition. According to him, three main assumptions define a BM. First, a BM possesses the logic, data, and evidence to convey how business is transacted, especially when business actions aim to create value for customers. Second, a business model represents the composition of costs, revenues, and profits associated when delivering the value to the customer. Third, it comprises a variety of different elements. These elements need to provide a functional interplay to transfer the theoretical constructs into a successful practical BM. Teece (2010) offered further guidelines on elements and actions aiding in establishing a BM, which is displayed in Table 2.9.

Elements of a business model
– Selection of technologies to be embedded in the product
– Determination of benefits to the customer from consuming the product
– Identification of market segments that need to be targeted
– Confirmation of available revenue streams
– Design of mechanisms to capture value

Table 2.9 Elements of Business Models (Source: adapted from Teece, 2010)

Based on the urgent need to have a commonly applied definition that would be intuitively understandable without oversimplifying or compromising any complex functions in organisations (Osterwalder and Pigneur, 2010), Osterwalder and Pigneur (2010) developed their well-known *business model canvas*. Due to its stance in BM research and its utmost importance in the transition process to a CE, the *canvas* is explained and illustrated in the following sections.

Osterwalder and Pigneur's (2010) *business model canvas* considers a BM as the core logic of how companies create, deliver, and capture value, and conceptualises BMs by seeing them as a set of assumptions and hypotheses (Ovans, 2015). The *canvas* is widely acknowledged in academia and industry. Organisations from different backgrounds use it as a template to visualise their own BM (Osterwalder and Pigneur, 2010; Ovans, 2015; Antikainen and Valkokari, 2016; Nußholz, 2017). It is divided into nine building blocks, each picking up on an organisation's intention to create profit (Osterwalder and Pigneur, 2010). Some of the blocks influence each other; hence, three overarching groups can be formed. The first group comprises key partners, activities, and resources; the second group comprises value proposition, customer relationship, channels, and customer segments; and the third group focuses on costs by looking at the cost structure and revenue streams. The *canvas* is displayed in Figure 2.7, including colour coding to emphasise the three groups.

The circular movement has recognised the advantages of the *canvas* and developed a liking for it. Especially since it manages to show a high practical relevance by covering the four main areas, business entities should specifically pay attention to: (1) customers; (2) offers; (3) infrastructure; and (4) financial viability (Osterwalder and Pigneur, 2010; Nußholz, 2017). Its popularity grew due to its ability to set standards easily. It supports organisations in setting strategic decisions on important topics, such as value creation, transfer, or capture. Building upon such a core logic leads to various authors using the *canvas* for their own research, or even combining it with additional variables to develop it further (Boons and Lüdeke-Freund, 2013; Nußholz, 2017; Urbinati et al., 2017). Not to neglect is the growing popularity once EMF made a version of the *canvas* available in their *Circular Design Guide* for interested organisations (EMF, 2016).

In summary, the literature agrees in great consistency that BMs are conceptual tools, helping all kinds of organisations understand how their business can be managed most effectively (Osterwalder and Pigneur, 2010; Teece, 2010; Bocken et al., 2014). In doing so, BMs act supportively in upcoming management tasks; are commonly used for analysis purposes; or inform comparison and performance assessments in arising business tasks and processes (Osterwalder and Pigneur, 2010; Bocken et al., 2014).

However, for many years, BMs and their SC processes, product design, material usage, and product EOL handling were only considered in one direction. The true merits of sustainable products, production processes, reuse and reverse business practices were not prioritised, neither by industry nor policy (Clinton and Whisnant, 2014; Whalen et al., 2018). The world's changing perspectives on environmental issues have encouraged thoughts about the level of circularity in the current BM. In the following section, the transition from LBM to CBM will be discussed.

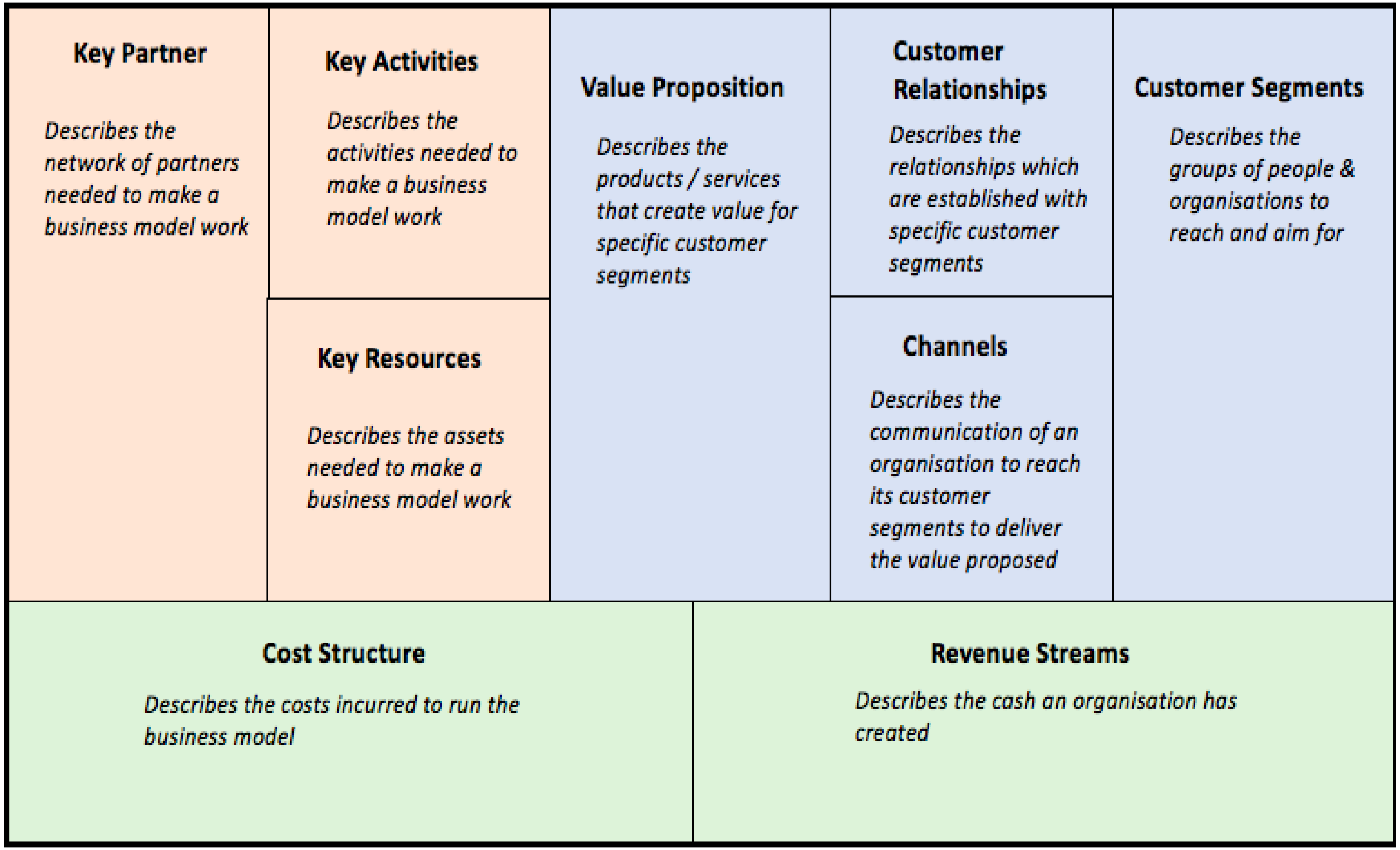

Figure 2.7 Business Model Canvas (Source: adapted from Osterwalder and Pigneur, 2010)

2.5.2 The Transition to CBMs—Circular Business Model Innovation

Innovative new BMs, which allow organisations on all levels to engage with circularity principles, were identified as a way forward (Boons et al., 2013; Antikainen and Valkokari, 2016; Merli et al., 2018; Guldmann and Huulgaard, 2020; Ranta et al., 2020). In doing so, the understanding of Business Model Innovation (CBMI) has been identified as the *"process of making changes to existing business models to devise new business model configurations, or crafting entirely new business models to create, deliver and capture value in novel ways*" (Guldmann and Huulgaard, 2020, p. 3). Based on this, the researcher considers CBMs as a subcategory of BMs, and CBMI as a transformation process from LBMs to CBMs.

Despite a variety of existent CBMI definitions (see Table 2.10), the researcher agrees with Bocken et al. (2019) and defines CBMI as a process of *"innovating the business model (i.e., updating the elements of an existing business model, or establishing a new organization and associated business model) to embed, implement and capitalize on circular economy practices"* (Bocken et al., 2019, p.3).

In fact, the researcher considers CBMs as a subcategory of BMs, and the transformation from LBMs to CBMs as the innovation process. Hence, CBMs are considered the outcome of CBMI processes. As so far, the BM terminology has been explained, this section focuses on the innovation process (CBMI) before looking in greater detail at CBMs (Section 2.5.3).

Despite the variety of existing CBMI definitions (see Table 2.10), scholars agree that CBMI is a type of sustainable business model innovation that aligns with the circularity principles (Geissdoerfer et al., 2018; Guldmann and Huulgaard, 2020; Santa-Maria et al., 2021). Hence, CBMI is described in two forms, either in the design of entirely new BMs or in the reconfiguration of existing BM elements, all in light of CE principles (Bocken et al., 2019). As CBMI is classified as a very young research field, only having emerged in the last five years (Diaz Lopez et al., 2019; Pieroni et al., 2019), tools and methods to support CBMI processes are limited (Bocken et al., 2019). Research by Bocken et al. (21019) identified only 13 publications focusing on tools for CBMI analysis from 2014 to 2019. This generates the viewpoint that CBMI is considered a more challenging and complex type of innovation than process and product innovation (Guldmann and Huulgaard, 2020). The incapability of dealing with a new, circular innovation process is claimed to come from an organisation's old value creation logic, which is limited to strict management structures and the distribution of resources (Chesbrough, 2010; Guldmann and Huulgaard, 2020). Hence, this particular occurrence of dealing with old value creation logic and the paradigm shift towards circularity is considered a particular and complex challenge (Guldmann and Huulgaard, 2020).

Definitions of Circular Business Model Innovation
"The process of CBMI […] is understood as innovating the business model (i.e. updating the elements of an existing business model, or establishing a new organization and associated business model) to embed, implement and capitalize on circular economy practices." *Bocken et al., 2019, p. 3.*
"CBMI can be defined as the conceptualisation and implementation of circular business models, which comprises the creation of circular start-ups the diversification into circular business models, the acquisition of circular business models, or the transformation of a business model into a circular one. This can affect the entire business model or one or more of its elements, the interrelations between the elements, and the value network." *Geissdoerfer et al., 2020, p. 8.*
"CBMI is concerned with the incorporation of circular services and product design in an existing or a new business model and commands a reconfiguration of multiple, if not all, business model elements, potentially affecting every part of how the company operates, its existing structures, procedures, values, beliefs, etc." *Guldmann et al., 2019, p. 81*
"We define CBMI in incumbent companies as the process of reconfiguring an existing linear business model to include CBM components in the form of value recreation, redelivery and recapture and an extended value proposition, or the process of reconfiguring an existing circular business model to include more, or better, versions of these CBM components. In start-ups, we define CBMI as the process of crafting a CBM based on those CBM components from the ground up." *Guldmann and Huulgaard, 2020, p. 3.*
"CE-oriented BMI incorporates principles or practices from CE as guidelines for BM design. It aims at boosting resource efficiency effectiveness (by narrowing or slowing energy and resource loops) and ultimately closing energy and resource flows by changing the way economic value and the interpretation of products are approached." *Pieroni et al., 2019, p. 201.*

Table 2.10 Definitions of Circular Business Model Innovation (Source: Author)

This challenge is of great importance in the set-up of any CBM, as considerations have to be made regarding how to propose, create, deliver, and capture value throughout the different cycles (Nußholz, 2018; Guldmann and Hulgaard, 2020). Depending on the complexity, the CBMI process can be initiated either at the beginning of the circular journey by discussing possible CBMs or as an action-oriented CBMI process, radically transforming the current LBM (Guldmann and Hulgaard, 2020).

Nonetheless, the literature supporting the development of CBMI states, *"there is still a lack of understanding the process of CBMI"* (Santa-Maria et al., 2021, p. 872). Most of the literature is claimed to be theoretical, and further empirical research is required (Santa-Maria et al., 2021), especially considering that we are approaching the so-called sixth wave of innovation, which is guided by a socio-technological transformation (Silva and Serio, 2016; Culey, 2018). Critical voices have claimed that traditional innovative pathways tend to aim exclusively for financial and business growth to the detriment of future development (Ehrenfeld, 2004; Teece, 2010; Baldassarre et al., 2017; Culey, 2018). Therefore, there is a greater risk of neglecting creative thinking towards new resource-efficient technologies (Baldassarre et al., 2017). Nonetheless, technological innovation, including robotics and other computing and digital technology, has reached research agendas (Ranta et al., 2021) in the hope of delivering greater and more variegated products or services on an environmental basis in CBMs (Teece, 2010; Pagoropoulos, 2017; Culey, 2018).

Having explained the mechanisms of CBMI to trigger the transformation of LBMs to CBM, the following section focuses on the *outcome of the transition process* by introducing five specifically identified CBMs.

2.5.3 Circular Business Models

The literature states that the development of CBMs requires a widespread and accelerated transition to a more sustainable society (Santa-Maria et al., 2021). According to the latest research by Geissdoerfer et al. (2020), the concept of CBMs was first present in the literature in the context of circular value creation, when Schwager and Moser (2006) developed individual BM types (Schwager and Moser 2006; Geissdoerfer et al., 2020). When EMF started to promote circularity in 2013, the concepts of CBMs re-emerged and remained, up to today, a popular topic (Geissdoerfer et al., 2020). Academics, politicians, and practitioners are eager to come forward with groundbreaking ideas of how such a circular model can be put into practice (Charter, 2016). However, like the great variety of CE definitions (Kirchherr et al., 2017), CBMs do not have a unified definition. In Table 2.11, a summary of the various ideas, interpretations, and definitions of CBMs is provided.

Circular Business Model Definitions
"A circular business model is the rationale of how an organization creates, delivers and captures value with and in closed material loops." (Mentink, 2014)
"A circular value chain business model (or green business model) is one in which all intermediary outputs that have no further use in the value-creating activities of the firms are monetised in the form of either cost reduction or revenue streams." (Ross, 2014)
"(…) a business model in which the conceptual logic for value creation is based on utilising the economic value retained in products after use in the production of new offerings. Thus, a circular business model implies a return flow to the producer from users, though there can be intermediaries between the two parties […and] always involves recycling, remanufacturing, reuse, or of their sibling activities (e.g., refurbishment, renovation, repair)." (Linder and Williander, 2017)
"Business model strategies suited for the move to a CE based on the taxonomy of slowing closing and narrowing resource loops." (Bocken et al., 2016)
"A circular business model describes how an organization creates, delivers, and captures value in a circular economic system, whereby the business rationale needs to be designed in such way that it prevents, postpones or reverses obsolescence, minimizes leakage and favours the use of 'presources' over the use of resources in the process of creating, delivering, and capturing value." (Den Hollander and Bakker, 2016)
"We define a circular business model as a business model in which the conceptual logic for value creation is based on utilising economic value retained in products after use in the production of new offerings. Thus, a circular business model implies a return flow to the producers from users […]. The term circular business model, therefore, overlaps with the concept of closed-loop supply chains, and always involves recycling, remanufacturing, reuse, or one of their siblings' activities (e.g., refurbishment, renovation, repair)." (Linder and Williander, 2017)
"A circular business model is how a company creates, captures, and delivers value with the value creation logic designed to improve resource efficiency through contributing to extending useful life of product and parts (e.g., through long-life design, repair and remanufacturing) and closing material loops." (Nußholz, 2017)
"[…] different modes of adoption of CE […] single firms […] as they adopt any of the circular practices (e.g. redistribution and reuse, remanufacturing or recycling of products) in their internal activities." (Urbinati et al., 2017)
"CBMs can be defined as Sustainable Business Models – which are business models that aim at solutions for sustainable development by creating additional monetary and nonmonetary value." (Geissdoerfer et al., 2018)

Table 2.11 Definitions for Circular Business Models (Source: Author)

Circular Business Model Definitions
“[…] how an established firm uses innovations to create, deliver and capture value through the implementation of CE principles, whereby the business rationale are realigned between the network of actors /stakeholders to meet the environmental, social, and economic benefits.” (Lahti et al., 2018)
“The rationale of how an organisation creates, delivers, and captures value with slowing, closing, or narrowing flows of the resource loops.” (Oghazi and Mostaghel, 2018)
“A circular business model represents a holistic system of co-evolving managerial practices for collective value creation, delivery and capture which provides solutions for sustainable development.” (Ünal et al., 2019)

Table 2.11 Continued Definitions for Circular Business Models (Source: Author)

Throughout the years, scholars and practitioners have made attempts to identify and classify the different CBMs. This has often been done in conjunction with the development of value canvases (Nußholz, 2017; Nußholz, 2018). Table 2.12 provides a list of CBMs named by the literature and used by industrial and policy bodies.

For this research, the researcher selected the CBM categories displayed at Position G in Table 2.12, which displays the following groups:

Model 1: Circular Supply Chain Model

Model 2: Resource Recovery Models

Model 3: Product Life Extensions

Model 4: Sharing models

Model 5: Product as a Service model

Note that the positions given do not replicate a particular order. They are purely for identification purposes. The decision to go with the CBMs introduced at Position G is based on their wide application in academia and industry, including renowned institutions, such as EMF, and political institutions, such as the EU. Furthermore, these CBMs align with the CBMs addressed in the studies of key authors in the field of circularly (Bresanelli et al., 2016; De Angelis, 2016; Geissdoerfer et al., 2020). In the following, each of the five CBMs of Position G is explained and summarised in separate tables.

Identified CBMs			
A	1. The Access Model 2. The Performance Model 3. The Hybrid Model	4. The classic long-life model 5. The gap exploiter	*(Bakker et al., 2014*)
B	1. Encouraging sufficiency 2. Industrial Symbiosis 3. Access and Performance Model	4. Classic long life 5. Extending product value Extending resource value	*Bocken et al., 2016)*
C	1. Short Cycle a) Pay-per-use b) Repair c) Waste reduction d) Sharing platforms e) Progressive purchase 2. Long cycle a) Performance-based contracting b) Take-back management c) Next-life sales d) Refurbish & resell 3. Cascades a) Upcycle b) Recycling c) Collaborative production	4. Pure circles a) Cradle-to-cradle b) Circular sourcing 5. Dematerialised service a) Physical to virtual b) Subscription-based rental c) Produce on-demand d) Produce on-order 3 D printing Customer vote	*(Van Renswoude et al., 2015)*
D	1. Cycling, 2. Extending	3. Intensifying, 4. Dematerialising	*Geissdoerfer et al., 2020)*
E	Pay-per-use, 1. Product life extension	Resource Value Extension	*(Whalen and Whalen, 2020)*
F	1. Performance / Service System 2. Incentivised return 3. Asset management	4. Collaborative Consumption 5. Long-Life Products	*(Circular Tayside, 2017)*
G	1. Circular Supply Models 2. Resource Recovery Models 3. Product Life Extensions	4. Sharing Models 5. Product as a service model	*(Lacy et al., 2014; Moreno et al., 2016; Lacy and Rutqvist, 2015; OECD, 2019; Sehnem, 2019)*
H	1. Sharing and extended use 2. Recycling and upcycling	3. Biologically based material	*(Larsson, 2018)*
I	1. Commercial Models a) Sell b) Exchange c) Share d) Rent or lease e) Service, performance, or results	2. Circular Operating Models a) Recovery and recycling b) Resell and reuse c) Refill and maintain d) Remanufacture	*(Weetman, 2017)*

Table 2.12 Identified CBMs (Source: Author)

<u>Model 1: Circular Supply Chain Model</u>

Circular Supply Chain Management is defined in the literature as follows:

> *"The configuration and coordination of organizational functions marketing, sales, R&D, production, logistics, IT, finance, and customer service in and across business units and organizations to close, slow intensify, narrow and dematerialise material and energy loops to minimize resource input into and waste emission leakage out of the system, improve its operative effectiveness and efficiency and generate competitive advantages.*"
>
> (Geissdoerfer et al., 2018, p. 715).

As the definition emphasises, the key components are engagement and coordination between different departments and partners. In a linear economy, partners have only minor options for engagement. Linear supply chains are likelier to deal with toxic, polluted, or non-recyclable products (components) (Lacy and Rutqvist, 2015). Circular supply chain models, on the other hand, work on the principle of providing "*renewable energy, bio-based or full recyclable input material to replace single-lifecycle inputs*" (Lacy et al., 2014, p. 12).

The literature clusters circular supply chains into three groups: (1) eco-industrial parks; (2) environmental, sustainable green systems; and (3) closed-loop supply chains (Masi et al., 2017; Farooque et al., 2019). The model of Circular Supply Chains remains broadly interpreted. Some researchers see the idea of establishing sustainable supply chain networks with integrated waste management options (Winkler and Kaluza, 2006), while others only identify circular actions in a closed-loop system as a circular supply chain model (Larsen et al., 2018; Lapko et al., 2019) and yet others consider them as an opportunity to integrate value recovery through reverse logistics actions (Bernon et al., 2018, Larsen et al., 2018, Farooque et al., 2019).

As the value chain, and in particular, the component of value recovery, is at the centre of the model, it aims to provide access to fully renewable, recyclable and/or biodegradable product components (Lacy and Rutqvist, 2015; Geissdoerfer et al., 2018). Practical examples are Waste-to-Energy actions, for instance, zero waste energy recovery facilities, or the replacement of fossil-based input with bio-based resources (Lacy and Rutqvist, 2015).

The model is currently applied in two variations, either by producing for others or by producing for the company's own operations. It is argued that it can provide a cost-effective long-term advantage since customers are looking for predictable and secure SCs with stable pricing (Lacy and Rutqvist, 2015). Table 2.13 summarises Model 1.

	Model 1: Circular Supply Chain Model	
Core idea	To provide renewable energy, bio-based or fully recycle inputs to replace linear components	
Requirements	• Non-toxic and not contaminated material • Functional return chains • No resource leakage along the value chain	
Examples	• Renewable energy • Bio-based materials such as bioplastics or biochemicals • Recyclable material can be infinitely used	
Model variations	1. Produce for others 2. Produce for own operations	
(Dis-)advantages	+ More predictable, long-term & cost-effective inputs + Reduced risks & stable pricing + Compliance with existent regulations	– Scaling takes time and monetary resources – Strong R&D know-how needed

Table 2.13 Model 1 - Circular Supply Chain Model (Source: Author)

Model 2: Resource Recovery and Recycling Model

With resources becoming increasingly more expensive, businesses need to look forward to protecting, recapturing, and reusing the material that is hidden in their (disposed) products (Lacy and Rutqvist, 2015). The model of resource, recovery and recycling focuses on the recovery of *"useful resources /energy out of disposed products or byproducts"* (Lacy et al., 2014, p. 12). Hence, the model has strong connections to the waste service management industry (Singh and Ordoñez, 2016).

The purpose of the model is *"to recover products or resources in order to reprocess them itself […]and /or to resell to specialists for further reprocessing"* (Weetman, 2017, p. 81). Since the model runs on the idea of maximising economic value and eliminating material leakages, it appears to be particularly attractive for organisations producing a larger volume of (by-) products, which can be reclaimed and reprocessed at reasonable costs. In addition, material that is clean in its nature, and not involved in complex product design, is preferred (Lacy and Ruqvist, 2015). The model has been criticised (Gregson et al., 2015; Stahel, 2015), as scholars argue that in a linear system, resource recovery is an important aspect of waste management, and only 30% of the total waste material is recovered (Singh and Ordoñez, 2016). Recycling rates in Europe, for example, have great discrepancies. On average, only 47% of the material is recycled (Doherty, 2019). In addition, circular experts consider recycling to be the least valuable resource loop (Stahel, 2015). Recycling actions are only seen as a legitimate loop if the entire waste management industry takes the challenge on board and shifts their *"thinking behind its activities from zero-value waste to highest-value preservation"* (Stahel, 2015).

On the other hand, the advantages of applying this model are listed as reduced costs of compliance and waste management, increased revenue by selling the unwanted product (materials), new interaction points with customers and deeper insights into product design and product disposal (Lacy and Rutqvist, 2015). Furthermore, it is a model that connects easily with customers from B2C markets. These customers benefit from convenient ways of disposing of their unwanted products by using pick-up services, drop-off points, buy-back, and send-back schemes (Lacy and Rutqvist, 2015; Weetman, 2017). A summary of the model is provided in Table 2.14.

	Model 2: Recovery and Recycling Model
Core idea	To recover useful resources/energy out of disposed of (by-) products
Requirements	• Less complex product design • Functioning return scheme
Examples	• Upcycling • Resource recovery • Sharing by-products • Closed-loop • Recycling (mechanical and chemical)
Model variations	1. Resource recovery to recapture value in closed loops (a company's own product) 2. Resource recovery to recapture value in open loops (any company's products) 3. Recovering waste and byproducts from a company's own production process and operations to recapture value
Advantages and Disadvantages	+ Increased revenue by selling unwanted products + Deeper interaction with customers after the point of sale + Deeper insights into product design and disposal + Cost savings when using secondary resources – Finding a way of controlling the return flow – Maintaining the quality and ownership right to resources – Easier in B2B than B2C markets

Table 2.14 Model 2 - Recovery and Recycling Model (Source: Author)

Model 3: Product Life Extension Business Model (PLEBM)

Product lifetime is defined as *"the duration of the period that starts at the moment a product is released for use after manufacture and ends at the moment a product becomes obsolete beyond recovery at product level"* (den Hollander et al., 2017, p. 519). Hence, PLEBMs aim to lengthen a product's lifetime by extending its use cycles. In doing so, it is important to differentiate between the fact that products can only have one lifetime, but one or more use cycles (den Hollander et al., 2017; Ertz et al., 2019). This shifts the focus towards longer durability, quality and functionality of the materials used and the product's design (Lucy and Rutqvist, 2015).

The literature has identified circular product design of utmost importance for PLEBM. Design for product integrity remains special for PLEBM, since it integrates design approaches for long use (design for physical and emotional durability), extended use (design for maintenance and upgrading), and recovery (design for recontextualising, repair, refurbishment, remanufacture) (den Hollander et al., 2017). This leads to a variety of options to extend the use cycles of products, for instance, build to last, refurbishing, take-back/trade-in/buy-back schemes, upgrade, refill, or repair options.

Similar to the importance of product design is the contact with customers after the point of sale (Lacy and Rutqvist, 2015). Applying product data in the manufacturing stages is assumed to be an easy process, yet generating data during usage phases and at the end-of-use phase to keep material in the cycles is still complex. Digital technologies are argued to be the solution to closing this gap (Lacy and Rutqvist, 2015; Weetman, 2017). A summary of the PLEBM model is provided in Table 2.15.

Model 3: Product Life-Extension Business Models		
Core idea	To extend the working lifecycle of products and components by repairing, upgrading, and reselling	
Requirements	Durability, quality and functionality of product material	
Examples	• Build to last • Refurbish • Take-back/buy-in/buy-back to remarket • Upgrade • Refill • Repair	
Model variations	N/A	
Advantages and Disadvantages	+ More interaction points with customers + Contracts with customers, e.g., maintenance	– Higher upfront costs to develop high-quality, easy to repair products – Difficult to quantify

Table 2.15 Model 3 - Product Life Extension Business Model (Source: Author)

Model 4: Sharing Platforms

The model of sharing platforms is addressed in the boundaries of the sharing, peer, collaborative, and circular economy (Sposato et al., 2017). In the literature, it is defined as a *"socio-economic system that leverages technology to mediate two-sided markets, which facilitate temporary access to goods that are underutilised, tangible, and rivalrous"* (Curtis and Mont, 2020, p. 4).

The model of sharing platforms aims to enable increased utilisation rates of products by obtaining, giving or sharing access to goods and services via platforms (Lacy and Rutqvist, 2015; Taranic et al., 2016). It is set up on a triadic relationship between the digital platform and the two main actors: the resource owner and the resource user (Curtis and Mont, 2020). The platforms do not produce products. Instead, they match demand with supply by identifying any idle capacity (Lucy and Rutqvist, 2015).

In the context of circularity, sharing platforms are said to bring economic and environmental advantages (Sposato et al., 2017). Interestingly, the idea of sharing became popular during the financial crisis in 2008 and is especially used by millennials (Weetman, 2017; Lucy and Rutquvist, 2015). Since then, the focus has shifted towards the business environment (Lacy and Rutqvist, 2015), and to date, growing potential in the mobility, manufacturing production, housing, and agro-food sectors has been identified (Sposato et al., 2017).

Currently, sharing platforms are predominantly used in the housing and automobile industries (Curtis and Mont, 2020; Schwanholz and Leipold, 2020). However, claims have been made that the model has not yet been efficiently explored (Curtis and Mont, 2020).

When changing to a shared model, businesses are urged to consider the time it takes for their customers to adapt. Once established, it opens a myriad of opportunities for creating revenue and new usage of assets. In addition, it fosters the engagement of employees, resulting in cultural and social improvements in the workplace (Lucy and Rutqvist, 2015; Weetman, 2017). Table 2.16 summarises the information for this model.

Model 4: Sharing Platforms		
Core idea	To enable increased utilisation rate of products by making possible shared use/access/ownership	
Requirements	Facilitation effort for renting, sharing, swapping, lending, gifting or bartering of resources	
Examples	N/A	
Model variations	1. Platforms in C2C environment 2. Platforms in B2C environment 3. Platforms in B2B environment	
Advantages and Disadvantages	+ Usage of the same resource by multiple customers + Reduction in the manufacturing of new products + Growth in consumption without the need to use primary resources + Availability and access independent of price and location of the product + Location and range independent offering	– Change in the behaviour of customer's needs time – Predominantly young customers

Table 2.16 Model 4 - Sharing Platforms (Source: Author)

Model 5: Product as a Service

The model of Product as a Service is also known in the literature as Product service systems (PSS) (Cherry and Pidgeon, 2018). Although the idea of PSS has been present for some time in the C2C sector, questions regarding customer acceptance have risen (Lacy and Rutqvist, 2015). Those questions are mostly related to uncertainty regarding customer acceptance (Cherry and Pidgeon, 2018; Elzinga et al., 2020), as little is known about this (Cherry and Pidgeon, 2018; Yang et al., 2018). Despite some literature identifying the customer as a possible barrier (Pecorari and Lima, 2021), recent research has shown the B2C and B2B markets have a growing interest in PSS (Yang et al., 2018), particularly regarding products of high amortisation or operating costs (Rutqvist and Lacy, 2015).

The literature has identified three types of PSS. First, product-oriented services, in which the product is still sold, but additional services are offered. Second, user-oriented services, in which the ownership of the products remains with the provider. The product, however, is made available in different forms, e.g., via leasing. The third is result-oriented services, at which customers and providers agree on a certain result without any product involvement. This could include activities such as management (i.e., catering services) or pay-per-service (i.e., km driven in fleet management) (Tukker, 2004; Tukker, 2015, Yang et al., 2018).

For the provider of the service, the product lifecycle needs to be carefully considered. The product needs to be fit for use, as this is critical when being rented for customers, as well as for maintenance and reuse. In addition, the objectives between the product provider and the customer must be in alignment (Lacy and Rutqvist, 2015). Table 2.17 provides an overview of the PSS models.

Model 5: Product as a Service Model		
Core idea	To offer product access and retain ownership to internalise benefits of circular resource productivity	
Requirements	Consideration of entire product lifecycle when setting up the model Products need to be designed for optimal use, maintenance, and reuse Alignment between provider and customer objectives for the product	
Examples	• Pay for use • Leasing • Rental performance	
Model variations	Product-oriented PSS Use-oriented PSS Result-oriented PSS	
Advantages and Disadvantages	+ Strong customer engagement + Less amortisation or operation costs + Growing customer loyalty	– The provider is responsible for product management costs – Return of product to a fixed or floating location – Keeping up to date on the status and position of all assets

Table 2.17 Model 5 - Product as a Service (Source: Author)

2.5.4 Value Perspective on Circular Business Models

"*Companies that solely focus on competition will ultimately die. Those that focus on value creation will thrive.*"

(Edward de Bono, Nobel Prize Nominee)

The terminology of value appears to be central to any BM (De Angelis, 2018; Charter and McLanaghan, 2019). Its creation is key to all businesses (Lindgreen and Wynstra, 2005). Suppliers must deliver value to survive on the market; for organisations, it is a fundamental requirement of success, and customers select the product or service that is believed to bring superior value to them (Hughes, 1999). If the necessary value is not found in the product or service, rejection is a logical consequence. Hence, business growth and success reflect and rely on the creation and delivery of value (Tzokas and Saren, 1997). It is essential, but often ignored, that the nature of value needs to be defined and understood in the business environment (Tzokas and Saren, 1997; Hughes, 1999).

The concept of value has been widely studied and interpreted by scholars from different business and management fields (Johnson et al., 1999; Bowman and Ambrosini 2000). The conceptual root of value is said to be found in business and service marketing, where customer value maintains an essential role (Ulaga, 2003). In the context of logistics and SCM, value is, amongst others, important with regard to value chains (Lindgreen and Wynstra, 2005). However, due to the high variety and application in different fields of business and management, value is difficult to define (Bowman and Ambrosini, 2000). It needs to be seen in the relevant context of the investigated phenomenon (Bowman and Ambrosini, 2000). As this research focuses on circularity, value is examined from a circularity perspective.

Since a linear economy often deals with comparable figures, value is likely defined on the gross domestic product and achieved benefits in an organisation (Velenturf and Jopson, 2019). However, limiting value to mathematical figures appears to be a restricted perspective from a circular point of view. Environmental and social perspectives are claimed to be neglected (Charter and McLanaghan, 2019; Velenturf and Jopson, 2019). In addition, economic figures do not replicate or consider the negative impact caused, for example, by the disposal of valuable items in landfills

(Bernon et al., 2018). Hence, traditional BMs are often criticised for focusing on value creation, delivery and capture solely from an economic value perspective (Evans et al., 2017; Kristensen and Remmen, 2019). Even if the environmental value is considered, the broader form of social value, which is important for a positive impact on society, is still neglected (Guldmann et al., 2019; Kristensen and Remmen, 2019).

Circularity, however, means creating a regenerative economy in which organisations strive to maximise value by considering the utilisation of products, components, materials, and services at all times (Guldmann et al., 2019). Therefore, value has been identified as an essential component of circularity. Since the value is central to BMs (Richardson, 2008, Bocken et al., 2019; Bertassini et al., 2021), it is equally essential for CBMs (Bocken et al., 2019). The key is to reconsider how value is created, delivered, and captured in business model innovation and apply this holistic value creation logic with circular principles (Bocken et al., 2019). In doing so, the literature has predominantly focused on the investigation of CBMs in the context of the triple bottom line (TBL) values (Lewandowski, 2016; Linder and Williander, 2017; Rizos et al., 2016; Ranta et al., 2018). It is argued that value in the context of the TBL encompasses the creation of social, environmental, and economic value (Iacovidou et al., 2017b; Bernon et al., 2018; Milward-Hopkins et al., 2018) and aids in deriving sustainability indicators (Zamagni et al., 2013).

Furthermore, CBMI processes rely on technological development. Hence, in recent years, some scholars have started to incorporate a new value domain of technical value (Iacovidou et al., 2017b; Velenturf and Jopson, 2019). Incorporating this value will lead to greater technical viability as well as investment appraisals. The literature suggests further elaboration on the technological value (Velenturf and Jopson, 2019); however, less on an individual domain, than on the collective domain, to retain greater clarity (Iacovidou et al., 2017b).

Besides the multidimensional value perspectives based on the TBL, the four value perspectives of Osterwalder and Pigneur (2010), value proposition, creation, delivery, and capture, are used by scholars when referring to value in a circular perspective (Bockent et al., 2014; Kraaijenhagen et al., 2016; Iacovidou et al., 2017a; Iacovidou et al., 2017b; Urbinati et al., 2017). For instance, research has focused on concepts of value (Nußholz 2017; Reike et al., 2018), innovation and technologies (Linder and Williander, 2017, Ranta et al., 2021), the design of circular toolkits (EMF, 2016), and collaborative actions (Hansen and Revellio, 2020; Bertassini et al. 2021) from the value canvas perspective. Table 2.18 provides an overview of the recent research on value, including the value perspective and CBM chosen.

Although the literature identified the importance of collaborative networks in circular actions, Bertassini et al. (2021) state that the literature is still not clear about the stakeholders (networks) in a CBM and the value these networks create and share. Hence, collaborative actions and circular networks have been identified amongst the above-mentioned technology and policy factors as contextual factors accompanying the transition phase of CBMs. In Section 2.6, the three identified contextual factors are introduced.

Authors	Value Relationship	Value Focus		CBM
		Value Canvas	Multidimensional Value / TBL	
Iacovidou et al., 2017a	Developed a value framework to assess value creation, destruction and distribution in resource recovery from waste systems	Value creation, Value distribution Value capture		
Iacovidou et al., 2017b	Challenged the current multidimensional values of the triple bottom line in resource recovery and waste valorisation by conducting a critical review		Economic, Environmental and Social Value	
Reike et al., 2018	Discussed controversies in CE based amongst other things on value retention options	Value capture		CBM Refurbishment
Bernon et al., 2018	Identified a variety of Circular Economy values which are in alignment with the retail reverse logistics sector		Economic, Environmental and Social Value	CBM Reverse Logistics
Milward-Hopkins et al., 2018	Developed an integrated modelling approach for value assessment		Economic, Environmental and Social Value	
Mishra et al., 2018	Investigated value creation and recovery in retail customer value proposition with a focus on fast-moving consumer goods	Value creation, proposition		CBM Closed-loop SC
Ranta et al., 2018	Value development in CE based on a framework that implies 3R strategy	Value proposition Creation Delivery Capture		General viewpoint
Manninen et al., 2018	Investigated the environmental value proposition in CBMs		Environmental Value	Not specified
Jensen et al., 2019	Discussed the impact of sustainable value creation in the context of the remanufacturing cycle		Sustainable Value	CBM Remanufacturing

Table 2.18 Overview research on value perspective in the context of circularity (Source: Author)

Authors	**Value Relationship**	**Value Focus**		**CBM**
		Value Canvas	Multidimensional Value / TBL	
Di Maio et al., 2017	Measured resource efficiency based on market value indicators		Environmental and societal value	Not specified
Kristensen and Remmen, 2019	Investigated social dimensions and shared value creation in PSS		Sustainable value based on social value and value proposition	CBM PSS
Hansen and Revellio, 2020	Investigated how central coordinators align with actors in the value chain to offer circular services	Value creation		Not specified
Bertassini et al., 2021	Looked at stakeholders in CBMs and investigated their value creation and capture	Value creation, Value proposition Value capture		Not specified
Ranta et al., 2021	Investigated how digital technologies enable resource flow and value creation in CBMI	Value creation, Value proposition Value capture		Not specified
Linder and Williander, 2017	Investigated the implementation of CBMI based on TBL values		TBL	Not specified

Table 2.18 continued. Overview research on value perspectives in the context of circularity (Source: Author)

2.6 Influencing and Contextual Factors in a Circular Business Model Environment

The following section will look at influencing and contextual factors in CBMs. To differentiate between the factors, the following were applied:

- Influencing factors are seen as factors influencing the features or outcomes of a CBM. Additionally, influencing factors can be used as control variables during the implementation process. Section 2.6.1. focuses on influencing factors.
- In every discipline, context shapes the effectiveness of knowledge implementation and fosters improvement processes (Coles et al., 2017). Contextual factors aid in reflecting on a unique context. The literature identified three main contextual factors: policy, collaboration, and technology, which will be addressed in Sections 2.6.2–2.6.4.

2.6.1 Identified Influencing Factors on the road to circularity

Circular activities are increasingly considered an effective solution to mitigate the negative impact on the environment while fostering growth and prosperity (Geissdoerfer et al., 2018). Scholars have listed a variety of factors influencing the implementation of circular activities. In the following, the identified influencing factors – in the form of enablers (+) and barriers (-) – are introduced and summarised in Table 2.19.

	Aloini et al., 2020	Andesen, 2007	Atasu and Subramanian, 2012	Bakker et al., 2014	Barquet et al., 2013	De Jesus and Mendonça, 2018	Den Hollander et al., 2017	Despeisse et al., 2017	Dunn et al., 2015	Esposito et al., 2017	Feng and Yan, 2007	Franco, 2017	Galbreth et al., 2013	Grafström and Aasam, 2021	Geng and Doberstein, 2009	Geng et al., 2010	Ghisellini et al., 2016	Govindan et al., 2015	Julianelli et al, 2020	Kirchherr et al., 2018	Kraaijenhagen et al., 2016	Krikke 2011	Lacy and Rutqvist, 2015	Lahti et al., 2018	Linder and Williander, 2015	Linder and Williander, 2017	Mathews and Tan, 2011	Masi et al., 2017	Mont, 2008	Ongondo et al., 2013	Pan et al., 2015	Park and Chertow, 2014	Preston, 2012	Rizos et al., 2016	Schulte, 2013	Sehnem et al., 2019	Todeschini et al., 2017	Urbinati et al., 2021	Vanner et al., 2014	Weetman, 2017	Zhu and Geng, 2013	Zhu et al., 2015
Economic																																										
Ammortisation and Investment costs			+										+	-						-								-					-	-				-	-			
Cost reduction (Recovery-, disposal-,			+																+																			-				
Material costs		+				+				+							+			-					+										+			+				
Volaitlity of resources prices																-																									+	
Enivronmental																																										
Consumer perception, awarness, willingness																				-								-					-	-		+	+					
Material recovery systems															+																											+
Procurement																			+																							
Social																																										
Knowledge, Know-how																																	-	-		-						
Social recognition	+																																	+		+						
Technological																																										
Information systems (information sharing, and -flow)																			+														-					+				
lack of data																				-								-														
Lack of training	-																																			-						
Technology availability, - development	+			+		+					+								+				+				+		+		-	+				+	+	+		+		
Organisational																																										
Collaborative actions (including stakeholders)	+													-							+												-			+		+/-	-	+		
CSR, company culture														+/-																				+		+	+					
Geographical proximity				-				-													-	-																+				
Infrastrucutre																																							-			
Management ambitions																							-	+				+										-				
Market management (demand & changes)												-							+						-									+		+	+	-				
Partner availability				+	+																									+								+				
Product complexity, -design						-		-						+/-				+/-	+									-								+		+	-			
Supply Chain / reverse SC																					+							-					-									
Volatility of input resources (quality & amount)							-		-					-						-								-										-				

Table 2.19 Overview of identified influencing factors (Source: Author)

	Aloini et al., 2020	Andesen, 2007	Atasu and Subramanian, 2012	Bakker et al., 2014	Barquet et al., 2013	De Jesus and Mendonça, 2018	Den Hollander et al., 2017	Despeisse et al., 2017	Dunn et al., 2015	Esposito et al., 2017	Feng and Yan, 2007	Franco, 2017	Galbreth et al., 2013	Grafström and Aasam, 2021	Geng and Doberstein, 2009	Geng et al., 2010	Ghisellini et al., 2016	Govindan et al., 2015	Julianelli et al, 2020	Kirchherr et al., 2018	Kraaijenhagen et al., 2016	Krikke 2011	Lacy and Ruqvist, 2015	Lahti et al., 2018	Linder and Williander, 2015	Linder and Williander, 2017	Mathews and Tan, 2011	Masi et al., 2017	Mont, 2008	Ongondo et al., 2013	Pan et al., 2015	Park and Chertow, 2014	Preston, 2012	Rizos et al., 2016	Schulte, 2013	Sehnem et al., 2019	Todeschini et al., 2017	Urbinati et al., 2021	Vanner et al., 2014	Weetman, 2017	Zhu and Geng, 2013	Zhu et al., 2015
Institutional																																										
Circular Business Models & approaches																			+																					+		
Funding, incentives and support for cleaner production			+											+/-																				-								
Legislations, waste directive, certifications	+					+												+		-								-						+				+		+		
Measureable goals																												-														

Table 2.19 continued Overview of identified influencing factors (Source: Author)

Reviewing the literature revealed that the majority of influencing factors are often grouped based on the following dimensions:

- economic influencing factors,
- environmental influencing factors,
- social influencing factors,
- organisational influencing factors,
- institutional influencing factors and,
- technological influencing factors.

(Aloini et al., 2020; Urbinati et al., 2021)

In most cases, ***economic influencing factors*** are considered blessings. So are volatile market prices for virgin material and procurement costs often seen as economic enablers of circularity (Andersen, 2007; Zhu and Geng, 2013; Ghisellini et al., 2016; Esposito et al., 2017; Linder and Williander, 2017; de Jesus and Mendonça, 2018; Urbinati et al., 2021). Using effective material recovery systems aids in increasing material recovery and disposal costs. Cost savings can also be achieved when sharing byproducts or waste resources, rather than paying high disposal costs or even landfill tax (Atasu and Subramanian, 2012; Galbreth et al., 2013; Kumar and Putnam, 2008; Budak and Ustundag, 2016). The reduction of operation costs when switching to circular production methods complements the list of enablers (Julianelli et al., 2020).

Nonetheless, high investment costs, or even high upfront costs, were listed as economic barriers (Preston, 2012; Vanner, et al., 2014; Rizos et al., 2016; Masi et al., 2017; Grafström and Aasma, 2021, Urbinati et al., 2021). However, some scholars have identified resource price volatility as a hurdle for circular activities (Geng et al., 2010).

The growing knowledge shift towards environmental initiatives, as well as increasing green awareness, were listed as ***environmental influencing factors*** (Todeschini et al., 2017; Sehnem et al., 2019). While in most cases, customer awareness and green product demand are seen as enablers (Todeschini et al., 2017; Sehnem et al., 2019), some literature has identified it as a barrier (Kirchherr et al., 2018). Recent publications see a positive influence on green/circular procurement strategies (Julianelli et al., 2020). Furthermore, energy savings (Linder and Williander, 2017) and landfill space preservation (Khor et al., 2016) are considered enablers of circularity.

Societal influencing factors are often directly connected with the end consumer. At this stage of circular development, it is differentiated between two kinds of consumers. On the one hand, consumers emerging from a B2B market are more aware of the current CE movement than consumers from a B2C market. Hence, the literature states consumers' knowledge about CE practices (Guo et al., 2017), environmental-friendly disposal strategies (Richter and Koppejan, 2016), and the scope of benefits, which might be achieved when being part of the circle, varies between the consumer groups of different markets.

Various studies have focused on consumer behaviour towards remanufactured products. Remanufactured products are said to increase the well-being of consumers and their social and personal benefits (Wang et al., 2013). Furthermore, the industry argues that remanufactured products benefit society by being cheaper than their virgin counterparts. Nevertheless, surveys have shown that society is not reaping this benefit. Although remanufactured products are significantly cheaper, a high reluctance towards these products remains (Wang et al., 2013). Hence, remanufactured products need to be consumer-attractive, suiting their specific needs (De los Rios and Charnley, 2017). Applying this to a circular setting requires trust and commitment from the consumer towards remanufactured products (Wang et al., 2013). In addition, a strong reputation combined with social recognition is a huge enabler (Rizos et al., 2016, Sehnem et al., 2019).

However, the biggest gap emerging in this matter appears to be the missing know-how of what social value in the context of circularity is and how it can be created and measured (Preston, 2012; Rizos et al., 2016; Sehnem et al.,2019).

Product complexity and design have been identified as positive and negative ***organisational influencing factors***. Circular initiatives to design products with an extended life are enablers (Grafström and Aasma, 2021). Nonetheless, the complexities of production processes or product components hinder the adoption of circular initiatives (de Jesus and Mendonça, 2018). Changes in product and market demands, as well as volatility in quality and amount of returned material, are seen as barriers (den Hollander et al., 2017; Fischer and Pascucci, 2017; Kirchherr et al., 2018; Masi et al., 2017; Grafström and Aasma, 2020; Urbinat et al., 2021). In this context, often feared but unspoken is the threat of losing reputation or legitimacy when customers might falsely associate a lower quality with recycled products (Park et al., 2010; Su et al., 2013; Fischer and Pascucci, 2017).

Managerial decision making has been identified as another barrier (Su et al., 2013; Veleva et al., 2017; Urbinati et al., 2021). Managers face immense cost pressure in realising circular concepts, resulting in ultimate avoidance. An additional difficulty appears to be the lack of encouragement of employees towards a stronger sustainable business culture (Veleva et al., 2017).

Collaborative activities are considered particularly a barrier when it comes to data exchange and the control of material flows in circular settings (Niero et al., 2017). Being in a phase of technological transition, technology is therefore considered an influencing factor. Research has so far focused on information and communication technology and its capabilities of closing the loop in Supply Chains (SCs) (Park et al., 2010; Sihvonen and Partanen, 2017; Urbinati et al., 2021). Furthermore, the availability of technical solutions for *R-Strategies* (Urbinati et al., 2021) has been identified as a positive **technological influencing factor**.

Nonetheless, criticism is still raised about the true impact and persistence of technology. Not all authors regard new technologies as a positive influence on circularity. Scholars claim that it is not yet certain *how* and *whether* new technologies, such as 3D printing or machine-to-machine communication, influence circular settings. In addition, new technologies challenge willingness and creativity to adapt to the new and unknown (Su et al., 2013; Fischer and Pascucci, 2017; Despeisse et al., 2017). Such willingness is especially needed when developing circular product design but equally in the context of new BMs. Hence, it is claimed that the strongest impact of technology will be made by circular product design and new CBMs (Elia et al., 2017). However, product design involves all parts of the SC (Niero et al., 2017). Therefore, it is argued that product designers need to constantly challenge economic, environmental, and societal viewpoints (Singh and Ordoñez, 2016). Furthermore, designers need to prevent products from becoming obsolete and ensure that their components can be recovered with a high level of integrity (den Hollander et al., 2017).

Legislation, waste directives, and the support that comes with political standards are one of the predominantly discussed ***institutional influencing factors*** (Atasu et al., 2013; Khor et al., 2016; Singh and Ordoñez, 2016; den Hollander et al., 2017; Niero et al., 2017; Zeng et al., 2017). In particular, governmental commitments, new environmental legislation (Östlin et al., 2008; Richter and Koppejan, 2016; Abu-Ghunmi et al., 2016) and the corporate image and sustainability agenda of organisations (Schenkel et al., 2015; Geissdoerfer et al., 2017) are a powerful influence in the shift towards circularity. In addition, SCs and the phenomenon of eco-industrial parks will be impacted and mainly driven forward by new and global political legislation (Fischer and Pascucci, 2017; Zeng et al., 2017).

2.6.2 The contextual factor of collaboration

"*Coming together is a beginning, staying together is progress, and working together is success.*"

(Henry Ford)

The terminology of collaboration encompasses a wide field. It yet needs detailed clarification when put in the context of sustainability and SC networks (Barratt, 2004). Research focusing on collaborative aspects in SCs is not rare (Barrat, 2004; Vachon and Klassen, 2008). Although there has been a recent change, shifting the focus toward sustainability topics (Toubolic and Walker, 2015). Since this research looks at CE, the focus is on collaborative actions in the context of circularity.

Collaboration in circularity is not yet clearly defined. Scholars refer to it simply as collaboration, Circular Supply Chains, or Circular Supply Chain Networks (Leisig et al., 2018). The growing awareness of this topic is indicated by Gonzalez-Sanchez et al. (2020), who identified 24 articles referring to the concept of a circular supply chain from 2017 to 2020.

Nonetheless, the definition of Leisig et al. (2018), who define collaboration in circularity as *"connecting network of factors in […] supply chain by managing data transparency, material flows, and exchange responsibilities, predictability and sharing benefits"* (Leisig et al., 2018, p. 977), has been a guide to this research.

Collaboration in the circularity context has been identified as a critical success factor (Blomsma, 2018; Geissdoerfer et al., 2018; Bertassini et al., 2021; Brown et al., 2021) aiding to unlock circular value, which manages the thin line between financial, environmental, and societal change (Stephenson, 2015; Weetman, 2017; Heath, 2016;

Kraaijenhagen et al., 2016). The literature states that sustainable change can only occur at the business and network levels (Brown and Bajada, 2018). Organisations cannot achieve circularity on their own; neither can an individual sector fulfil such a tremendous change independently (Heath, 2016). Preston (2012) states, *"In a world of high and volatile resource prices, a CE offers huge business opportunities. […] but to drive broader change it is critical to collect and share data, spread best practice, invest in innovation, and encourage business-to-business collaboration"* (Preston, 2012, p. 1). Hence, willingness towards courageous partnerships and collaboration in circular networks is vital (Heath, 2016).

The literature identified a variety of different stakeholders in circular networks, including governmental agencies and legislators (Brown and Bajada, 2018). For the implementation process, however, the discussion shifts from partners toward the right approach to apply (Lieder and Rashid, 2016; Millar et al., 2019). *Top-down* is considered an approach that addresses national efforts by incorporating stakeholders such as legislators and society. *Bottom-up,* on the other hand, focuses on the effort that individual companies can contribute towards the implementation process. (Lieder and Rashid, 2016). Despite their differences, it is argued that concurrently applying both approaches would aid in implementing CE in large-scale settings (Lieder and Rashid, 2016; Millar et al., 2019).

One of the difficulties identified is the inverse motivation among multiple stakeholders involved in a CBM. Aligning and converging stakeholders' aims and sharing a common vision is vital, but finding and including the multitude of stakeholders for a CBM is a different matter (Kirchherr et al., 2018; Millar et al., 2019). Scholars have identified a variety of different stakeholder groups driving the way towards sustainable and circular practices. Besides suppliers, customers, policy, and the overarching society, collaborative networks can include investors, government agencies, non-profit organisations, or other special interest groups, as well as media, manufacturers, and retailers (Brown et al., 2018). Despite being identified as crucial, there is not yet a consensus about how to incorporate all stakeholders in one big circular setting, including the identification of challenges and benefits of such collaborative partnerships (Leipold and Petit-Boix, 2018; Millar et al., 2019). Figure 2.8 shows the collaborators identified by the literature as an overview.

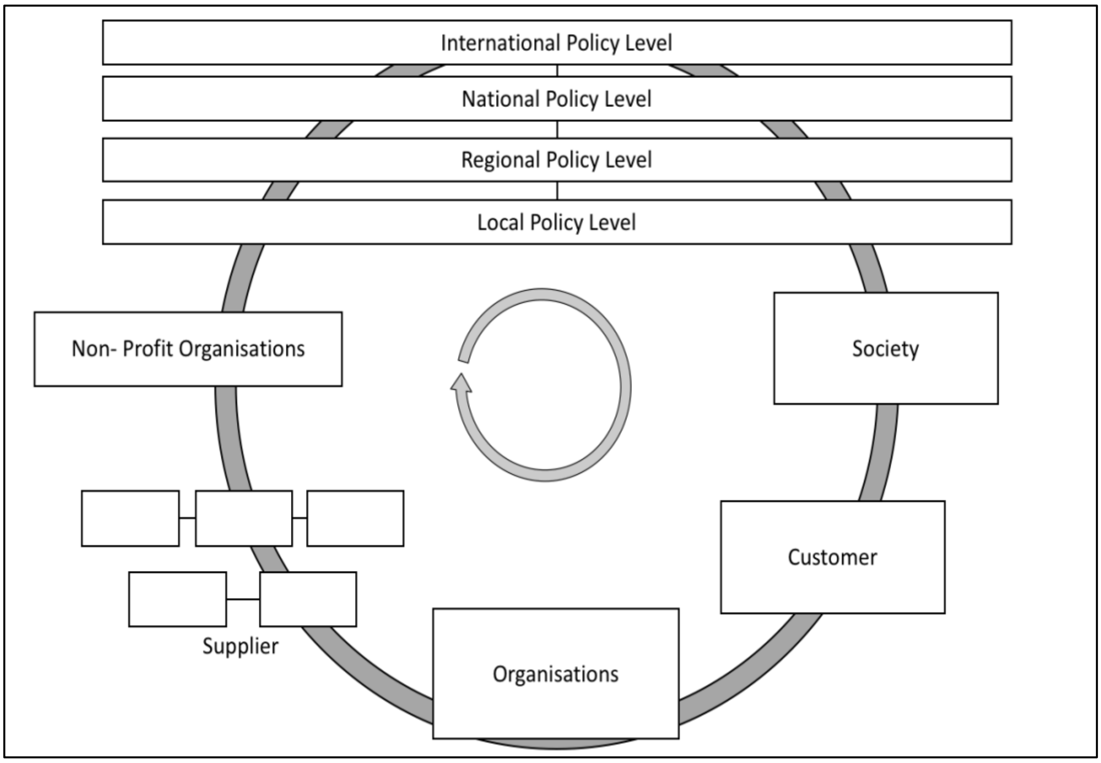

Figure 2.8 Collaboration identified in the literature (Source: Author)

2.6.3 The contextual factor of Policy

Previous research claims, circularity can be reached when organisations manage the complex interplay between institutions and organisations, on a policy level, in their CBMs (Ekins and Speck, 2011; Bleischwitz et al., 2012; Domenech and Bahn-Walkowiak, 2019). Current research has not yet identified how this complex interplay takes place or can be managed between institutions and organisations. This is a research gap this research will further discuss. However, reviewing the literature identified three major policy levels relevant to this research (international, European, UK, and Welsh policy levels). In the following section, the levels will be introduced.

<u>International Level – United Nation Sustainability Goals</u>

The UN Sustainability Goals (SDGs) were established in September 2015 as part of the 2030 Agenda for Sustainable Development. The agenda follows the holistic approach of leaving no one behind and achieving sustainable development for everyone (United Nations, 2021). There are 17 goals, which are displayed in Figure 2.9, aiming to transform the world. Each goal targets a variety of objectives. The goals connecting with CE and CBMs are as follows:

- SDG 6 (Clean Water and Sanitation)
- SDG 7 (Affordable and Clean Energy)
- SDG 8 (Decent Work and Economic Growth)
- SDG 12 (Responsible Consumption and Production) and
- SDG 15 (Life on Land) (Schroeder et al., 2018)

Figure 2.9 UN Sustainability Goals (Source: United Nations, 2021)

European-level EU frameworks

The EU has increasingly shown its interest in greener and more resource-efficient production processes, especially by announcing the *Roadmap for Resource Efficiency* in 2011 (Domenech and Bahn-Walkowiak, 2019). The roadmap sets the fundamental course to achieving a more sustainable Europe, pointing out challenges and opportunities while at the same time declaring missions and visions for circularity (European Commission, 2011). The report also included first thoughts about CE, setting the milestone for the years to come (European Commission, 2011). In 2015, the idea of circularity took shape when Brussels announced an EU-wide action plan for CE (European Commission, 2015). The report emphasised the combined importance of all economic actors of businesses, consumers, local, regional and national authorities in the transition process; additionally, it identified five priority areas: plastics, food waste, critical raw materials, construction and demolition, biomass and bio-based products, announced (European Commission, 2015).

Currently, the CE movement on a European level is driven by three strategic documents. These documents were announced in a certain period and should be understood as supportive guidelines towards a CE in the EU (Domenech and Bahn-Walkowiak, 2019).

The first document, *Europe 2020 – A European strategy for smart, sustainable, and inclusive growth* (published in 2010), outlined a ten-year strategy towards a more sustainable Europe. At the heart of this strategy are five measurable targets: (1) for employment, (2) for research and innovation, (3) for climate change and energy, (4) for education, and (5) for combating poverty. The targets are considered flagship initiatives, indicating the direction that should be taken by all European Member States. To ensure the decisive and measurable contribution of the targets in different EU countries, targets can be converted into national law (European Commission, 2010).

In 2011, the second document published was the *Circular Economy Roadmap*. This document was the first European document to refer to circularity from a waste management perspective by defining waste as an important resource. In doing so, the circularity idea started off by shifting the focus towards the resource efficiency of metals and minerals (European Commission, 2011).

After four years, the third, the *Circular Economy Action Plan*, was published in December 2015. Since the EU had realised the potential of CE, the report went into greater detail about CE aspects. The focus was on unlocking the circular value by providing stimulating and sustainable activities. This should lead to economic and social growth via job opportunities created by circularity.

Despite placing the action plan on the EU level, it was understood that a successful implementation could not be done without all EU Member States' support. Hence, the states were encouraged to join this long-term movement and implement CE in their national laws (European Commission, 2015).

In 2018, the *EU Monitoring Framework for a Circular Economy*, which included ten key indicators covering the life cycle phases of products, was published. It was for the first time that the plan promoted a systemic approach across all value chains and put a special focus on specific waste streams, including plastic, food, and water (European Commission, 2019). All ten indicators are summarised in Table 2.20.

#	Indicator	Explanation	Action planned
		Production & Consumption	
1	EU self-sufficiency for raw materials	Reducing risks for (critical) raw material	Resource Efficiency Roadmap
2	Green public procurement	Public procurement accounts can drive CE	EU support scheme for green public procurement
3	Waste generation	Minimising waste generation	Waste Framework Directive; strategy for plastics
4	Food waste	Food waste has a negative impact on climate, the environment and economy	General Food Law Regulation
		Waste Management	
5	Overall recycling rates	Increase recycling activities	Waste Framework Directive
6	Recycling rates for specific waste streams	Reflecting on the progress in recycling key waste streams	Waste Framework Directive
		Secondary Raw Materials	
7	Contribution of recycled materials to raw materials demand	Usage of secondary raw materials for new products	Waste Framework Directive
8	Trade in recyclable raw materials	Reflection on the importance of trade taking place on internal markets	Internal Markets policy
		Competitiveness and Innovation	
9	Private investments, jobs and gross value added	Reflection on the creation of jobs and growth	Investment Plan for Europe, Structural and Investment Funds
10	Patents	Innovative technologies boost the global competitiveness	Horizon 2020

Table 2.20 EU Key Circularity Indicators (Source: European Commission, 2019)

National Level – UK policies

As an immediate response to the European Commission's announced Circular Economy Package the British Department for Environment, Food and Rural Affairs (DEFRA) published a document, discussing the matters around the implementation of CE. The published document addressed the hurdles in implementation processes, circular values, and actions in the UK economy; and provided suggestions of principles and measurements, which should be considered by the UK and EU in the future (DEFRA, 2015). In addition, the UK claims to have started its first steps towards the implementation of CE. These actions are taking place nationwide, and in the individual administrations, see Table 2.21.

Examples of CE activities based on the EU's Circular Economy Package

UK-wide examples:

- Funding and working with the Waste and Resource Action Programme (WRAP)
- Developing resource-efficient business models (REBus project, led by WRAP)

England

Circular Strategy: *'Our waste, our resources: a strategy for England'*

Examples

- Funding and supporting action-based research projects
- Launch of the Build Environment Committee to support the construction sector
- Great Recovery Project, led by the Royal Society of Arts and Manufacturing
- Innovate UK (previously known as Technology Strategy Board) aims to increase resource efficiency in the manufacturing sector as well as food supply chain

Scotland

Circular Strategy: *'Make things last'*

Examples

- Consultation on a Circular Economy Strategy for Scotland published by the Scottish Government
- Various research projects in the Scottish Institute for Remanufacture
- Scottish Material Brokerage Service; supports the transformation of resources collected by Scottish councils

Wales

Circular Strategy: *'Towards Zero Waste'*

- Examples
- Funding WRAP Cymru (also known as WRAP Wales)
- Funding for the Waste Awareness Wales campaign 2002
- The Eco-design Centre; organisation developing and delivering collaborative multi-sectoral projects based on eco-design concepts
- Funding of the Resource Efficiency Wales service, which aims to support resource efficiency in first, second and third sector organisations

Northern Ireland

Circular Strategy: *'N/A'*

- Examples
- Prosperity Agreement by the Northern Ireland Environment Agency (NIEA)
- The Eco-School Programme

Table 2.21 Circular Economy Activities in the UK (Source: adapted from DEFRA, 2015; UK Parliament, 2016)

Responding to the EU's enquiry about the barriers that each individual member state sees, the UK referred to four overarching topics. These topics ranged from a regulatory, financial, informational, and systemic point of view (DEFRA, 2015). Conducted research on CE barriers, explored those barriers in more depth and identified that the four overarching barriers are connected. In that regard, a limited willingness to collaborate was also identified as a cultural hurdle to overcome

(Kirchherr et al., 2018).

In essence, achieving economies of scale, gaining access to information, or establishing the necessary collaborative infrastructure level is seen as problematic. Fulfilling essential systems change requires huge sums of investment, as well as a behavioural shift from society. Both aspects, combined with the perceived value, are considered another hurdle based on policymakers (UK Parliament, 2016). In their initial response to the EU regarding the Circular Economic Package, the British government stated six guiding principles that aid in overcoming the barriers (DEFRA, 2015). Details of these six principles are captured in Table 2.22.

Guiding Principles to Establish CE
1. Seek greater resource efficiency, plus reducing reliance on virgin material
2. Reduce complexity and ensure that measurements are complementary rather than contradictory
3. Adopt a holistic approach
4. Maintain integrity of EU single market by supporting and measuring growth and innovation, plus reduce the burden on SME business
5. Respect principles of subsidiary and proportionality while equally recognising when EU action is needed and harmonising policy framework to share best practice
6. Freedom of action for member states to act in a most economical and environmental way

Table 2.22 Guidelines towards CE proposed by UK Government (Source: adapted from DEFRA, 2015)

Notably, the research took place while the UK was still considered a member of the EU. Since the change in waste laws and legislation after the completion of Brexit is still unknown, the researcher considered the UK as a parting member of the EU and referred to laws and reports valid at the time.

<u>Local Level – Welsh policies</u>

On a local policy level, Wales, as the only one of the four countries belonging to the UK, introduced its own environmental policy, called the Well-being of Future Generations Act. The author will from now on refer to it as the *Act*, which is the equivalent expression used in official policy documents.

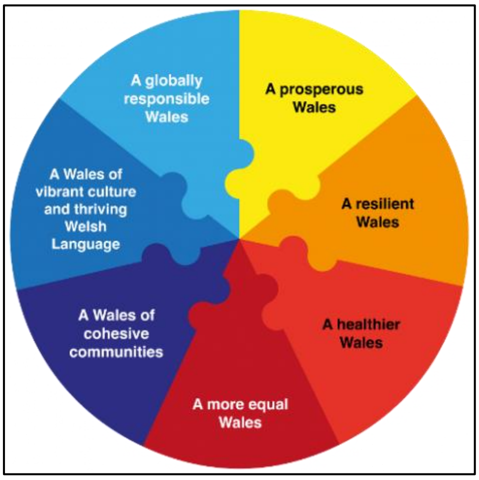

Figure 2.10 Wellbeing Goals (Source: Welsh Government, 2015)

The Act aims to improve *"the social, economic, environmental and cultural well-being of Wales"* (Welsh Government, 2015, p. 3) by putting seven well-being goals in place; see Figure 2.10 (Welsh Government, The Act 2015). Although the Act does not refer directly to circularity, the first two goals (*a prosperous Wales* and *a resilient Wales*) fit the context of CE. It sets the way forward for *"an innovative, productive and low carbon society which recgnises the limits of the global environment and therefore uses resources efficiently and appropriately"* (Welsh Government, The Act 2015, p. 6), as well as pointing out to *"a nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience"* (Welsh Government, The Act 2015, p. 6). The Act is seen as a chance to frame new thinking, especially since it is aligned to the former Welsh sustainability report *One Wales: One Planet* and the overarching Welsh Waste Strategy *Towards Zero Waste*. However, the impact and influence this Act has on businesses implementing and following a CBM remain unknown.

2.6.4 The factor of Technology

The third and last identified contextual factors refer to technology. To date, research has not precisely established the role of technology in circularity. Furthermore, the research does not discuss technology in the context of CBMs. So far, research has mainly discussed technological aspects based on aspects such as technological innovation, eco-innovation (de Jesus and Mendonça, 2018; de Jesus et al., 2018), user-driven innovation (Baldassarre et al., 2017), sustainable technology (Braam et al., 2018), and digital and disruptive technologies (Lacy and Rutqvist, 2015; Pagoropoulos et al., 2017; Ranta et al. 2021). It appears that most of the papers take the perspective of the consumer, rather than looking at the position of other collaborative stakeholders in CBMs and their relation to technology. In fact, technology is considered an essential factor, aiding in the transition process toward circularity (Lacy and Rutqvist, 2015; Bressanelli et al., 2018), but exploring its deeper role has been neglected.

The idea of technology in a BM/CBM context is often based on Sustainable or Circular Business Model Innovation (CBMI) (Bocken et al., 2018). Such innovative approaches go beyond prevalent sustainability approaches by shifting the focus towards efficiency, productivity, and greener supply chains (Bakker et al., 2014; Bocken et al., 2018). Studies have pointed out a variety of technological functionalities that in their realisation have the power to support the transition towards CE (Bressanelli et al., 2018). A summary of the functionalities is displayed in Table 2.23. Nonetheless, as technology is a wide field, this research will only focus on digital technologies in CBMs.

CE-enabling technological functionalities
Using technology …. - to enhance product design and product lifespan - to enhance marketing activities - for monitoring and tracking, which prevents incorrect usage and enables multiple sharing with other users - to enhance general technical support - to allow preventive maintenance - to enhance the execution of end-of-life activities (refurbishment, recycling)

Table 2.23 Enabling technological functionalities (Source: Bresanelli et al., 2018)

The digital revolution has had an impact on existing markets, organisations and customers. The development of mobile technology and the internet has led to an availability independent of actual time or location. Direct communication between supplier, producer, and customers is possible (Braam et al., 2018). This new, more customer-focused emergence has led to the unique option of staying in touch with the customer after the actual point of sale (Lacy and Rutqvist, 2015).

The advantage of digital technologies in CBMI processes is also seen in the circular value proposed and created. Digital technologies can provide product designers with the opportunity to offer more user-friendly and user-centred value propositions to consumers (Bressanelli et al., 2018; Lopes de Sousa Jabbour et al., 2018), yet closer connections and exchange between business entities, their customers and other stakeholders would be required. Inevitable for such a deep exchange would be the willingness to collaborate (Bressanelli et al., 2018). However, the literature states that the way in which digital technology favours the transition towards circularity has not yet been established in detail (Pagoropolous et al., 2017; Bresanneli et al., 2018). More recent studies, looking at value perspectives, still state similar gaps, and urge investigations of how digital technologies can enable value creation in CBMI settings (Ranta et al., 2021). Nonetheless, recent literature reviews identified possible digital technologies applicable in the circular context mainly as digital technologies emerging from the Industry 4.0 movement. This includes but is not limited to the following technologies: RFID (Pagoropolous et al., 2017), Internet of Things (Pagoropolous et al., 2017, De Sousa Jabbour et al., 2018, De Sousa Jabbour et al., 2018, Ranta et al., 2021), data integration and analysis (Pagoropolous et al., 2017, Ucar et al., 2020), Ranta et al., 2021, cloud manufacturing (De Sousa Jabbour et al., 2018) and additive manufacturing (De Sousa Jabbour et al., 2018, Rosa et al., 2019, Ranta et al., 2021). Nonetheless, research still considers major gaps in empirical evidence showing the application of digital technologies in CBMs (Ranta et al., 2021).

2.7 Summary of gaps in knowledge against the research questions

Reviewing the literature indicated that CE gained greater momentum over the years (Geissdoerfer et al., 2018). Hence, the number of publications investigating circularity-related issues has increased over the last few years. It appears to be popular to take either a certain perspective (e.g., customer perspective or supplier perspective) or to look at circularity from an individual industry sector. Notably, a lot of academic publications and books and grey literature focused on identifying the influencing factors of circularity. A systematic overview, including a clear classification and identification of said influencing factors, was missing. Geissdorfer et al. (2018), for instance, suggest that future research should investigate *"the influence of a better understanding of the relationship between the Circular Economy and sustainability and their influences over the performance of supply chains, business models, and innovation systems"* (p. 767). Hence, with scholars differentiating between the three circularity levels (macro, meso, micro), the thoughts of CBM were added to the circularity discussion (Urbinati et al., 2021). However, the transition from linear BMs to a CBM requires time and supportive innovative approaches and is accompanied by risks (De los Rios and Charnley, 2017; Linder and Williander, 2017). In addition, influencing factors (enablers & barriers) accompanying this shift need to be identified. Only a few papers have discussed the idea of influencing factors in the context of

CBMs. Hence, this research aims to identify an organisation's motives and trends in joining CBMs. How important this gap still is can be emphasised in a recent publication by Aloini et al. (2020), who identified critical success factors (enablers and barriers) of circularity based on a review. However, they are assuming that the factors identified in the literature could be implied to CBMs and aid in answering the question of *"which factors may encourage an organization to undertake CE actions"* (p. 6) without conducting empirical research. Urbinati et al. (2021) identified similar gaps by stating that research is still missing on systematic views of enablers and barriers for CBMs and the adoption of related managerial practices. Therefore, the researcher aims to identify the influencing factors in joining CBMS by posing **Research Question 1:**

How do influencing factors facilitate the implementation of Circular Business Models?

Contextual factors are described as an area of key concern, especially since CBMI processes *"take place in in a given social, organisational and individual setting which shapes the process by influencing […] what types of CBM are possible [and] what type of stakeholders are involved"* (Guldmann et al., 2019, p. 44). Pagaropolous et al. (2019) argued similarly by claiming that the role of data integration in circularity is minimally discussed. Research conducted in the area of industrial symbiosis looked at networking and innovation activities to detect if those two variables are enablers of industrial symbiosis and how they can facilitate the development of industrial symbiosis (Taddeo et al., 2017). However, similar research in the field of CBM is missing. In addition, recent literature still identifies a lack of understanding of the CBMI process. Since most of the literature is theoretical, further empirical research claims are made (Brown et al., 2021; Santa-Maria et al., 2021).

Given the current popularity of technology, how digital technology favours the transition towards circularity has not yet been established in detail (Pagoropolous et al., 2017; Bresannelli et al., 2018). In fact, recent studies have identified a lack of empirical studies looking at the benefits of (digital) technology in CBMs, as well as how (digital) technologies act as a catalyst for CBMs (Ranta et al., 2021). Furthermore, there is an urge to combine the value perspective with digital technology and to discuss how digital technologies can enable value creation in CBMI settings (Ranta et al., 2021).

As any circular-oriented innovation requires collaboration (Brown et al., 2021), the literature has identified collaboration as a contextual factor. Collaboration is needed in CBMs to scale up (Bertassini et al., 2021). However, circular research is still claimed to lack empirical investigations in collaborative processes (Brown et al., 2021). In addition, there is a need to look in more depth into CBMI processes and their level of collaboration (Leisig et al., 2018; Brown et al., 2021). The literature indicates that future research should explore the size of Circular Supply Networks, including any dependencies of stakeholder collaboration and cooperation. This could include identifying various drivers and individual effects in Circular Supply Chain Networks (Brown et al., 2018). In doing so, the effects of government policy should be examined (Brown et al., 2018). This leads to the third contextual factor in this research: policy.

In the literature, policy has been identified as an important component of circularity. A variety of strategies have been proposed at different policy levels to move society beyond the limits of growth (Leipold and Petit-Boix, 2018). With new legislation being released on an institutional basis, organisations are urged to manage complex processes in their CBMs internally and externally. However, it is claimed that limited progress has been made on implementing legislation strategies at different policy levels (Kirchherr et al., 2018). In fact, very little is known about how business communities might take on board these strategies and how these initiatives contribute to CBMI (Leipold and Petit-Boix, 2018). Therefore, this research aims to explore the role of circular collaboration in CBM further to identify the digital technologies and policy guidelines that foster collaborative actions. In doing so, the following **Research Question 2** is posed:

How do contextual factors contribute to the implementation of Circular Business Models?

As the concept of value is identified as central to any BM (Bocken et al., 2019), it is necessary to understand the role and impact of value on CBMs. The literature on CBMs and value perspectives revealed that both are strongly connected. Widely established for CBM research is the value canvas by Osterwalder and Pigneur (2010), which divides value into four perspectives. To the researcher, they appear to be the pillar of any successful CBM (see Figure 2.11).

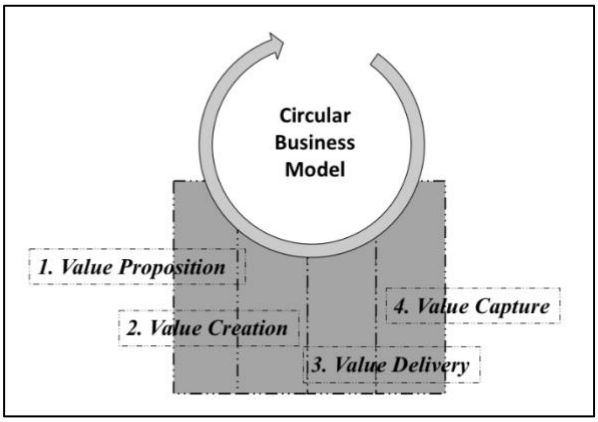

Figure 2.11 Pillars of CBMs (Source: Author)

Since the TBL perspective maintains an important role in any sustainability research, a wide variety of research has focused on TBL values in circularity (Ranta et al., 2021). However, this has primarily been done by investigating the TBL values on an individual basis.

Literature has done limited attempts to combine Osterwalder and Pigneur's value canvas with the TBL values. Kristensen and Remmen (2019) are the only papers starting to merge the value canvas with TBL aspects. However, their focus is only on the value proposition rather than on the entire value canvas. In conjunction, measurements of value creation are rarely discussed in the literature. Most of the literature around value focuses on CE indicators and the CBMI process. However, research has identified clear gaps in the assessment of value creation in CBMs (Manninen et al. 2018). Assessment methods and tools of measurement to identify criteria of value realisation are of utmost importance (Manninen et al., 2018).

The importance of research looking at circular value perspectives has recently been highlighted by Bertassini et al. (2021) when confirming a need for more advanced research in sustainable or circular value. Based on these identifications, the following **Research Question 3** is posed:

How is value conceptualised and measured in Circular Business Models?

Table 2.24 provides an aid to the reader to understand the connection between the section of the literature review, the posed research questions and aims, as well as the connection to the finding sections.

Research questions and objectives	Chapter Section(s)	Topics and reasons for inclusion	Connection to research chapters
Research Question 1: How do influencing factors facilitate the implementation of Circular Business Models? a.) To identify influencing factors in joining Circular Business Models	2.3 – 2.5	Circular Economy – to familiarise the reader with the background of circularity – to understand the strategies and principles of CE – to identify influencing factors	5
Research Question 2: How do contextual factors contribute to the implementation of Circular Business Models? a.) To explore the role of collaborative partnerships in Circular Business Models (including challenges and benefits) b.) To explore the role of digital technology in CBMs c.) To investigate the effectiveness of political guidelines and support available to organisations being part of a Circular Business Model	2.6	Contextual Factors of Digital Technology, Collaboration, Policy - to identify the importance of the contextual factor of collaboration in CBMs – to investigate the role of digital technology in CBMs – to identify the influence of current rules and regulations on a policy level	6

Table 2.24 Overview Research Questions (Source: Author)

Research questions and objectives	**Chapter Section(s)**	**Topics and reasons for inclusion**	**Connection to research chapters**
Research Question 3: How is value conceptualised and measured in Circular Business Models? a.) To identify value perspectives in Circular Business Models and their connection to TBL *b.)* To gain a greater understanding of the value measurements in Circular Business Models	2.5	Circular Business Models, Value, Circular Business Model Innovation – to identify the different CBMs – to identify the value perspectives that surround circular business	7

Table 2.24 continued Overview Research Questions (Source: Author)

2.8 Chapter summary

"Current social patterns of production and consumption drive a twin environmental crisis of resource scarcity and waste overload" (Velenturf and Purnell, 2017, p. 1). CE is an approach to changing the current system to provide a more sustainable world. The literature review introduced the historical background of circularity (Section 2.3) and the foundation and concepts of CE (Section 2.4). It identified a variety of influencing factors that foster or hamper the implementation process (Section 2.4.4). However, the transformation process requires a change in the current BMs. Despite having identified the influencing factors for circularity, science lacks empirical research in identifying the influencing factors for CBMs. Hence, a deeper dive was taken into the transformation process toward CBMs (Section 2.5).

In doing so, the variety of CBMs was addressed, but more importantly, value was identified as a vital variable. The focus shifted towards the different value perspectives and canvases currently present in CBM research. Osterwalder and Pigneur's (2010) value canvas was identified as popular amongst CBM research. Looking closer at the value variable revealed, value is often looked at from a certain perspective (e.g. customer or supplier), or highlights a specific characteristic (e.g. value proposition) in an individual industry sector. With the importance of the TBL for any sort of sustainability research, it was interesting to see that research has not yet combined the value canvas with TBL values. Instead, science has identified contextual factors that accompany the transformation process from linearity to circularity (Section 2.6). It became evident that circular collaborative networks are inevitable. However, collaborative actions also require the successful management of the interplay between institutions and organisations on a policy level. Hence, policy has been identified as another contextual factor (Ekins and Speck, 2011; Bleischwitz et al., 2011; Domenech and Bahn-Walkowiak, 2019).

The last identified contextual factor referred to technology. Since the transformation towards CBMs began, innovative processes allowing organisations to engage with the principles of circularity were discussed. Radical innovative transformation is needed, but the field still lacks empirical research. Reviewing the literature further revealed that the field is missing to connect digital technologies to the important variable of value. There is still a gap in how digital technologies enable value creation in CBMI settings (Ranta et al., 2021).

3 Conceptual Framework

<u>Chapter aims:</u>

a) To explain the purpose & development of the conceptual framework
b) To explain the theory accompanying the study and framework

3.1 Chapter overview

"*Without a belief that it is possible to embrace the reality with our theoretical models,*
there could be no science.
This belief is and always will be the main motive of all scientific works."
(Albert Einstein, Theoretical Physicist)

The previous chapter provided a foundation about the research topic, introduced the terminology, and posed the research questions and aims. In doing so, academic theoretical knowledge was gained. Nonetheless, as CE is an emerging field arising from the encounter between academia and industry, the importance of practical insights is important.

Much is written about academic–industrial encounters. Close collaborations are needed *"for opening frontiers of both science and industry"* (Kato, 2014, p. 993). Critics, on the contrary, fear the incompatibility of priorities on both sides. Many research projects are critised for the necessity of immediate applicability of research findings in practice (Pronk et al., 2015). Nonetheless, numerous collaborations show that mergers and interactions can be fruitful and lead to new prosperity through willingness and open exchange (Kato, 2014; Pronk et al., 2015). Therefore, an encounter with established industrial experts in the field of CE was seen as vital and fruitful to achieve higher research quality standards. Their expert knowledge aided in the development of the framework, which will be introduced at the end of this chapter.

In general, the development of the conceptual framework took place in three main phases:

Phase 1 aimed to understand circularity and CBMs from a practical perspective. Expert encounters provided a deeper understanding of circular applications and the hurdles occurring in diverse industry sectors.

Phase 2 conducted a focus group discussion with CE to better understand CBMs and to expand on current knowledge.

Phase 3 focused on deepening the gained knowledge by conducting site and event visits in an online and offline setting.

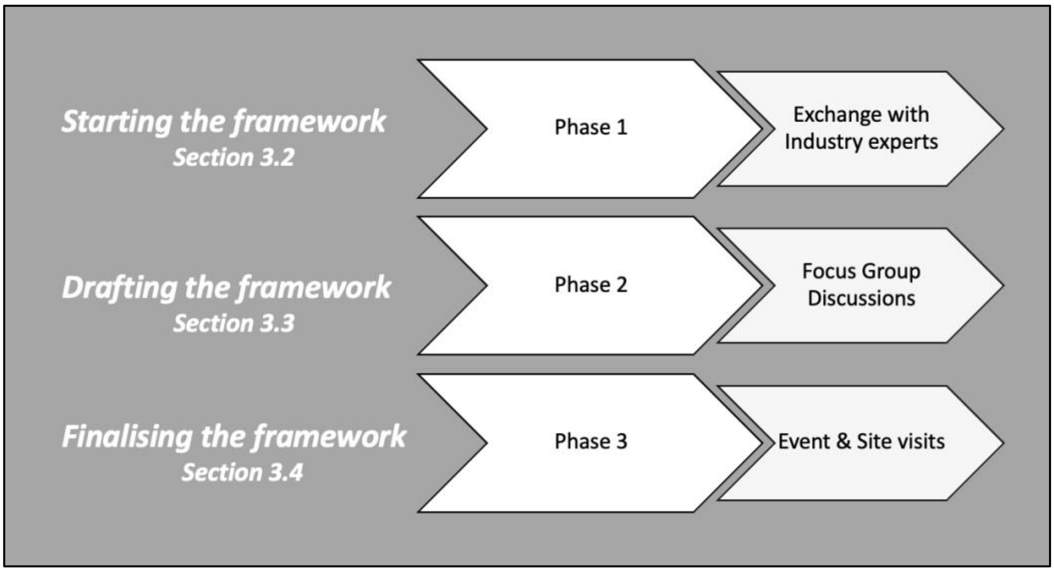

Figure 3.1 Overview of Framework Phases & Development (Source: Author)

The information gathered was used to develop the conceptual framework, as well as to develop and trial the interview protocol for the data collection process. Figure 3.1 summarises the three phases of guidance.

3.2 Phase 1: Starting the framework—the industry expert encounter

The first phase aimed to get a greater understanding of circular applications from a practical perspective. Exchanges at an exploratory stage of the research can improve efficiency and precision in data collection, as experts can reveal important practical knowledge (Bogner et al., 2009). Therefore, the researcher attended a series of events in the fields of sustainability and CE, including expert exchanges. These expert exchanges were part of a professional sustainability forum held in London. The topics of these forums varied around sustainability and circular economy. The researcher joined the expert exchange events as a note-taker. An event followed a three-parted structure:

Part 1: Short presentations of invited guest speakers based on the theme of the forum

Part 2: Panel discussion with questions from the audience

Part 3: Splitting the audience in pre-selected roundtable discussions.

The expert exchange took part in the round-table discussion, up to seven to ten experts discussed a specific issue or question on circularity. The experts selected the roundtables prior to the event, which ensured that experts joined a topic and issue in their area of expertise. On average, a roundtable discussion lasted 30–45 minutes. During this time, the researcher took notes about the discussions that followed the standardised structure of: (1) Challenges and Barriers; (2) Best Practice, (3) Solutions and (4) Warnings. An example of the notes is provided in Appendix A. These events have influenced the development of the framework. The topics of the discussion rounds are listed in Table 3.1.

Expert Exchange	**Topic / Theme**	**Linkage to Research**	**Key Findings (if applicable, influence on the framework)**
Expert Exchange #1 (11/2017)	The circular supply chain	Discussion around the usage and application of circularity in supply chains	Sharing of key business drivers for CE practices • policy • costs • legal compliance (Policy influence on CBMs)
Expert Exchange #2 (12/2017)	Automating Sustainability Reporting in the cloud	Discussion of the role of technology in sustainable/circular supply chains	Identification of challenges for technology in CSCs Avoid perceiving technology as *the* solution Avoid proliferation (key is right capabilities rather than anything else) (Technology influence on CBMs)
Expert Exchange #3 (01/2018)	Ending the take-make-waste linear paradigm	Discussion of how waste reduction ideas are implemented and how they can be promoted	A stronger commitment and more actions from business combined with a higher level of consumer responsibility plus more pressure from legislation and policy – all applied at the same time – could be the first steps towards a more circular business environment. (Policy and technology as influencing factors)

Table 3.1 Expert Exchange - Roundtable Discussion Topics (Source: Author)

Expert Exchange	Topic / Theme	Linkage to Research	Key Findings (if applicable, influence on the framework)
Expert Exchange #4 (05/2018	Empowering the Circular Economy with Artificial Intelligence	Discussion about the influence of artificial intelligence and robotics on the idea of circularity	It is important to discover ways how AI can be used to support CE A business model change is needed at some point (Technology's influence on CBMs)
Expert Exchange #5 (06/2018)	Supply chain process optimisation in an age of disruption	Discussion on the challenges that technology brings in sustainable and circular supply chains	A change in mindset which allows staff to make mistakes and be creative is required Application of a value approach, rather than defining all on a low-cost approach (Technology's influence on CBMs)
Expert Exchange #6 (02/2019)	Embedding the SDGs across supply chains	Discussion about the impact of the UN Sustainability Goals on sustainable and circular supply chains	Participants named a variety of challenges and best-practice approaches before remarking that transparency, mindset change, collaboration and commitment are the indicators that need to be focused on when embedding SDG's across supply chains (Collaboration as an influence on CBMs)
Expert Exchange #7 (11/2019)	Reimagine	Discussion about the innovative circular idea in the post-plastic area	A mix of government and industrial initiatives, combined with new ideas from start-ups, and the application/development of green technologies will in the long term create credible solutions for this complex system (Technology's influence on CBMs)

Table 3.1 continued Expert Exchange - Roundtable Discussion Topics (Source: Author)

3.3 Phase 2: Drafting the framework – Focus Group Discussion

The second phase comprised a focus group (FG) discussion with experts from different industry sectors. The FG aimed to discuss a set of questions that emerged from the literature review and the knowledge gained in the expert exchange meetings. The following section will outline the foundations of the FG discussion (Section 3.3.1) before discussing the findings (Section 3.3.2). Direct quotations in these sections refer to statements of FG participants and are marked in *"italic"*.

3.3.1 Outline of the Focus Group Discussion

The FG discussion method is useful in a preliminary or exploratory stage of the research, as it explores common beliefs, feelings, and considerations towards the respective topic. FGs provide a secure environment for participants to share experiences which would not be discussed in other settings, such as one-to-one interviews (Krueger, 1988).

As the expert exchange meetings indicated that CBM, and particularly waste management handling, is a sensitive topic, FG discussions appeared to be an appropriate data collection method. Participants would share more best practice approaches and difficulties about waste handling while interacting in a confidential and secure social environment of like-minded people (Gibbs, 1997).

FGs can be used as an individual method, but equally, complement other research methods. The FG discussions aimed to complement previously gained knowledge through the literature review and expert exchange encounters. The FGs were organised as part of a practitioner's event, targeting industrial experts from various industries to share their best practices in CE applications. Due to the high number of participants, two FGs took place in parallel. Each group consisted of 12–15 participants, pre-allocated based on their occupational background and sector affiliation (e.g., manufacturing, automotive, groceries, retailer, semi-conductor, and logistics service sector). Additionally, policymakers, consultants from non-profit organisations, and academics were represented in both groups. Pre-allocating participants allowed a critical and broad discussion atmosphere to emerge.

The discussion was moderated in an informal and unstructured way, allowing us to follow the attendees' flow and ideas (Carey and Asbury, 2012). Time was set up for approximately an hour to pose the following two questions.

1. What challenges does/or could your organisation experience when applying the business model of waste valorisation? (internal and external challenges)
2. How can technology facilitate collaboration when realising the business model of waste valorisation?

Both questions aimed to be of a comprehensible, broad, and interesting nature, fitting both practitioners and academics alike. Participants were asked to brainstorm the questions and capture their ideas on post-it notes before the discussion started. The discussions were recorded to facilitate analysis. Additional notes from notetakers and the post-it notes created a rich set of qualitative data. A picture of the post-it notes is displayed in Appendix B.

Since qualitative data are known to be messy and unclear, a thematic analysis at a semantic level was applied. Thematic analysis allows the researcher to identify generic patterns and themes. The thematic analysis did not aim to interpret any underlying conceptualisations, ideologies, and assumptions of participants. Instead, emerging themes and patterns in the data were interpreted into the broader context and, where applicable, set in relation to the literature (Braun and Clarke, 2006). In doing so, the following seven themes were identified:

1) Awareness and knowledge of CBMs
2) Implementation process for CBMs
3) Circular business strategy for organisations
4) Collaboration
5) Communication strategies
6) Supply chain; and
7) Product, services, and processes.

The next section introduces and discusses the findings of each theme.

3.3.2 Findings of the Focus Group Discussion

In the beginning, participants conveyed that their organisations are either fully aware or already involved in sustainability actions. Participants approved that the sustainability movement is generally acknowledged in the industry. However, general **awareness and knowledge** about specific CBMs (e.g., valorisation models) appear to be an issue. Most of the participants felt confident in tackling environmental aspects, such as CO2 emission reduction. However, a widely stated problem referred to the collaboration and working attitude of individual organisations. Organisations were criticised for focusing only on issues occurring in their own bubble, and thereby creating a *"very narrow focus, which is very difficult to break out of*. Hence, organisations find it difficult to identify and realise new collaboration concepts. An example was given by the awareness about the CBM of valorisation, which strongly depends on the industry sector. In addition, the implementation process remains difficult, even for those who were already aware of CBMs.

Knowing the individual components of waste streams allows waste classification and pushes the scientific development of CBMs further. However, classifying components, especially hazardous kinds, can be extremely complex. In that regard, laboratory technology for waste stream classification and stronger collaborative interactions with waste stream technology providers were listed as possible solutions. According to participants, laboratory technology includes all sorts of modelling techniques (e.g., thermodynamic modelling or geochemical modelling). The results from such modelling techniques can inform further analytical methods.

Nonetheless, criticism was raised that these technological tools are either unknown or difficult to afford. Hence, possible funding opportunities were discussed. In doing so, robotics has been identified as advantageous, particularly in the form of waste pickers, which can take over dangerous or monotonous work. In addition, technological development was identified as a contributing factor when facilitating systems change and transforming industries. Successful examples addressed referred to, e.g., food web platforms that link producers with end consumers and charities.

There was common agreement among participants that the **actual implementation process of CBMs** is challenging, on both sides, internally and externally. A major difficulty appears to be the lack of missing best practice business cases as role models, as well as the recruitment of experienced staff members. Furthermore, technological readiness and reliability, as well as traceability, were addressed.

Traceability is vital in a circular environment but was criticised in industries in which cross-contamination of material or workspaces is an apparent threat.

Nonetheless, traceability is linked to the problem of losing the connection to products after the point of sale. In a circular environment, connecting activities with suppliers and customers after the point of sale, i.e. via EOL, deposit return, and recycling schemes, were identified as vital.

Difficulties in the implementation process
• Lack of empirical research and best practices cases • Recruitment of experienced staff • Readiness and reliability of technology • Time restrictions in the integration process • Additional storage/or working space • Traceability

Table 3.2 Difficulties in implementation process (Source: Author)

When looking at CBMs from a **business strategy** perspective, costs are instantly addressed. Participants raised concerns around implementation and repair costs, as well as costs in comparison to the actual value received when running CBMs. Additionally, affordability, with respect to being able to buy the necessary equipment, was mentioned.

In the light of costing, funding pools and their availability were equally discussed as the impact of policy regulations, restrictions and accreditation options. Industry-specific accreditation and legislation, which could accelerate the concepts of circularity, are claimed to be missing or are passed too slowly. Hence, stronger efforts regarding linkages with external institutions are requested. How such linking, with external institutions, could take place can be seen when looking at regulations and restrictions around Extended Producer Responsibility (EPR).

EPR is controversially discussed in connection with deposit return schemes (DBS) for plastic bottles and aluminium cans. It was pointed out that some policy regulations might be difficult to apply, *"they [annot. the organisations] are forced to do so", "fulfilling some of those regulations is really complicated"*. Furthermore, liabilities and internal rules were mentioned as challenging, or even as value destructing. An example from luxury fashion products was provided, where unsold products were burnt rather than keeping them in the circle.

Support from top management regarding innovative ideas was additionally identified as challenging. It appears to be necessary to drive compliance to realise circularity. This compliance is also required from the collaborative stakeholder networks, which is the fourth emerging theme, **collaboration**.

Currently missing is a clear commitment from stakeholders to take the risk and embark towards a CBM. In a B2B environment, user behaviour and customer perception are immediately mentioned. Fear that brands might be negatively affected *"because the offered product is made of waste"* is omnipresent. To be able to react quickly against such public perceptions, stakeholders need to share information with the public and make them aware of circular products. The current lack of clarity raises questions about how organisations convince the public towards circularity. Educational events, organised in cooperation with non-profit organisations or political institutions, are considered the first step.

In addition, changes in external and internal **communication strategies** are required. Organisations need to "*be made aware that you can only recycle what is ultimately sent into the loop"*. Furthermore, ineffective cross-departmental communication needs to be eradicated. There is also a common wish for stronger (cross) industrial activities, as industries need to cooperate when aiming for circularity.

The role of design was a recurring topic in the FG discussions, particularly when **communication strategies** and **products, services and processes** were discussed. Designers *"have spent the last 15, 20 years having an absolute whale of a time, completely unfettered access to all sorts of materials and the more differentiation you could put into your product, the better it was, the more tick boxes you got."* However, nowadays, it appears that designers should be involved at an early stage to design suitable circular products. Participants raised the question, *"How can we [annot. the organisations] design it [annot. the product], so we don't get this waste in the product in the first place?"*

Parts of the solution were seen as stronger communication strategies and technological collaboration. It could be *"that source of differentiation,"* which is needed. At the beginning of the development and design stages, technology could provide the necessary levels of capability and functionality while dismantling any possible complexity. To summarise, technology is considered vital in establishing stronger communication and exchange strategies, particularly at the product design

level.
Better communication abilities would also help to tackle a variety of challenges in the **Supply Chain**, as difficulties in the implementation of quality, production flow, and product liability in circular activities on a global supply chain were identified.

Quality assurance and product flow were discussed in the context of a circular lean environment. In such an environment, waste stream predictions need to be very precise. This endeavour is currently considered very difficult to realise when returned waste streams come from different tiers. Intensifying these already-existing collaborative relationships in supply chains could be of further help.

Furthermore, concerns were raised about the quality and liability regarding the circulating material. If there is *"some issue with his product [annot. the supplier's product] in the market, where is the liability for that?"*. In addition, a lack of understanding and willingness to collaborate regarding circular material on a cross-industrial basis was identified.

Regarding the role of technology, participants agreed that technology maintains a supporting role in circularity. Omnipresent appears to be the shift towards technologies, such as artificial intelligence and robotics. The latter offers higher quality control and was specifically praised in the context of waste handling (e.g., dismantling of electronic products). Nonetheless, higher acquisition costs and scepticism from the employees – "*Robots will take our jobs"* are not uncommon.

Besides robotics, digital technology was mentioned as a facilitator. Digital technology enables live reporting and tracking options. Tracking options (e.g., asset tracking and smart tracking) were also discussed in the context of closing the gap between the point of sale and end of life. Tracking would provide a whole new set of rich data, for instance, "*where it [annot. the product] is, ... how long it's been on the shelf, ... where it's been sold, how many times it's been returned"*. The group's judgement revealed that tracking would *"value the components of a product"*.

Digital technology also includes online platforms. The platforms provide a virtual space for exchanging material. In doing so, these platforms are valuable connection tools in circular supply networks. Notably, a variety of start-up organisations have begun to offer this online service. It appears that certain industry sectors push towards these platforms. So are the logistics service sector investing in shared warehouse management. However, some industries do not know about the origin or handling of such platforms.

Agreement about the implementation of digital technology suggested that its implementation is easier to start in a B2B environment. Nonetheless, digital technology should not be neglected when dealing with a B2C environment. On the contrary, it should be considered a bridging facilitator when aiming to engage end consumers to stay in the loop.

The power of digital technology in CBMs was also addressed with the current social revolution and the dominance of social media presences. Originally used as a medium, aiding contact, social media has now gone beyond this point and functions as a sharing and communication platform. Nowadays, social media platforms can bridge the network with customers. This has been discovered in the food industry, where the sector is using a variety of food apps that offer cheap food at the end of the day, rather than throwing it away. The app releases benefits for both customers and organisations. Figure 3.2 provides a summary of the previously described findings. It must be noted that these findings were previously published in the author's publication*: Leder, N., Kumar, M., Sanchez Rodrigues, V., 2020. Influential factors for value creation within the Circular Economy: Framework for Waste Valorisation. Resources, Conservation & Recycling 158*, as stated in Section 1.4.

Awareness and Knowledge	• to understand the terminology, the opportunities and the realisation process • to raise awareness and commitment towards Waste Valorisation
Implementation Process	• Converting theory into practice (lack of business case examples) • Time comittment, resource availaility and readiness of technology
Business Strategy	• Costs of implemenation, repair, received value & required equipment • Availability of funding, liability & internal regulations regarding waste treatment
Communication	• to promote collaboration and establish strong networks • to communicate effectively new ideas on a cross funcitional level
Product, Services and Processes	• product and process design for re-use • identification of waste streams and their quality
Stakeholders	• customer behaviour and perceptions • policy support (i.e. legislations, accreditation)
Supply Chain	• dependability of waste received • identification of opportunties in the supply chain

Figure 3.2 Overview Results Focus Group Discussions (Source: Author)

Organisations are aware that collaboration and technology are crucial to reaching circularity and CBMs in the near future. Collaborative partnerships with other organisations and external institutions are necessary for a circular environment and will ultimately create value for organisations involved in this type of partnership. This aligns with findings from the literature, stating that collaborative activities have been identified as an inevitable element in CBMs (Rizzi et al., 2013; Brown and Bajada 2018; Stewart and Niero, 2018; Veleva and Bodkin, 2018).

3.4 Phase 3: Finalising the framework—Event and Site Visits

3.4.1 Outline of event and site visits

The researcher participated in several industrial events and policy forums. This enabled the building of tacit knowledge. In science, tacit knowledge is opposed to explicit knowledge (Collins, 2010). While explicit knowledge exists in the form of printed or electronic information, accessible with or without (monetary) restrictions, tacit knowledge describes knowledge that is based on a person's understanding or experience (Busch, 2008). Hence, visiting events enabled us to see insights via panel discussion and direct information sharing with practitioners from different industries and CBMs.

The difficulty of tacit knowledge is related to its soft nature. It is difficult to test or measure tacit knowledge (Busch, 2008). Despite having a controversial role in the different academic disciplines, its impact is tremendous. It drives the sciences and has a high impact on topics such as artificial intelligence (Collins, 2010). Despite some critique, tacit knowledge plays a major role in the note-taking and annotation of fieldwork (Wolfinger, 2002). Wolfinger (2002) suggested a strategy called comprehensive note-taking. In this strategy, notes are taken based on a predefined structure. The advantage of this method is that it even captures information, such as people, places, and events. Information that could otherwise appear in the moment is mundane but turns out to be valuable later on (Wolfinger, 2002). The researcher followed the structure suggested by Spradley (1980). Spradley created a list of nine points that should be considered. Since the list was made to support observing people, the researcher has made some changes so that it can be used when observing and participating in industrial or policy events. These changes mainly aided in the data analysis process. Table 3.3 shows Spradley's original list and the modified list.

Spradley's list of note-taking	List applied for this research
Space The physical places or places	**Location** The location where the event took place
Actor The people involved	**Actor** Who was the event for? Target group?
Activity A set of related acts that people do	**Activity** What were the activities during the event (e.g., panel discussion, presentation, site visit, etc.)?
Object: The physical things that are present	**Object:** Were transcripts, presentations, notes, etc. available after the event?
Act Single actions that people do	**Act** How was the networking opportunity?
Event A set of related activities that people carry out	**Event** Event theme and category
Time The sequencing that takes place over time	**Time** Length of the event
Goal The things people are trying to accomplish	**Goal** Aim of the event and take-away message
Feeling The emotions felt and expressed	**Feeling** Any thoughts or ideas related to the research

Table 3.3 Note-taking during events (Source: adapted from Spradley 1980; Wolfinger, 2002)

In total, a range of 39 different events from 14 different organisers was visited over the period of four years (2017–2020). The events took place both online and offline. Due to the global pandemic in 2020 and offline events shifting towards online events, the number of webinars increased significantly. The events targeted a mixed audience, consistent with practitioners from industry, policy, and academia, and covered a variety of research-related CE aspects.

With an emerging framework and the identification of the contextual factors, the researcher felt the need to visit events specifically covering political perspectives and developments, technological aspects, local CE actions, and different CBMs.

To keep the quality of the study informed by current global developments, the researcher considered it essential to start attending CE events with a special focus on a post-pandemic circular environment. Table 3.4 provides further details with regards to the events visited.

Event Category	Number
Circular Economy in the Sustainability Context	10
Circular Business Models	3
Local Circular Economy	7
Policy aspects in a Circular Economy	7
Technology aspects in a Circular Economy	4
Packaging and Plastic considerations in a Circular Economy	2
Circular Economy and the Waste Sector	2
Circular Economy in a post-pandemic society	2

Table 3.4 Outline of Events (Source: Author)

3.4.2 Impact of event and site visits on the framework

The event visits contributed to the researcher's tacit knowledge and the improvement of the conceptual framework. In the following, the impact of each event category, displayed in Table 3.4, on this study is introduced.

Circular Economy in the sustainability context

Most events visited can be classified in this category. At the beginning of the research, these events were useful for comparing academic considerations and results to practical problems from the industry. Hence, the events were considered a source of inspiration and creativity.

The introduction to countless circular organisations aided in building a solid network, enabling the first steps in connecting with potential case companies and interview partners. Visiting events that focused on the broader side of circularity provided the advantage of getting to know the CE from a wide perspective.

Circular Business Models

The variety of CBMs and their categorisation in five CBMs encouraged the researcher to attend tailored events, either highlighting one CBM or looking at a broad variety of CBMs. At the beginning of the study, events aiming at resource recovery and valorisation were selected and shaped the development of the study. With the research moving along, the detailed insight given helped in the decision-making process of the research focus. This included decisions such as whether the research project should focus on one or multiple CBMs.

Local Circular Economy Events

Events focusing on the local development of CE were essential to the research and the framework, as they provided networking opportunities. Additionally, this aided in deciding whether the research focus should be on Wales or include the rest of the UK and Europe. Once the researcher decided that the research would focus on a wider geographical range, events tailored to the economy of other parts of the UK were visited.

Policy Events

The policy events were especially helpful in recognising the influence of political institutions and associations. Being introduced to new directives, their implementation, and plans on future directives aided in identifying trends and variables that could shape CBMs, but also in the context of how individual businesses feel about policy agreements. Notably, very rarely was the audience directly asked for feedback regarding regulations and directives. The researcher can only recall one single event where the audience was asked for feedback on legislation. This indicates that collaborative actions that link political partners need to be further explored and were therefore included in the framework.

Technology Events

Events on technological aspects were rare. However, they were of particular use, as these niche events provided a great opportunity to reflect on current knowledge and linked the technology aspect with CBMs. Reflection on events resulted in questions such as: How does technology aid in the application of circularity? Is technology influencing collaborative activities? And if so, how? It needs to be noted that many technology events focused on plastics or other organic components. Less focus was put on digital technology, which supports the claim of research gaps in the field of digital technology for circularity.

CE and post-pandemic development

These events predominantly emerged after the framework had been developed. However, the researcher decided to attend these events to understand the latest scientific results and considerations. The discussion topics focused in the first weeks on reducing the damage to the economy and slowly shifted towards the overall question of how CE can fit into a post-pandemic economy. Where are the challenges, and how could CE possibly help overcome the challenges of a pandemic?

3.5 The conceptual framework

3.5.1 The theoretical foundation of the framework

A theory in science is considered as a lens to view and assess emerging or existent aspects and features of research; it functions as a guide and analytical tool in the data analysis process; and aids in forming the result of the research by integrating findings into the bigger picture (Mkhomazi and Iyamu, 2013).

Since a theory influences the research and its results, it is deemed critical. This criticality should be recognisable in the data collection and analysis process. Both are intended to be conducted in the boundaries of the theory. In addition, theories rely on certain characteristics and rationales. They should indicate the relationships between participants in their environment. Hence, the selected theory needs to encompass the technical and social contexts of the investigated phenomena (Mkhomazi and Iyamu, 2013).

In the following sections, the researcher intends to indicate the process of finding and applying the research theory in the framework. Therefore, a closer look at dominant theories in the wider Business and Management field is taken, before focusing on the theories in CE and outlining the selected theory.

Theories have always been part of Business and Management research. Nonetheless, in some business fields, the use of theories is more common than in others (Schmenner and Swink 1998). Given the practical nature of Operations Management, theoretical underpinnings have always taken a subordinate role. Instead, practical relevance, applicability and usefulness have been foregrounded (Walker et al. 2015). Hence, theory usage and intellectual rigour in the field of Operations Management have been criticised from the early days (Schmenner and Swink, 1998). However, in recent times, theoretical approaches have developed a particular interest in the wider field of Operations Management (Hitt et al., 2016), with a growing interest in theories from organisational sciences, sociology, and economics (Walker et al., 2015; Hitt et al., 2016).

Despite the large variety of theories applied, the overarching understanding of theory appears to be similar in the business context. Wacker (1998), for instance, defines theories as *"the precise definition in a specific domain to explain why and how the relationships are logically tied so that the theory gives specific predictions"* (p. 363ff). Poole and van de Ven (1989) defined a theory as *"a limited and fairly precise picture*" (Poole and van de Ven, 1989, p.562). Lee and Lings (2008) explain that a theory *"makes falsifiable or testable predictions about things not yet observed"* (Lee and Lings, 2008, p.116). Stephen Hawkins said, *"a theory is always provisional"* (Lee and Lings, 2008, p. 116).

Despite growing interest in circularity, research has focused on the analysis of practical aspects with limited theory development or expansion (Liu et al., 2018). Only a few scientists have investigated the theoretical lenses of circularity (Liu et al., 2018; De Angelis, 2018; Lathi et al., 2018). Liu et al. (2018), who specifically investigated and compared theories applied in Green SCM and CE, identified a list of theories that are either mentioned or already applied in CE research (Liu et al., 2018). As the number of academic papers is growing, Liu et al.'s list is not exhaustive and has been expanded over the period of the PhD research by the researcher. The full list of CE theories, including their definitions, can be seen in Table 3.5.

The groupings and definitions of theories listed in Table 3.5 aided in identifying leading theories in circular research, and, ultimately, the selection process of the researcher's theoretical lens. In addition, exchange with academics in the field of sustainability, aided in shortlisting five theoretical lenses:

1. Resource-based view
2. Institutional theory
3. Stakeholder theory
4. Ecological modernisation theory
5. Social capital theory

As this research is driven by the variables of circularity, value and collaboration, the theory should incorporate the values in a collective manner. In the following, the theories are briefly explained, and suitability discussed.

Overview of theories in the Circular Economy		
Group 1: Theories *applied* in CE		
Theory		**Definition & Explanation**
a.	**Resource-based view**	RBV suggest that resources with four attributes (valuable, rare inimitable and non-substitutable) simultaneously have the potential to sustain the competitive advantages of an organisation (Barney, 1991)
b.	**Institutional theory**	Institutional theory emphasises that the regulative, normative, and cultural-cognitive elements conduct coercive, normative and mimetic mechanisms to influence organisational social behaviour (DiMaggio and Powell, 1893, Richard, 2001)
c.	**Stakeholder theory**	A stakeholder is defined as "a stakeholder in an organisation is any group or individual who can affect the achievement of the organisation's objectives" (Edward, 1984)
d.	**Resource dependence theory**	Resource dependence theory examines how the inter-organisational power of organisations affects the ability to obtain resources and maintain executive succession with dynamic power in the environment (Pfeffer, 1977)
e.	**Social network theory**	Social network theory suggests understanding how the behaviours of social actors in the relations system and, how the relationship structure influence behaviours. Density and centrality are the two aspects of social networks (Rowley, 1997)
f.	**Diffusion of innovation theory**	Diffusion of innovation is defined as innovation diffused by certain communication channels with time among members in a social system (Rogers, 2003)
g.	**Cluster theory**	Clusters are geographic concentrations of interconnected companies and institutions in a particular field, aiming to affect competitiveness (Porter, 1998)
h.	**Theory of socio-technical transition**	Theory of socio-technical transition posits that transitions in technologies do not emerge alone but relate to a series of changes in society such as regulations, norms, infrastructure, and networks (Voß et al., 2009, Chen, 2012, Jurgilevich et al., 2016)
i.	**Social embeddedness theory**	Social embeddedness theory refers to organisations embedded in eco-industrial networks with social relationships characterised by their locations and ongoing relations in networks (Granovetter, 1985, Domenech and Davies, 2011)
j.	**Knowledge-based view**	The knowledge-based view is seen as a unique and inimitable resource, with complex social interactions which make it hard to copy (Grant, 1996)

Table 3.5 Theories applied in CE research (Source: adapted from Lahti et al., 2018, Liu et al., 2018, De Angelis, 2021)

	Overview of theories in the Circular Economy	
k.	**Endogenous growth theory**	Endogenous growth theory explores the balance of economic and environmental performance by improving resource efficiency (Smulders, 1995)
l.	**Ecosystems theory**	Ecosystem theory postulates two aspects of survival: organisms vs organism, leading to competition, and organisms vs environment, leading to mutualism (Fox, 2016)
m.	**Social cognition theory**	Social cognition theory is built upon three elements for social integration: individual cognition, personal behaviours and social observation and their interrelations (Butt, et al., 2017)
n.	**Evolutionary theory**	Evolutionary theory presumes that the economy is always evolving in a context that is not completely familiar to or understood by the actors (Nelson, 2008).
	Group 2: **Theories with strong *popularity* in CE**	
a.	**Theory of industrial symbiosis**	The part of industrial ecology known as industrial symbiosis engages traditionally separate industries in a collective approach to competitive advantage involving the physical exchange of materials, energy, water and byproducts. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity (Chertow, 2000).
b.	**Ecological modernisation theory**	Ecological modernisation theory addresses jointly achieving industrial development and environmental protection through innovation and technological or modernity (Spaargaren, 2000).
	Group 3: **Theories with great *potential* in CE**	
a.	**Social capital theory**	Social capital is defined as the sum of the actual and potential resources embedded in and derived from the network of relationships possessed and developed by an organisation (Putnam, 1995).
b.	**Systems theory**	Systems theory regards the organisation as a system with interconnected activities to produce products and provide services (Von Bertalanffy, 1968).
c.	**Social exchange theory**	Social exchange theory posits that relationships between organisations are formed by the use of subjective cost-benefit analysis and the comparison of alternatives. The two assumptions of social exchange are rationality and structuralism in making decisions (Emerson, 1976).

Table 3.5 continued Theories applied in CE research (Source: adapted from Lahti et al., 2018, Liu et al., 2018, De Angelis, 2021)

Overview of theories in the Circular Economy		
d.	**Theory of production frontier**	A production frontier is defined as the maximum output that can be produced from any given set of inputs, given technical considerations (Aigner et al., 1977).
	Group 4: Theories only *mentioned* in CE	
a.	**Complexity theory**	Complexity theory analyses supply chain dynamics with sustainability parameters (Matos and Hall, 2007).
b.	**Transaction cost economics**	Transaction cost economics is flexibly applied, to explore the link between buyers-suppliers relationship stability (Lai et al., 2005).
	Group 4: Theories only *mentioned* in CE (continued)	
c.	**Agency theory**	Agency theory can help understand and explore eco-industrial development governance modes (Liu et al., 2018).
d.	**Information theory**	Information theory includes information asymmetry as a core tenet. It is important to minimise environmental information asymmetry between suppliers and buyers (Erlandsson and Tillman, 2009).
e.	**Paradox theory**	A paradox is defined as contradictory yet interrelated elements that exist simultaneously and persist over time (Smith and Lewis, 2011, p. 382).
f.	**Organisational theory**	Organisation theory is the study of organisational design, relationships, and structures. It focuses on such dimensions as level of organisation formalisation, specialisation, standardisation hierarchy of authority, complexity, size, goals and strategy. These dimensions provide a way of measuring and analysing organisations (Daft, 1997).

Table 3.5 continued Theories applied in CE research (Source: adapted from Lahti et al., 2018, Liu et al., 2018, De Angelis, 2021)

Due to its imminent connection to the environment, **the resource-based view (RBV)** was one of the first theories to be shortlisted. The RBV is one of the most cited and influential theories in the history of management theories (Kraaijenbrink et al., 2009). It examines the reasons why organisations in the same industrial environment might differ in their performance (Kraaijenbrink et al., 2009). In doing so, an organisation's competitive advantage and how it is sustained are of utmost interest (De Angelis, 2016). RBV assumes that resources are heterogeneous, rare, or difficult to substitute, but valuable, which makes it a popular theory for circularity (Barney, 1991; Kraaijenbrink et al., 2009; De Angelis, 2018). Nonetheless, Kraaijenbrink et al. (2009) identified some points to criticise: "RBV's applicability is too limited" (Kraaijenbrink et al., 2009, p. 360), with substantial lack of managerial and operational validity, as the result of creating the illusion of total control (McGuiness and Morgan, 2000). A widespread viewpoint claims that RBV does not contain law-like generalisations and is more a tautology (Priem and Butler, 2001; Lockett et al., 2009; Kraaijenbrink et al., 2009). Hence, "the value of a resource is too indeterminate to provide for useful theory" (Kraaijenbrink et al., 2009, p. 360).

Based on its popularity in sustainable and circular research, RBV appeared as an important but equally mainstream theory in the field of sustainability and circularity (Liu et al., 2018). The RQs posed in this study are not focused on understanding competitive advantage or performance. They focus on understanding the contextual and influencing factors of CBMs and how they impact the value conceptulisaiton. Hence, RBV appeared to have a too generic purpose. In addition, the emphasis on required variables was considered as not strong enough.

Institutional theory was further identified by the literature as popular research in sustainability and circularity (Liu et al., 2018). It is acknowledged as a "dominant theory of organizations or a macro theory of environment relations" (Aksom and Tymchenko, 2020, p. 1224). In the early stages, sociologists used the terminology of institutional when referring to "aspects of organizations involved in mediating relations with external constituencies […] [to secure] favourable perceptions of an organization by constituents as a way, […] of ensuring, necessary resources" (David et al., 2019, p. 2). The ability to progressively accumulate new knowledge with more accurate predictions, or at least more precise predictions than competitors, has always driven the success of this theory (Aksom and Tymchenko, 2020). Parson's work in that regard divided organisations into three levels (technical, managerial, and institutional) (Parson, 1960), with the third level being described as "critical to articulating the connection between an organization's espoused goals and the function of the larger society" (David et al., 2019, p. 2.). Based on Parson's work, many scientists have used this theory in linking an organisation with societal values (David et al., 2019). Furthermore, DiMaggio and Powell (1983) identified the three isomorphic mechanisms of coercive, mimetic, and normative leading to achieve homogeneity amongst organisations (DiMaggio and Powell, 1983). Although the theory remains popular in management research (DiMaggio and Powell., 1983, Richard, 2001, Liu et al., 2018), the researcher was not interested in understanding the isomorphic changes in organisations as a result of CBM application and thus rejected this theoretical lens. Instead, this research looked at different variables in three different CBMs and their impact on value conceptualisation. Based on the researcher's viewpoint, this can not be investigated in a homogenic context.

Stakeholder theory was the third theory shortlisted due to its popularity in sustainability and circularity (Liu et al.2018). The theory conveys the idea that *"business is a set of value creating relationships among groups that have a legitimate interest in the activities and outcomes of the firm and upon whom the firm depends to achieve its objectives"* (Harrison et al., 2019 p.3). Hence, it foregrounds two variables of the research (value and collaboration). However, criticism emerged when the terminology of effectiveness could be seen in the light of *as much value as possible*. This viewpoint was criticised by Edward et al. (2012) when stating that business ethics and business issues have never been sharply distinguished in stakeholder theory. Therefore, the researcher believes this theoretical lens puts the emphasis on economic value whilst neglecting social and environmental value, respectively, the value characteristics of value proposition, -creation, -delivery and -capture.

Ecological Modernisation theory (EMT*)* is listed as a popular theory in environmental sociology (Spaargaren, 2000) and has proved to be popular in circularity research (Liu et al., 2018). It is based on the idea that technological development, industrialisation, economic growth, and capitalism are compatible with ecological sustainability and additionally drive ecological transformation (York and Rosa, 2016). Nonetheless criticism emerged that the theory is not a real theory, but rather aims to popularise the idea of sustainable capitalism (O'Connor, 1994, Fisher and Freudenburg, 2010). Additionally, the theory is criticised as incapable of providing adequate technological solutions to environmental problems but rather starting a rebound-effect in fostering neutralising environmental progress through economic growth (Jänicke, 2008). Ultimately, the theory was rejected for this research, as it foregrounded the technological variable but rather neglected the value creation, particularly towards social value.

Social Capital theory is grouped as a theory with great potential in circularity (Liu et al., 2018). The following section provides deeper insights into this theory and why it has been selected as the accompanying theoretical lens for this research.

3.5.2 Social Capital Theory

> *"Feature of social life—networks, norms, and trust—that enable participants to act together more effectively to pursue shared objectives… Social capital, in short, refers to social connections and the attendant norms and trust."*
>
> *(Putnam, 1995, pp. 664–665)*

Social Capital theory (SCT) has always been considered an umbrella theory (Hirsch and Levin, 1999; Manning 2017). It is a *"meeting place to facilitate trans-disciplinary research from a multitude of perspectives"* (Manning, 2017, p. 876). This wideness provides opportunities for interpretation and makes SCT applicable to a variety of scientific fields (Hirsch and Levin, 1999; Andriani and Christoforou, 2016; Manning, 2017). As an umbrella theory, SCT can add value to a field that lacks a unified paradigm or theoretical consensus (Hirsch and Levin, 1999; Manning 2017). Although scholars might slightly differ in their view about SCT, they agree that SCT focuses on the social relationships/structure and their embedded resources (Manning, 2010; Glover, et al., 2016; Callahan et al., 2018).

In essence, SCT values relationships highly (Callahan et al., 2015; Andriani and Christoforou, 2016). It comprises investments in social relations with expected returns (Lin, 2001). Hence, trust, cooperation, and reciprocity are considered to have a positive impact on the wealth of society in facilitating collective actions, reducing costs, and opportunistic behaviour (Andriani and Christoforou, 2016). In short, social networks are considered to shape the economic development of a society (Sabatini, 2009). Looking at this from a social network perspective, three dimensions have been identified. The first dimension, the structural dimension, is based on networks and network ties, which form clusters of norms. Secondly, there is the relational dimension, which refers to the value and expectations that are shared by members of the network. Thirdly, the cognitive dimension covers sanctions and rewards that help maintain the network's norms and values (Ehlen et al., 2013).

Looking at SCT from a network perspective reveals that SCT reflects on different characteristics of such networks and their role in shaping economic development (Sabatini, 2009; Claridge, 2018). The first perspective is bonding, which implies strong networks, also called bonding networks, between entities that know each other or share commonalities (Sabatini, 2009; Callahan et al., 2018; Claridge, 2018). Individuals in such horizontally bonded networks are said to share two kinds of trust. Benevolence-based trust, in which individuals believe the networks care about the well-being of partners; and competence-based trust, in which individuals believe the network is qualified and justified to hold the position in the network (Callahan et al., 2015).

The second, bridging, also called vertical ties, are weaker, less intense network relationships (Halpern, 2005; Claridge, 2018). Nonetheless, their contribution to the network is as important as bonding ties. So are bridging activities considered more valuable, as they provide access to information, organisations, people and resources that would otherwise be inaccessible (Levin and Cross, 2004, Calahan et al., 2015). Hence, the terminology of bridging is self-explanatory. It is about creating bridges to other sectors or societies (Sabatini, 2009). Third, linking activities describe activities of connecting individuals or organisations with institutions of political or financial background. Linking activities allow access to resources, ideas and information from institutional power and enable an organisation to *"scale up social capital and social action to a politically and economically effective level"* (Sabatini, 2009, p. 430). Table 3.6 provides an overview as guidance for the reader.

Social Capital Theory overview

<u>Dimensions of SC</u>

Structural Dimension *(cluster of norms)*

- *Network*
- *Network ties*
- *Appropriate organisations*

Relational dimension *(expectations that are shared by members)*

- *Trust*
- *Norms*
- *Obligations*
- *Identification*

Cognitive dimension *(sanctions and rewards to help maintain the norms)*

- *Shared codes and languages*
- *Shared narratives*

Characteristics of bonding, bridging and linking

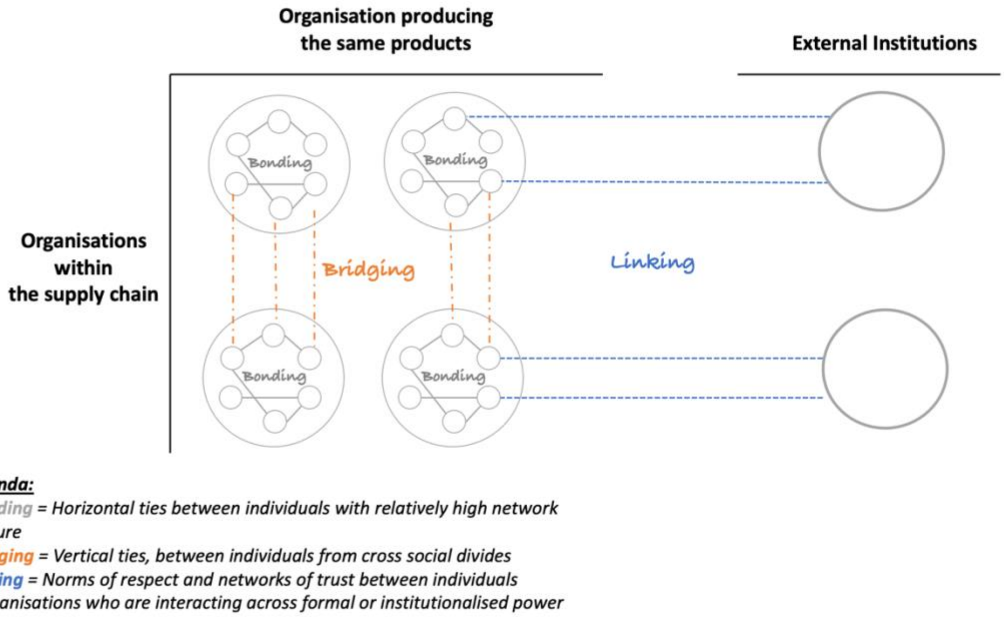

Table 3.6 Overview of Social Capital Theory (Source: adapted from Halpern 2005; Ehlen et al., 2014; Claridge, 2018)

Outline of the framework

A framework or model could be compared to the researcher's map of the territory in need of investigation (Miles et al., 2014). It *"explains, either graphically or in a narrative form the main things to be studied—key factors, variables, or constructs—and the presumes relationships among them"* (Miles et al., 2014, p. 20). It is developed at the beginning of a research project and evolves and progresses as the study continues. The framework can be displayed in a variety of ways. For instance, in a simplistic or elaborative way, commonsensical or theory-driven, descriptive or casual (Miles et al., 2014). Independent of illustrations, a framework derives from the literature and maintains a supportive function for the researcher. It aids the researcher in being selective and decisive when identifying the main variables driving the research. In the data collection and analysis process, it supports outlining and interpreting relationships amongst the variables and the collected data. It also reduces the risk of overload due to data (Miles and Huberman 1994). When working based on a framework, flexibility is key. Scholars need to maintain the ability to depict newly acquired insights in their framework (Eisenhardt, 1989; Hartmann, 2014). In other words, frameworks change as research progresses (Miles et al., 2014).

The framework shared in Figure 3.3 introduces the first version of the framework. At the end of this thesis, a revised framework is proposed that is influenced by the findings chapters (Section 7.2). The following paragraphs explain the framework's underlying theory and variables.

To begin with the left side of the framework, which describes the business relationship and parties (customer, organisation, supplier). Together, these three variables build a simplified CBM, in which they follow bonding and bridging relationships to perform in a circular environment. Research Question 1 investigates which factors influence individual organisations to be part of a CBM. At the centre of the framework is the variable of value (Research Question 3). As identified in the literature review (Section 2.5.4) and the expert encounter (Section 3.2), the variable of value is assumed to link towards collaborative network activities, policy, and technology (Section 2.6.2–2.6.4). It is assumed that the contextual factors have an impact on the value variable in a CBM (Research Question 2).

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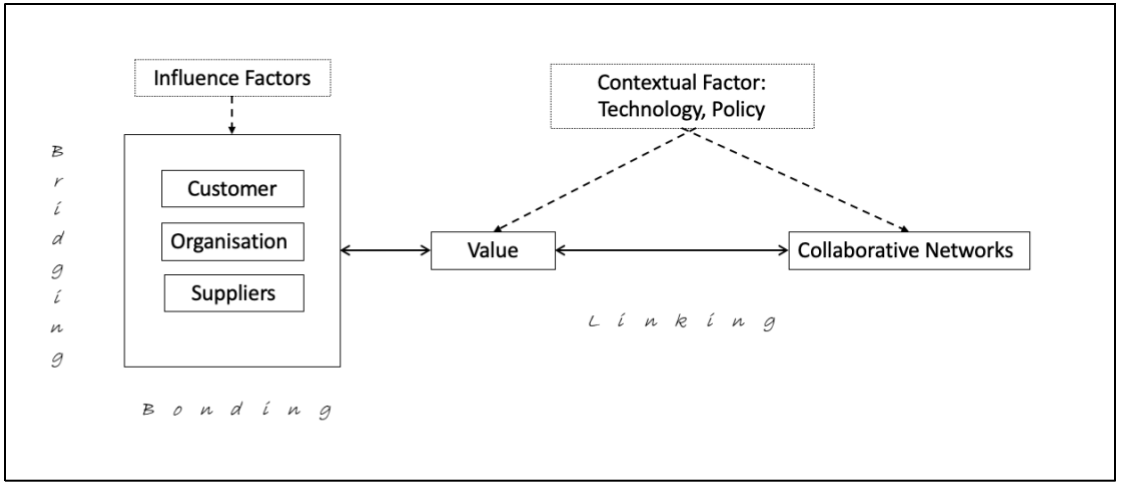

Figure 3.3 First version of Framework (Source: Author)

Variable	Comment	Assumed connection to SCT	Connection to RQ
Box of Organisation, supplier, customer	This box replicates the connections in one CBM, consisting of the three simplified parties: supplier, OEM, customers	Bonding, Bridging	RQ1
Contextual factor 'Technology' and 'Policy'	The literature review (see Section 2.6), and the expert encounter (see Section 3.2) identified policy and technology as contextual factors required in a circular environment	Linking	RQ2
Collaborative Network	The literature review (see Section X), and the expert encounter (see Section 3.2) identified collaborative networks as contextual factors required in a circular environment	Linking	RQ2
Value	Value creation is the main aspect of this work	Bonding, Bridging, Linking	RQ3

Table 3.7 Explanation of framework variables (Source: Author)

3.6 Chapter summary

This chapter provides detailed insight regarding the development of the theoretical framework. A framework is important for every piece of research and indicates the researcher’s map of investigation. The researcher developed the framework over three phases: Phase 1 – expert exchange, Phase 2 – focus group discussion, and Phase 3 – event and site visits. Insights into each phase and its impact on the framework were provided. This supported the three phases of the identification of the main variables influencing the research, as well as the identification of their meaningful relationship. The variables driving this research are value, collaboration and external influencing factors.

With the further progression of the research and the three phases, minor changes were applied to the framework. Furthermore, the theoretical lens was decided upon. Insights into said decision process were provided by introducing, defining, and shortlisting the different theories applied in the field of circularity. In the following, the selected theory and its different dimensions are introduced in greater depth to aid the reader in understanding the conceptual framework. By selecting SCT, the researcher aims to make a new theoretical contribution to the field of circularity, as SCT is one of the minor applied theories in the field of CE.

4 Research Methodology

<u>Chapter aims:</u>

a) To explain the philosophical and theoretical position, which underpins the study
b) To explain and justify the research approach & strategy
c) To layout the case study design

4.1 Chapter overview

This is chapter forms, together with Chapter 2 (Literature Review) and Chapter 3 (Conceptual Framework), the theoretical section of this thesis. Research in Business and Management often follows a scientific approach. A scientific approach focuses on making observations using human senses or scientific instruments that include any measurement devices (Maylor and Blackmon, 2005). In doing so, scientific research looks out for patterns that can be interpreted as general laws or theories. The following section will take a deeper look at the research perspective taken in the boundaries of the scientific approach and based on the research hierarchy displayed in Figure 4.1. It will explain the researcher's philosophical stances, the research strategy, applied data collection methods, and data analysis tools and techniques.

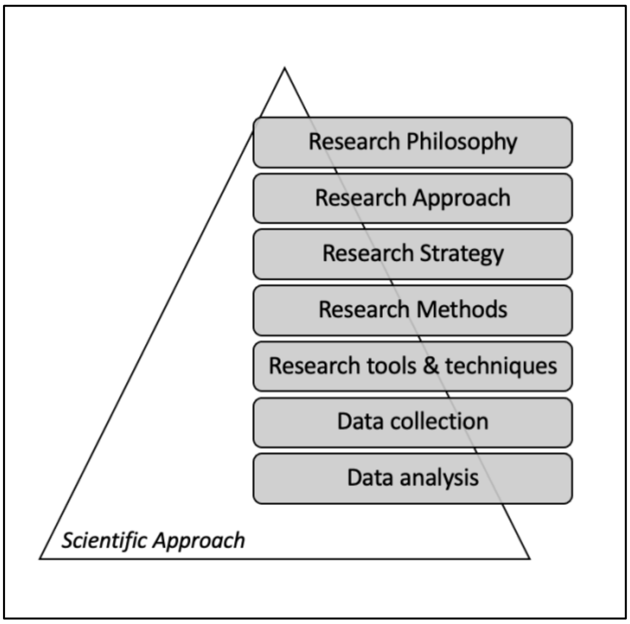

Figure 4.1 Research hierarchy (Source: adapted from Maylor and Blackmon, 2005)

4.2 Research philosophy

Business research is situated in the field of social sciences, which includes disciplines such as psychology, sociology, and economics. These different disciplines inform studies in specific areas, for instance marketing, organisational behaviour or operations management (Saunders et al., 2009; Bryman and Bell, 2011). In doing so, social reality is approached based on philosophical stances or paradigms (Blaikie, 2007). The choice of philosophical stance reflects the researcher's deeper belief and value. It replicates the strategy, or general logic, to investigate the proposed research question(s) (Maylor and Blackmon, 2005). There have been long debates about desirable philosophical stances, their multiplicity, research paradigms and methodology in business research (Tsoukas and Knudsen, 2005; Saunders et al., 2009). Before looking in more detail at three possible philosophies, the assumptions that underlie a research philosophy are explained (Maylor and Blackmon, 2005; Saunders et al., 2009).

Research assumptions provide insights into *the nature of reality and how the researcher knows reality* (Maylor and Blackmon, 2005). In doing so, they aid in distinguishing between each philosophy (Saunders et al., 2009). The sciences identified the following four assumptions:

First, *ontology,* which refers to what is considered to (not) exist in reality (Maylor and Blackmon, 2005). Therefore, the core of the phenomenon under investigation is looked at, and assumptions about the nature of reality are made (Saunders et al., 2009; Kivunja and Kuyini, 2017).

Second, *epistemology,* which originated from the Greek word episteme, which means knowledge (Kivunja and Kuyini, 2017) and considers the nature and form of knowledge, its acquisition and communication to human beings (Cohen, 2007; Scotland, 2012; Kivunja and Kuyini, 2017).

Third, *axiology* describes the researcher's viewpoints towards values (Hassard, 1991) and the relationship between human beings (Saunders, 2009).

Fourth, *methodology* describes the strategy or plan regarding the data collection process, with its aim of investigating and obtaining knowledge about the real world. It is often connected to *why, what, from where, when* and *how* questions (Hassard, 1991; Saunders 2009; Scotland 2012). A methodology aims to answer *how the enquirer investigates whatever they believe can be knowledgeable to the population* (Scotland, 2012).

The introduced assumptions have direct consequences for investigating and maintaining knowledge about the social world (Burrell and Morgan, 1979). In other words, different ontologies, epistemologies, and models are likely to signpost toward different methodologies. It is acknowledged that the philosophical stance in research is challenging to define. Therefore, philosophical stances can vary in the same research fields. Nonetheless, this variety is particularly important, as it contributes to knowledge creation.

In research, the nature of reality (ontology) is viewed from two contrasting perspectives. *Objectivist* ontology is preferred by researchers investigating physical objects. Researchers following said ontological assumptions deal with “what is physically real and do not consider anything that does not fit in with this ‘reality’, such as social objects” (Maylor and Blackmon, 2005, p. 156). On the contrary, *subjectivist* ontology is suitable for studying individual or societal phenomena. Subjectivist ontology differs from its objectivist counterpart, as human behaviour differs from the behaviour of natural objects (Maylor and Blackmon, 2005).

Business research applies two extreme epistemological positions. On the one hand, there is the epistemology of positivism, following the ontological assumption of an objectivist. On the other hand, there is subjectivism, which follows the ontological assumption of a subjectivist (Maylor and Blackmon, 2005; Easterby-Smith et al., 2015). Table 4.1 provides further details regarding the epistemological and ontological positions of business researchers.

Epistemology	Ontology	Comments
Positivism	Objectivist	Used extensively in the management literature
Realism	Objectivist	Becoming more popular
Critical realism	Objectivist	Acknowledges that management researchers can not directly know reality, but they can study the world 'as if' they would know it. The knowledge of reality can be 'good enough'
Interpretivism	Subjectivist	The goal of the research is not to explain but to understand human behaviour. Mainstream epistemology for business research
Constructivism	Subjectivist	Focuses on the collective construction of social phenomena
Subjectivism	Subjectivist	Focuses on the 'multiple realities' that exist when social reality is imposed by social actors rather than being constructed or interpreted

Table 4.1 Research Approaches (Source: adapted from Maylor and Blackmon, 2005)

Burrell and Morgan (1979) provided an important overview of the four assumptions in a polarising philosophical perspective model, using subjective and objective dimensions to further indicate the polarity (see Figure 4.2). The extreme positions are illustrated in the linearity of the model. On one end, there is positivism, and on the other, anti-positivism (Burrell and Morgan, 1979). Although scientists still debate the components listed in each position, this is not necessarily a negative aspect. Outlining characteristics from one philosophical perspective is extremely difficult. Differences in viewpoints are not wrong, but rather foster critical scientific discussion (Sayer, 2000; Easterby-Smith et al., 2015).

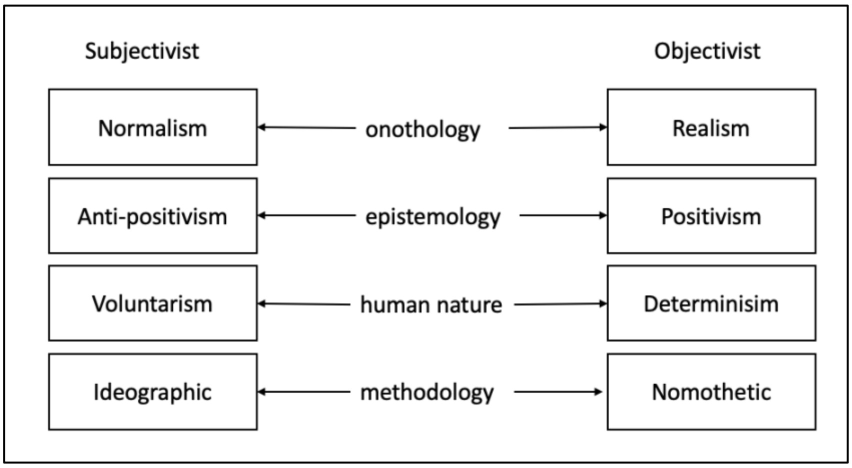

Figure 4.2 Subjective and objective dimensions (Source: adopted from Burrell and Morgan, 1979)

As the four research assumptions have been clarified, a closer look at specific research philosophies can be taken. In business research, the philosophies of positivism, interpretivism and (critical) realism are often applied (Maylor and Blackmon, 2005; Saunders et al., 2009; Bryman and Bell, 2011). The following subsections will outline these three philosophies in further detail and aim to justify the reasons for the selected philosophy. Table 4.2 functions as a summarising overview for the reader.

Issue	Positivism	Realism	Interpretivism
Aim of the paradigm	Seeking law-like regulation and statements	Explanation to improve practice	Achieve and understanding and improvement to local situation
Epistemology ***(researcher's view on what constitutes knowledge)***	– Objectivists – Facts are separated from values – Only observable phenomena can provide credible facts /data	– Epistemic relativism: facts are value-laden – Observable phenomena provide credible data/facts – Focus is on explaining in a context	– Idealist/subjectivist: social reality is created by the researcher
Ontology ***(researcher's view of the nature of reality)***	– Reality is objective and independent of social actors – Reality exists and is the one that is experienced	– Reality is objective and exists independently of human thoughts, beliefs, and knowledge, but is interpreted through social conditioning – Reality is generated based on the domains of the real, actual, and empirical	– Reality is socially constructed and subjective – Subjective idealism under which a person's own reality is constructed Or Weak internalism, where reality exists due to an intersubjective construction
Axiology ***(researcher's view of the role of values)***	– Research is value free – Researcher is independent of the data and maintains objective	– Research is value-laden – Researcher is biased by worldviews, cultural experiences, and upbringing	– Research is value bound – Researcher is part of what is being researched
Methodology	Favours quantitative methods	Open to different methodologies	Favours qualitative methods

Table 4.2 Comparison of paradigms (Source:adapted from Saunders et al., 2009; Armstrong, 2019)

Issue	Positivism	Realism	Interpretivism
Causality	Connection of the events	Generative mechanisms are interrelated entities with causal powers	Does not exist or is not considered
Approach to systems	The world is systemic and observable (functionalist, rationalist)	The world is systemic. Hence, structures and mechanisms can be seen as interrelating entities. Each entity can be seen as a component and system	No assumption that world is systemic, but systems thinking can be used to learn about the world and its problems

Table 4.2 continued Comparison of paradigms (Source: adapted from Saunders et al., 2009; Armstrong, 2019)

4.2.1 Positivism

The roots of positivism go back to the French philosopher Auguste Comte in the 19^{th} century. Comte's position led to a general philosophical doctrine, which believes that knowledge is based on sense experience, experimenting and observation (Cohen, 2007; Riley, 2007). Since the time of Comte, the terminology of positivism has been interpreted differently. Besides putting positivism in the context of social evolution, there are various dissociations, such as logical positivism, or the assumption of positivism as a sort of methodological positivism, when relating to a set of scientific research practices (Riley, 2007).

Independent of its interpretations, positivism aims to explain human behaviour in terms of cause and effect by building true and precise, almost law-like generalisations (May, 2001). Like (critical) realism, positivism assumes a scientific approach in which knowledge is developed when collecting and understanding data (Saunders, 2009; Bryman and Bell, 2011). Data should be collected in the social environment of people to be able to generalise from it (May, 2001). During data collection, a theoretical mindset helps to develop hypotheses that might be (partly) confirmed or refuted in the following (Saunders, 2009).

In a positivistic research approach, researchers do not take a particular side. Their independence is neither affected by the research subject nor by the research subject (Remenyi et al., 1988; Saunders, 2009). In doing so, an objectivist ontology, by collecting data in a value-free manner, is fulfilled. Additional principles of positivism are displayed in Table 4.3.

Principles	Explanation
Principle of Phenomenalism	Only phenomena and knowledge confirmed by the senses is considered knowledge
Principle of Deductivism	Theory is used to generate testable hypotheses from which law-like generalisations derive
Principle of Inductivism	Knowledge is created by gathering facts, which allow law-like generalisations
Principle of Objectivism	Data must be collected in a value-free manner
Principle of scientific statements	Distinction between scientific and normative statements; only scientific statements are the true domain for researchers

Table 4.3 Principles of Positivism (Source: adapted from Bryman and Bell, 2015)

A positivistic philosophy is often applied when following quantitative research methods. Quantitative research follows a logical structure in which theories underpin the research problem. The problem can, in the following, be addressed by the researcher's hypotheses, which derive from general theories (Bryman 2004). A common criticism of positivism challenges the use of quantitative methods. Not all quantitative research is theory-driven. Researchers complain about less theoretical guidance when bridging the gap between grand theories and low-level empirical findings. Bureaucracy in organisations or the prospect of absorption into wider theoretical schemas are also items of criticism (Bryman, 2004). Another critique refers to the rejection of adequate recognition of scientific theories of hypothetical entities that are not directly observable. The use of rhetorical devices, such as analogies and metaphors, to understand mechanisms underpinning phenomena is counter the positivistic approach (Bryman, 2004).

4.2.2 Interpretivism

Interpretivism is a contrasting paradigm to positivism (Bryman and Bell, 2011; Hammersley 2012). It emerged out of the criticism that rich insights into the complexity of the social world might get lost when applying purely the scientific model of positivism (Saunders 2009; Bryman and Bell, 2011).

Interpretivism had its intellectual heritage in the 19th century and emerged out of Weber's notion based on the German word 'Verstehen'. 'Verstehen' is equivalent to the English noun 'understanding', or the verb 'to understand' (Bryman and Bell, 2011; Hammersley, 2013). Considering the deeper meaning of the terminology 'Verstehen', the interpretivistic movement developed out of the idea that researchers should be able to understand fellow human beings from an inside perspective. These inside perspectives are based on empathy, culture and experience. As opposed to positivism, the outside perspectives maintain a major role in focusing on explaining the behaviour of physical objects (Hammersley, 2013). Hence, interpretivism follows the idea that humans interpret and judge their social environments. Cultural aspects, lifestyle and cultural orientation influence human behaviour and thinking (Hammersley, 2013). Therefore, an interpretivistic research approach is characterised by a concern for the individual (Cohen, 2007).

Other than positivism, interpretivist research does not follow the idea of law-like generalisations. Interpretivism grasps the subjective meaning of social actions. People and their institutions, which are the main subject of investigation, are fundamentally different compared to the natural sciences (Bryman and Bell, 2011). Researcher's value and reflect the distinctiveness of individuals and their role as social actors in society (Saunders 2009; Bryman and Bell, 2011). Interpretivists value empathetic understanding of human action, compared to their positivistic counterparts, who value the forces triggering human actions (Bryman and Bell, 2015).

4.2.3 (Critical) realism

(Critical) realism has gained momentum in social science research as a viable paradigm that stands in contrast to interpretivism and positivism (Wynn and Williams 2012). Realism itself is defined as *"the view that entities exist independently of being perceived, or independently of our theories about them"* (Phillips, 1987, p. 205). In other words, realism is a doctrine that considers objects of our knowledge as mind-independent. Their existence is unaffected by the thinking of mind-endowed beings (Rescher, 1976). In social sciences, realism has always been the important and dominant approach (Maxwell, 2012). This led to the dissociation of diverse types of realism (Tsang, 2017). The type of realism that is firmly established in Business and Management research is called critical realism (McAvoy and Butler, 2018).

Critical realism emerged from the question of what reality must be like to make science possible (Danermark, 2002). Hence, the complex world is structured into different layers (Bhaskar, 1978; McAvoy and Butler, 2018). To identify the deeper meaning of these layers, critical realism examines the mechanisms underlying them (McAvoy and Butler, 2018). These structures and mechanisms can either be based on physical settings, i.e., possible to see or touch, or be based on non-physical and unobservable settings, such as ideas and social structures (Danermark et al., 2002; Mingers, 2006; McAvoy and Butler, 2018). These considerations align with the basic assumption of critical realists, who say the real world exists independently of our knowledge of it (Bhaskar, 1998; Bygstad et al., 2016). In other words, there is an external reality, which is separated from our descriptions, and which scientists aim to explore (Bryman and Bell, 2015). This reality consists of three main domains:

- the real,
- the actual and,
- the empirical (Bygstad et al., 2016).

The domain of *the real* consists of structures of physical and social objects, with the option for a behaviour called a mechanism. These mechanisms have the power to trigger (or not trigger) an event in the domain of *the actual*. In the domain of the *empirical,* these events may or may not be observed (Bygstad et al., 2016; McAvoy and Butler, 2018). Hence, structures are believed to be not deterministic but rather have the potential "to enable and constrain events through their inherent mechanisms" (Bygstad et al., p. 84).

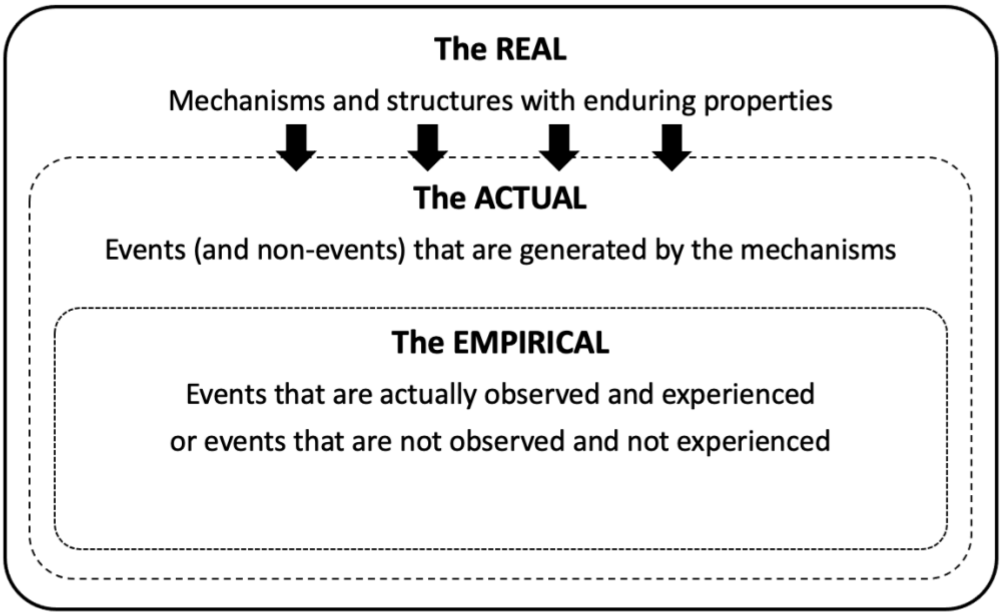

Figure 4.3 The domains of critical realism (Source: adapted from Mingers, 2006)

The ability of all three domains to be out of phase with each other (Bhaskar, 1978; McAvoy and Butler, 2018) indicates their connection to an open system and at the same time their applicability in business research. Business research, in contrast to laboratory research, operates in an open environment where many variables cannot be controlled. Hence, it is necessary to operate in an open system environment (Ryan et al., 2012; McAvoy and Butler, 2018). Applying an open system investigation based on critical realism in this research allows the researcher to look openly at the changes in circular business relationships and circular industrial networks that will occur once an organisation is part of a CBM.

As Business and Management activities are—to a certain extent—concerned with the social world which surrounds their business environment. Hence, researchers, maintaining a critical realist perspective in business and environment research, believe that they will only understand the matters of the social world if they can understand the social structures that gave rise to the phenomenon under investigation (Saunders, 2009). Looking at the influencing factors for CBMs will require a certain level of understanding of the social structure surrounding circularity.

The transition period from linearity to circularity and the implementation of CBMs require radical systems change. A critical realist in business relationship research aims to identify the structures and mechanisms that form the nature of the relationships (Sayer, 1992; Ryan et al., 2012). Therefore, this philosophical stance suits this research, as it looks at structural change and transformation in business relations.

4.3 Research approach

4.3.1 Introduction to research approaches

A research approach is described by philosopher Charles Saunders Peirce as the pathway for scientific reasoning (Spens and Kovács, 2006). It needs to follow the argumentation line of the research (Spens and Kovács, 2006) while equally managing to link the theory with the research (Bryman and Bell, 2015). Often, the linkage between research and theory can be the most complex part (Bryman and Bell, 2015). During the process of acquiring knowledge, theory needs to answer the role it maintains (Spens and Kovács, 2006; Bryman and Bell, 2011). Therefore, the researchers selected a specific research approach.

There are three commonly applied research approaches: inductive, deductive, and abductive reasoning (Spens and Kovács, 2006). Inductive or deductive reasoning is popular in the field of Business and Management (Arlbjorn and Halldorsson, 2002; Näslund, 2002). Following from a generalisation to a specific case (deductive reasoning) or vice versa, moving from a specific case to law-like generalisations are two popular approaches (Kovács and Spens, 2005). Nonetheless, both approaches bring limitations, and operations management research has been criticised for its limited engagement with theoretical development. Therefore, the concept of abductive reasoning has gained greater attention over the years (Spens and Kovács, 2006).

It is acknowledged that all three approaches differ in many factors and characteristics. Figure 4.4 and Table 4.4 provide a comparative overview of each of the three approaches. In the following subsections, each approach is elaborated. Since the choice of research approach is of major importance, the last section will explain and justify the reasons for the selected research approach.

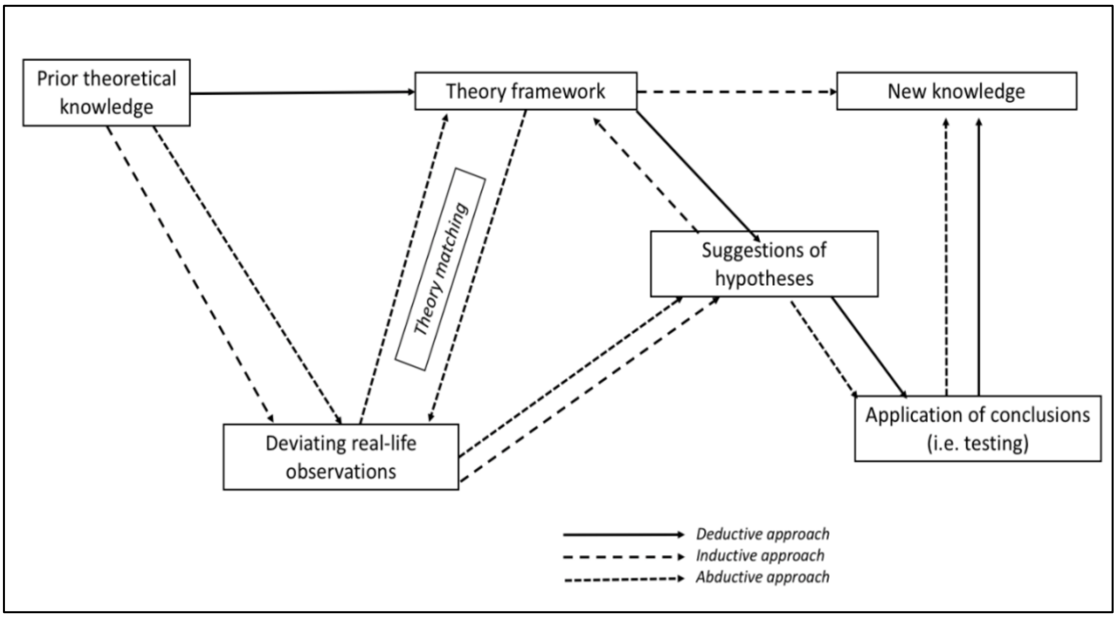

Figure 4.4 Overview of research approaches (Source: adapted from Kovacs and Spens, 2006)

	Deduction	Induction	Abduction
Purpose	To provide a structured process for testing a theory or a phenomenon	To provide a broad conclusion based on specific ideas	Focus on particularities of specific situations; Possible reasons are pursued to explain the evidence
Testing	Hypothesis or theory testing	To draw generalisable ideas from the specific	Scientific knowledge is created through intuitive leaps
Starting point	Theoretical framework	Empirical observations Theory is absent	Empirical observations unmatched by deviating from theory
Aims	Testing/evaluating theory	Developing theory	Developing new understanding
Conclusions	Corroboration or falsification	Generalisation/ Transferability of results	Suggestions (for future directions, theory, paradigm or tool)

Table 4.4 Comparison research approaches (Source: adapted from Maylor and Blackmon, 2005; Saunders et al., 2009; De Brito and van der Laan, 2010)

4.3.2 Deductive reasoning

The deductive research approach enjoys great popularity in the scientific field of research (Saunders, 2009; Bryman and Bell, 2015). It is considered the most common view when linking theory and research (Bryman and Bell, 2015), and its logical and clear structure makes it popular for quantitative research (Hyde, 2000). As displayed in Figure 4.5, deductive reasoning follows an almost linear procedure (Saunders, 2009; Bryman and Bell, 2015), during which testable hypotheses, which explain the relationships between the variables, are written. In the following, an indication is developed to establish how the concepts of variables can be measured, before hypotheses are tested and data outcomes are being listed Collins (2010). Researchers applying deductive reasoning are advised to especially consider the applied theory, as any deducted hypothesis from the theory must be translated into operational terms (Bryman and Bell, 2015).

In summary, theory and hypotheses drive the process of data collection in a deductive approach (Bryman and Bell, 2015). Deductive research is seen as "a study in which a conceptual and theoretical structure is developed and tested by empirical observation; thus particular instances are deduced from general inferences" (Collis and Hussey, 2013, p. 7).

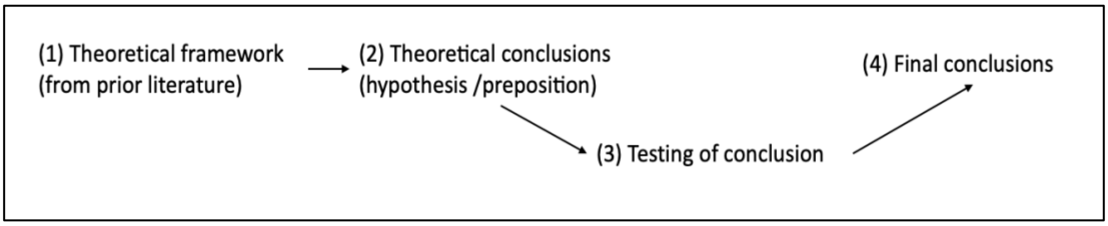

Figure 4.5 Deductive Reasoning (Source: adapted from Kovacs and Spens, 2006)

4.3.3 Inductive reasoning

Induction is considered to be the mirror image of deduction (Johnson, 1996; Spens and Kovács, 2006). Contrary to deductive reasoning, inductive reasoning considers the theory as the outcome of the research (Bryman and Bell, 2015). Rather than testing a theory (Spens and Kovács, 2006), as deductive reasoning would do, the aim is to develop a new theory (Arlbjorn and Halldorsson, 2002; Maylor and Blackmon, 2005). In other words, the researcher draws generalisable inferences from observations (Bryman and Bell, 2015). This is done by analysing the data based on emerging patterns (Hyde, 2000; Maylor and Blackmon, 2005).

Induction fits very well as an approach for research areas which do not have a theory yet (Maylor and Blackmon, 2005) or when the concept is not clear (Hyde, 2000). Hence, inductive reasoning is the preferred and traditional choice when conducting qualitative research (Hyde, 2000). Figure 4.6 displays the details regarding the process of inductive reasoning.

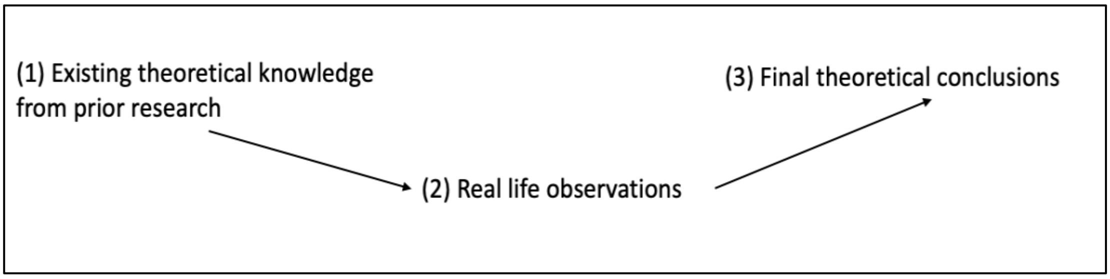

Figure 4.6 Inductive reasoning (Source: adapted from Kovacs and Spens, 2006)

4.3.4 Abductive reasoning

Abductive reasoning is a rather novel approach in the field of (Operations) Management (De Brito and van der Laan, 2010). It is said to have its origin with philosopher Charles Saunders Peirce, who traces its origins to the ancient Greek philosopher Aristotle (Spens and Kovács, 2006; De Brito and van der Laan, 2010). Although they share some similarities, abductive reasoning needs to be seen differently from inductive and deductive work. It is said to be a fruitful approach if a researcher's objective is to discover new things (Dubois and Gadde, 2002).

The abductive approach gains knowledge from elaborating on different possibilities. Possible reasons are pursued to explain the evidence (Rescher, 1976; De Brito and van der Laan, 2010). In doing so, abductive reasoning focuses on particularities of specific situations, rather than focusing on generalisations and their specific manifestations. This aids in the justification of which results are generalisable and which pertain to specific situations (Spens and Kovac, 2006).

Abduction is often applied when the phenomenon is already known, but new insight can be created when taking a shift in perspective. Logistics and Management research uses such perspective shifts often, for instance, when borrowing established theories from other scientific fields to feed their research (Spens and Kovac, 2006).

The process of abduction follows an intuitive and creative approach (Spens and Kovac, 2006). Scientific knowledge is created through intuitive leaps rather than logical processes (Taylor et al., 2002; Spens and Kovács, 2006). Using intuitive leaps allows us to break out of the constructs and boundaries that come with deduction and induction (Spens and Kovac, 2006).

Abductive reasoning builds up from rule to result to case (Danermark, 2002; Spens and Kovács, 2006). In most cases, it starts with a real-life observation. Since abduction encourages researchers to look simultaneously for theory while conducting empirical research, a learning loop is created. This learning loop is also addressed as a creative iterative process of theory matching (Taylor et al., 2002) or systematic combining (Dubois and Gadde, 2002). This interactive aspect of being able to move back and forth between theory and empirical research is found in action research and case study research (Dubois and Gadde, 2002; Spens and Kovács, 2006). Figure 4.7 displays the process of abductive reasoning.

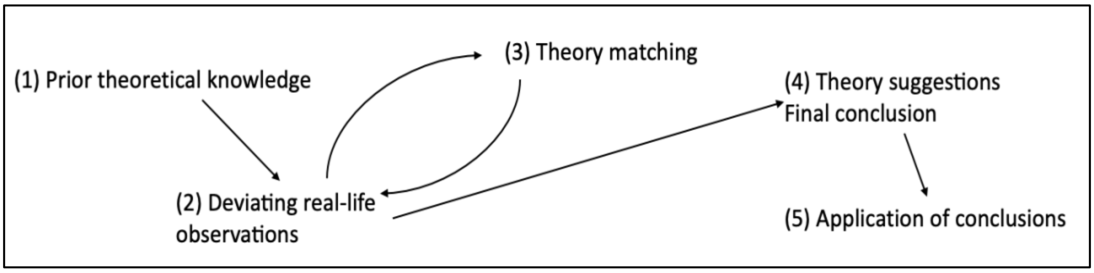

Figure 4.7 Abductive Reasoning (Source: adapted from Kovacs and Spens, 2006)

4.3.5 The selected approach

"*To engage in abductive reasoning, there must be a complex or puzzling situation*"

(Mirza et al., 2014, p. 1981)

Abductive reasoning has been selected as the research approach. The current situation of CE and CBMs is considered a complex, and indeed, puzzle-like situation. To fully understand the reasons for abductive reasoning, the idea of complexity needs to be understood in a circular context.

Most real-world systems, such as the economy, are complex, as they cannot be understood or analysed in their individual parts. Participants and actions are strongly intertwined. Small changes can have surprisingly large effects. However, complex systems are also adaptive. And so is the system of a Circular Economy, in which different flows of resources interact with each other (Heinrich and Jamsin, 2020).

Abductive reasoning encourages the equal use of theory and empirical data. The theory will mainly guide the data collection. In other words, the researcher is encouraged to apply a theoretical lens when collecting data. However, the researcher is not restricted to theoretical underpinnings or specific data. Abductive reasoning is a great way of exploring the greater scheme of things as it allows the researcher to collect data outside the themes that emerged from the theoretical lenses. In doing so, it is avoided that data does not fit in pre-established frameworks, or that data is of no theoretical use.

It is acknowledged that in an abductive approach, the selection of theory and the data analysis can be done at the same point in time (Ryan et al., 2012). This leeway particularly suited this study. As shown in Figure 4.8, Phases II–V, the data collection included focus group discussions, expert exchange, and interviews. Phase I describes the starting face. "*The trigger for abductive research is deviating observations from previous knowledge*" (De Brito and van der Laan, 2010, p. 864). These were done via exchange with experts, but also an exhaustive review of academic and grey literature. The latter is in the form of industrial, consultancy, and policy reports.

Particularly, the data collection in Phases II and III allowed the researcher to explore data that emerged outside any theoretical lenses (Ryan et al., 2012). Phases II and III mainly involved what Taylor et al. (2002) described as creative learning loops of theory matching (Taylor et al., 2002). In that way, theoretical theories were explored, disseminated, and matched towards the results and the framework development.

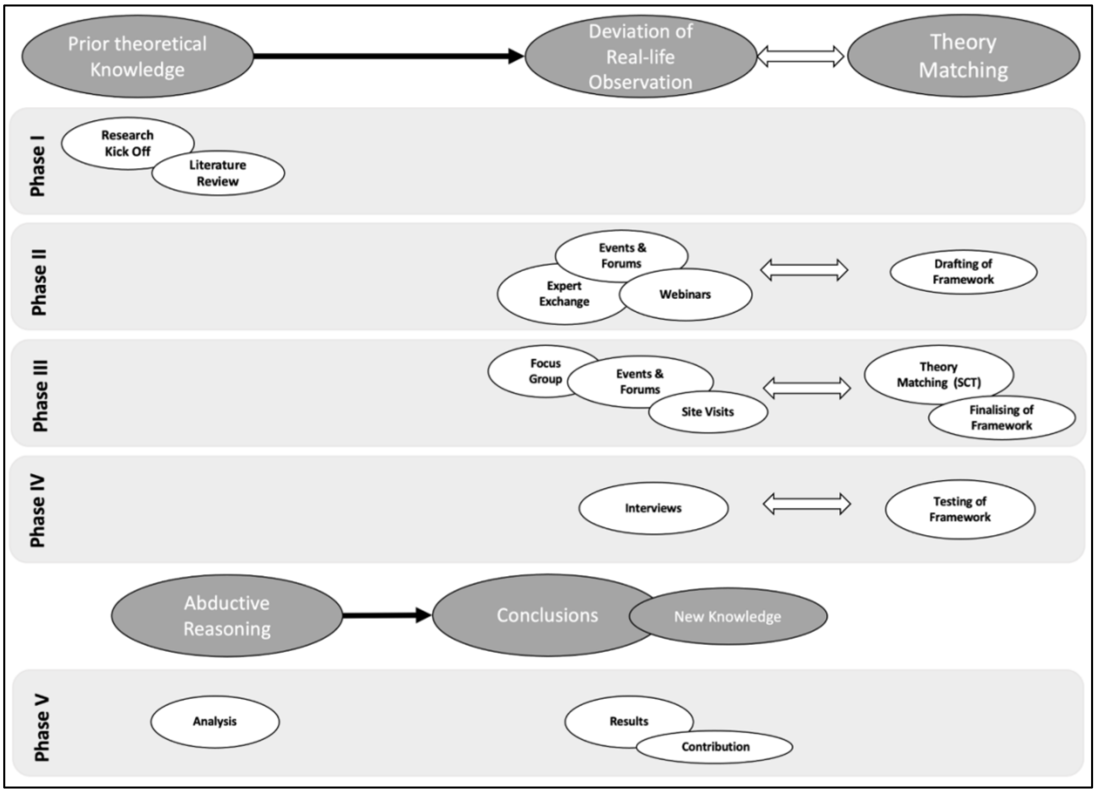

Figure 4.8 Abductive Research Process (Source: Author)

4.4 Research strategy, tools, and techniques

Since Chapter 3 has already discussed the development of the framework by revealing the details about the expert exchanges (Section 3.2) and outlining the FG discussion (Section 3.3), the following sections will specifically outline the research strategy of the case study approach by focusing on the tools and techniques applied.

The research was conducted over the period of five years (2016–2021) and followed the strategy of case study research with a multi-methods design. Section 4.4.1 will introduce case study research, before Section 4.4.2 reveals details about the case study layout, including the sampling strategy.

4.4.1 Case study research—an introduction

Case studies originate from the desire to understand specific social phenomena. They are seen as a useful approach for assessing contemporary phenomena in a real-life context (McCutchecon and Meredith, 1993; Robson, 2002; Seuring, 2008; Saunders et al., 2009), as well as complex structures in different industries (Yin, 2009). In this research, CBMs are a contemporary phenomenon that will be investigated in the real-life context of circular supply chain networks.

Case study design is a popular and widely used research design in the field of business and management research (Kiridena and Fitzgerald 2006; Saunders et al., 2009) and a serious contender in theory-building research (Kiridena and Fitzgerald, 2006). Yin (2009) noted that a case study design is the most challenging research design. However, it can be applied in exploratory investigations in which variables are unknown and phenomena are not completely understood (Voss et al., 2002). Appropriate conduction will allow an in-depth understanding of processes (Saunders et al., 2009) and a holistic view of the research context (Yin, 2009).

Saunders et al. (2009) and Yin (2003) developed four case study strategies for business research. These four strategies are split into two dimensions. The first dimension is a *single* case study versus a *multiple* case study, and the second dimension distinguishes between holistic and embedded cases (Saunders et al., 2009). Due to access restrictions to supplier and customer networks of case organisations, a multiple case study design was selected.

Saunders et al. (2009) argued that a multiple case study enables a researcher to establish whether findings occur in more than one case. If so, multiple case studies offer the chance to build a solid construct (Dyer and Wilkins, 1991; Ojasalo, 2008) and offer the possibility to generalise the findings (Saunders et al., 2009). Eisenhardt (1989) sees multiple case studies as a powerful tool for building theory. A multiple case study allows for the expansion or independent corroboration of individual cases (Burrell and Morgan, 1979; Eisenhardt; 1989; Ojasalo, 2008).

4.4.2 Case study layout of this research

Selecting a relevant and clear research strategy is very important, as it will enable the researcher to meet the research objectives and aids in answering the research question(s) (Saunders et al., 2009). As this research takes place over different phases, it has been decided to apply multi-methods as a measurement to ensure data triangulation (see Figure 4.9). In the first stage, the expert exchange and FG discussion informed the development of the framework, while case study interviews allowed the framework to be tested.

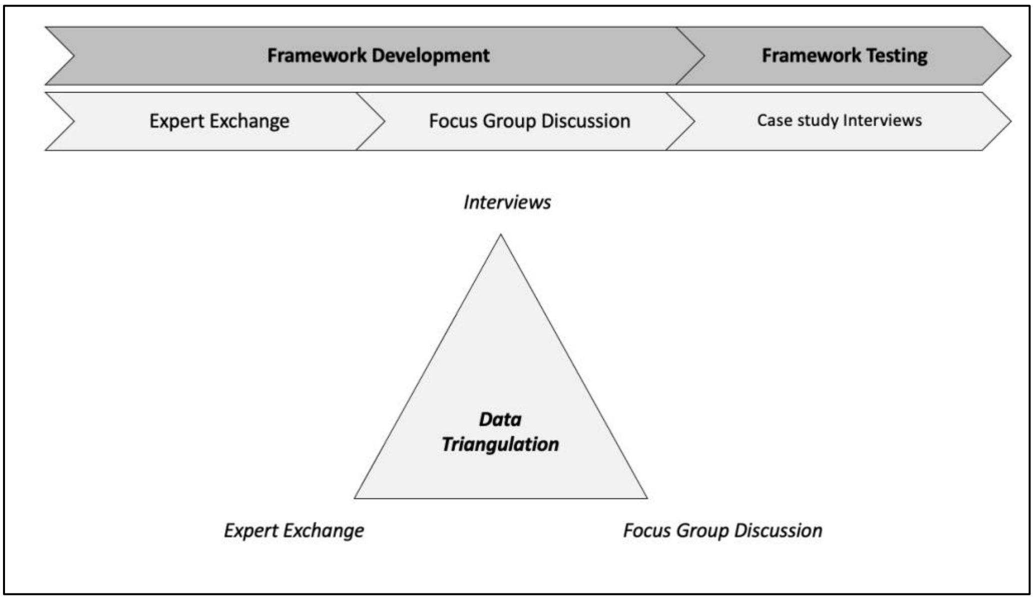

Figure 4.9 Data Triangulation (Source: Author)

As it is impracticable to collect data from the entire population, a sampling strategy is required (Saunders et al., 2009). As this research follows a case study approach, non-probability sampling has been acknowledged. Non-probability sampling is a popular sampling strategy in business research where random sampling can be inconvenient or not appropriate to answer the research question. Hence, non-probability sampling provides a range of techniques, such as pilot surveys, to determine the range of the problem. It is acknowledged that non-probability sampling has, compared to its counterpart, no rules in terms of sample size other than “the logical relationship between [the] sample selection technique and the purpose and focus of [the] research” (Saunders et al., 2009, p. 233). This research follows the non-probability sampling strategy of judgemental sampling. This strategy is specifically suited for smaller samples and case study research, as it allows the researcher to judge the selection of cases that will answer the research questions.

The selection of the case organisations was strongly connected to the unit of analysis: *Circular Business Models*. Businesses of all sizes and industry sectors were considered in the selection process. Main selection criteria included that organisations had embarked on their circular journey and already applied circular practices. However, it is important to note that the timeframe of how long circular practices were incorporated in business actions did not influence the selection of respective case organisations. Therefore, the findings provide a snapshot of a mix of organisations of different industry sectors which had applied circular practices for a different amount of time, in three CBMs.

With the selection of the research strategy, the unit of analysis was also decided on as *the Circular Business Model*. The unit of analysis is of major importance, as it reveals the basis of any coding (Milne and Adler, 1999). If the unit of analysis is chosen as too detailed, the analysis can focus too much on the micro level, while if chosen too broad, the analysis can focus on the macro level, missing essential smaller units on a micro level (Roller and Lavrakas, 2015). CBMs are at the centre of this work and are addressed in all three research questions. Hence, CBMs appeared to be a suitable unit of analysis for this specific research. Furthermore, the literature review identified a variety of different CBMs (see Section 2.5.3). As this research looks at the CBMs via the in Table 2.12 identified position G, it was aimed to capture these five CBMs through a non-probabilistic sampling strategy. Despite the effort to advertise the call for case study organisations on external platforms, such as the Chartered Institute of Waste Management Newsletter, only three of the five overarching Circular Business Model categories could be investigated due to access issues.

In sum, the case study layout comprised a total of 25 organisations, of which 12 were classified as Original Equipment Manufacturer (OEM), two public organisations (Public), three social enterprises (SE), two technology providers (Tech), four non-profit organisations (NGO), one waste service provider (WSP), and one national governmental body (Gov). In total, 36 interviews were conducted and three overarching CBMs were closely investigated. On average, an interview lasted between 50–90 minutes and was conducted by telephone, online or on-site. Interviewees were familiar with the relevant CBM, and their job position varied from Founder or Executive Director to Sustainability or Operations Manager up to Innovation Manager. Whenever possible, site visits were included after the interview to see the discussed circular processes in a real-life setting (see Table 4.5 for further details). It was not always possible to conduct multiple interviews with the entire supply chain network of the respective organisations due to confidentiality reasons and supplier and customer restrictions.

Overview case study	
Sampling strategy:	Non-probability sampling – judgemental sampling
Unit of analysis - CBMs covered ○ *Models*	Circular Business Models – Circular supplies ○ *Bio-based material* – Resource and recovery ○ *Recycle* ○ *Valorisation* – Product Life Extension ○ *Refurbishment and remanufacturing* ○ *Refill* ○ *Upcycle* ○ *Repair*
Number of case organisations	25
Number of interviews	*36* (on average 1-3 interviews per organisation)
Interview time	50-90 minutes
Site visits	8
Case Org. Type:	– Original equipment manufacturer – Social enterprise – Public organisation – Non-profit organisations – Technology provider – Waste service provider – Government institutions
Industry sector	– Manufacturing – Health – Public sector – Food and drinks – Waste sector – Construction and steel – Paper and plastics – Arts and architecture – Textiles

Table 4.5 Overview of Case Study (Source: Author)

As explained in the literature review (Section 2.5.3), the aim was to have case organisations from all five CBMs. However, due to a variety of issues, including the challenges that the organisations faced during the pandemic, there was a restricted number of CBMs.

The final selection of case organisations was based on their ability to apply a CBM. In other words, only organisations that had already established a CBM were selected. It needs to be emphasised that the progression and level of circularity in the case organisation were not a criterion. Some organisations had just developed their CBMs, while others were implementing their model for some years. Interviewee participants were selected based on their knowledge of the respective CBM. Therefore, preceding conversations with a contact person were conducted to establish a suitable interview participant. If requested, an interview protocol was sent beforehand. These preceding conversations and information aided in the search for a suitable interview participant. An overview of individual organisations, how they are connected amongst each other and the information about the CBM is provided in Figure 4.10.

As guidance to the reader, a green arrow indicates a connection of the respective organisations in real-life business operations, whereas a dotted line indicates a connection in real life with an organisation is existent, but not with the exactly interviewed organisation. For instance, the dotted arrow between NGO4 and Gov1 indicates that NGO4 has connections with a governmental body, but not the exact government body that has been interviewed; whereas the arrow from NGO2 to Gov1 indicates that NGO2 is collaborating with Gov1 in real life.

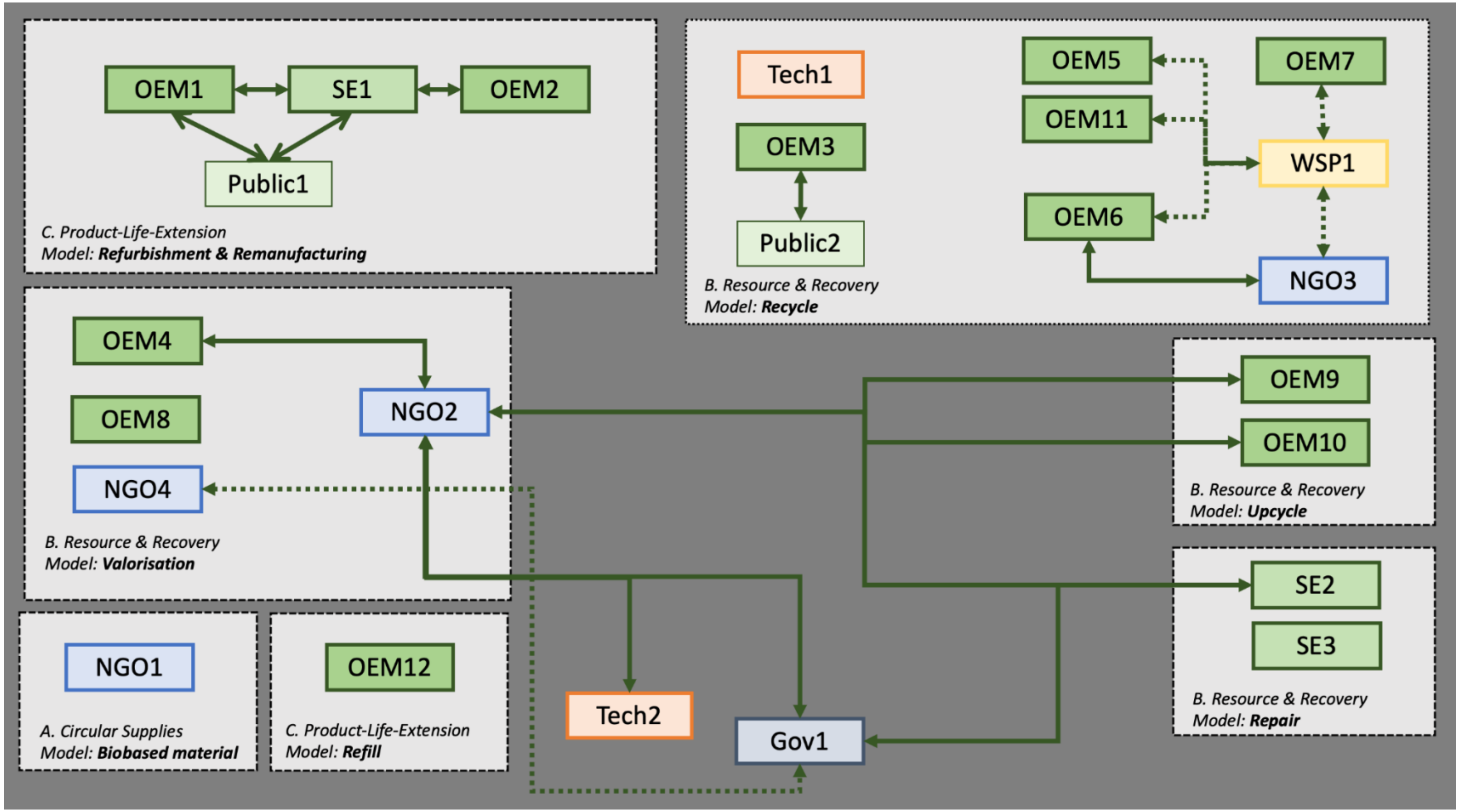

Figure 4.10 Case companies' layout (Source: Author)

Name	Sector	Interviewee No.	Job Position	No of Interviews	CBM Category and Example	
OEM1		Int. 1	Commercial Director	1	C. Product Life Extension	Refurbishment & Remanufacturing
		Int. 2	Operations Director	1		
		Int. 3	Factory Manager	1		
OEM2	Manufacturing	Int.1	Head of Sustainable Development	1	C. Product Life Extension	Refurbishment & Remanufacturing
OEM3	Health care	Int. 1	Chief Operating Officer	1	B. Resource and Recovery	Recycle
		Int.2	Managing Director	1		
		Int.3	Technical Compliance Manager	1		
OEM4	Food and Drinks	Int.1	Chief Operating Officer	1	B. Resource and Recovery	Valorisation
OEM5	Construction and Steel	Int.1	Innovation Manager	1	B. Resource and Recovery	Recycle
OEM6	Paper and Plastics	Int.1	Director and Head of Innovation	1	B. Resource and Recovery	Recycle
OEM7	Food and Drinks	Int.1	Head of Public Affairs & Sustainability	1	B. Resource and Recovery	Recycle
OEM8	Arts and Architecture	Int. 1	Founder	1	B. Resource and Recovery	Valorisation
OEM9	Paper and Plastics	Int.1	Founding Director	1	B. Resource and Recovery	Upcycle
OEM10	Arts and Architecture	Int. 1	Founder	1	B. Resource and Recovery	Upcycle

Table 4.6 Details of case organisations (Source: Author)

Name	Sector	Interviewee No.	Job Position	No of Interviews	CBM Category and Example	
OEM11	Construction and Steel	Int.1	Sustainability Manager	1	B. Resource and Recovery	Recycle
OEM12	Health care	Int.1	Founder	1	C. Product Life Extension	Refill
Public1	Public sector	Int.1	Facilities Development Manager	1	C. Product Life Extension	Refurbishment and Remanufacturing
Public2	Health	Int.1	Waste and Sustainability Officer	1	B. Resource and Recovery	Recycle
SE1	Manufacturing	Int.1	Founder & Managing Director	1	C. Product Life Extension	Refurbishment & Remanufacturing
SE2	Public Sector	Int. 1	Co-Founder	1	C. Product Life Extension	Repair
SE3	Public Sector	Int. 1	Chief Executive Officer	1	C. Product Life Extension	Repair
Tech1	Textile	Int.1	Business Development Director	1	B. Resource and Recovery	Recycle
Tech2	Waste Sector	Int.1	Founder & Managing Director	1	B. Resource and Recovery C. Product Life Extension	Recycle /Reuse
NGO1	Construction and Steel	Int.1	Managing Director	2	A. Circular Supply Chains	Circular Supplies
		Int.2	Environment Technician	2		
NGO2	Public	Int.1	Senior Research Analyst	1	B. Resource and Recovery	Valorisation

Table 4.6 continued Details of case organisations (Source: Author)

Name	Sector	Interviewee No.	Job Position	No of Interviews	CBM Category and Example	
NGO3	Public	Int.1	Director	1	B. Resource and Recovery	Recycle
NGO4	Public	Int.1	Sector Manager Bioeconomy	1	B. Resource and Recovery	Valorisation
WSP1	Waste	Int.1	External Affairs Director	2	B. Resource and Recovery	Recycle
		Int.2	Sustainability and Social Value Lead	2		
Gov1	Policy	Int.1	Head of Waste Strategy for Welsh Government	1	N/A	N/A
		Int.2	Technical Appraisal Manager - Innovation Division	1		

Table 4.6 continued Details of case organisations (Source: Author)

4.4.3 Reliability and validity in case study research

Reliability and validity are important variables for any research, as they inform researchers about inconsistencies or fluctuations in data sets (Chen and Krauss, 2004). Critical scientific discussion about case study research concluded that value and the high quality of the case study will be achieved through the maximisation of the following four aspects: construct validity, internal validity, external validity and reliability (Kiridena and Fitzgerald, 2006; Yin, 2009, Bryman and Bell, 2015).

Construct validity refers to the extent to which the researcher establishes correct operational measures for the concepts being measured (Voss et al., 2002). Demonstrating that the correct conduct of research has been followed, the tactics of Stuart et al. (2002) have been followed in the discussion of methods for data collection. This results in a chain of evidence that should enable any other researcher to replicate the research (Stuart et al., 2002). Multiple sources of evidence, including grey literature such as governmental and industry reports and events (online and offline) to support the interview data, were created. The results have been verified by exchange with experts and in focus group discussions.

Internal validity refers to the conclusions on which causal relationships between variables can be established, whereby specific conditions have the potential to lead to other conditions (Stuart et al., 2002; Bryman and Bell, 2016). In case study research, internal validity is more a problem of inferences, which are often done in interviews and observations (Yin, 2009). Stuart et al. (2002) suggest the application of case studies, which are different in nature, to improve internal validity. Therefore, a variety of different CBMs were included to provide a holistic view of CBMs.

External validity expresses whether the research results can be generalised beyond the context of the immediate research (Voss et al., 2002; Yin, 2009; Bryman and Bell, 2015). This is particularly challenging in case study designs but is apparent to all research methods (Yin, 2009). This study followed a rigorous and thorough research approach, analysing case studies in different CBMs. However, the exploratory nature of this work does not aim to achieve full generalisability. This will be further elaborated on in Chapter 8, research limitations.

Reliability refers to the consistency of research findings when conducting similar research (Yin, 2009; Saunders et al., 2009; Bryman and Bell, 2011). To ensure replicability of the research, a case study protocol was developed, and interviews were recorded, transcribed, and catalogued.

Reliability and Validity — Summary		
	General Explanation	Applied in this research
Construct validity	The extent to which the researcher establishes correct operational measures for the concepts being measured (Voss et al., 2002); resulting in a chain of evidence, which should enable replication of the research (Stuart et al., 2002).	Usage of multiple sources of evidence: – *academic and grey literature* – *governmental /industry reports* – *event visits* – *interviews and FG discussion* – *expert exchange* Clear description of replication purposes
Internal validity	Refers to the conclusions of which causal relationships between variables can be established (Stuart et al., 2002; Bryman and Bell, 2016).	A variety of different CBMs from different industries was included to provide a holistic view.
External validity	Expresses whether the research results can be generalised beyond the context of the immediate research (Bryman and Bell, 2016; Yin, 2009; Voss et al. 2002).	The study followed a rigorous and thorough research approach; analysing the case studies in different CBMs. However, the exploratory nature of this work does not aim to achieve full generalisability (see Chapter 8 for further details)
Reliability	Refers to the consistency of research findings, when conducting similar (Yin, 2009, Saunders et al., 2009; Bryman and Bell, 2011).	To ensure replicability, a case study protocol was developed, as well as interviews being recorded, transcribed and catalogued.

Table 4.7 Summary of reliability and validity (Source: Author)

4.5 Data collection and analysis

"The search for the codable moment—a way of seeing."

(Boyatzis, 1998, p. 1)

4.5.1 Data collection methods

Collecting data via multiple methods provides a richness of data. In this research, richness was created by using qualitative data collection methods of FG discussions and case study interviews. Although qualitative data can be challenging due to its non-standardised and complex nature (Silverman, 2004; Saunders et al., 2009), it aids in answering the RQs and identifying true meaning in the findings.

As the details around the data collection for the FG discussion have already been introduced in Section 3.3.1, this section will solely reveal insights into the data collection methods and analysis of the conducted case study interviews.

Interviews are a prominent data collection strategy in qualitative and exploratory research (Saunders et al., 2009; Bryman and Bell, 2011). Furthermore, the researcher's philosophical stance acknowledges the opinions of individuals as a valid contribution to research.

In contrast to structured interviews, which follow standardised questions, semi-structured interviews allow researchers to encounter specific organisational contexts in relation to the research topic (Saunders et al., 2009). As the research looks at different CBMs and case organisations belonging to different industry sectors, semi-structured interviews have been acknowledged as interview techniques. Semi-structured interviews equip the researcher with the opportunity to probe and elaborate on shared knowledge, ideas and concepts, which is either new to research or new to the researcher (Deetz and Alvesson, 2013). While vice versa, the interviewee has the freedom to share his or her knowledge, ideas and familiar concepts (May, 2001). This amount of flexibility has been acknowledged since the case organisations maintain different functions in the CBMs; therefore, different concepts and ideas had to be considered. An interview protocol is attached in Appendix C. It is noted that semi-structured interviews might hamper the nature of exploratory studies. Nonetheless, asking the same questions to all respondents led to comparable data from the different organisations and CBMs.

Interview participants' job positions varied from senior to middle management staff members. To reduce single-respondent bias, multiple interviews in an organisation were conducted (where possible). On rare occasions, multiple participants contributed to the interview. It needs to be noted that multiple-participant interviews can be biased due to power relationships between the interviewee participants (Denscombe, 2010).

All interviews were audio-recorded and transcribed when permitted by the interviewee. The researcher acknowledged that audio recording can inhibit interviewees, while preventing the fallibility of the researcher's memory when analysing the data (Denscombe, 2010). To provide a comfortable interview environment, particularly in audio-recorded settings, the researcher undertook special training on qualitative interviewing, which included mock interviews to practise.

The interviews were conducted as a mix of telephone interviews or in person on site. Visiting on site allowed relationships to be formed between the interviewee and interviewer before the audio-recorded interview. In addition, it provided valuable insights into seeing the CBM model run in practice, and on three occasions there were follow-up conversations with employees working on site. Note-taking during the interviews, but particularly during these follow-up conversations with employees, aided in the data collection process and the understanding of the collected data.

4.5.2 Data analysis methods

The data analysis was guided by Miles et al. (2014), who followed a three-step approach, which is illustrated in Figure 4.11.

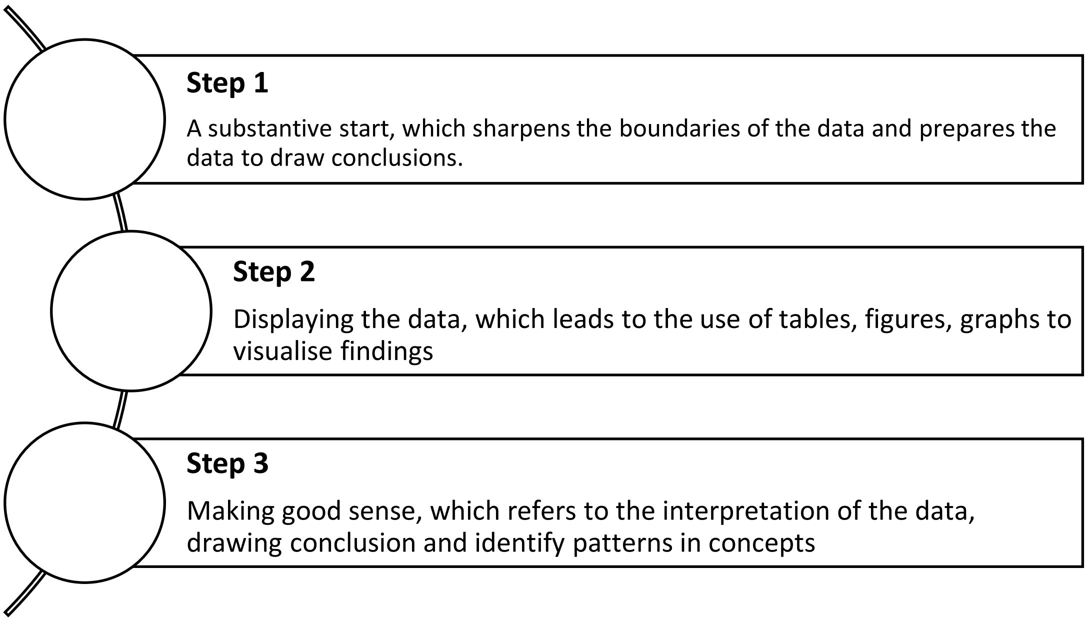

Figure 4.11 Data analysis steps (Source:adapted from Miles et al., 2014)

Although the FG discussion and the analysis of the data have already been described in Section 3.3.1, this section briefly provides further details, before looking at the data analysis of the interview data.

<u>Analysis of FG data</u>

Focus groups are frequently used in qualitative research to gain an in-depth understanding of social issues (O.Nyumba et al., 2018). As multiple participants are discussing a topic, a huge amount of data can quickly be produced (Bryman and Bell, 2011). The researcher had the following amount of data to analyse after the two discussions:

- Audio recording and audio transcription
- Post-it notes from participants
- Notes from additional note-taker

It is recommended to develop a strategy of analysis that incorporates both themes' participants' contributions and their patterns of interaction. Although Bryman and Bell (2011) noted that this is not easy, the researcher aimed to ensure these interactions by having an additional note-taker sitting in the discussion round. As participants were asked to introduce themselves at the beginning, it was possible to identify individuals in the recording. However, this can on occasion be difficult due to variations in voice pitch or multiple individuals speaking at the same time (Bryman and Bell, 2011).

As the post-it notes functioned as summaries, respectively keywords, of what participants had discussed, these were first used to identify patterns regarding topics and/or industries. Participants were asked to put their initials on the post-it, which aided the identification of industry sectors. This first search for patterns prepared the data and provided a good overview. In the following, the audio transcripts were analysed for these patterns, bearing in mind that new patterns that were not recorded on the post-it notes could emerge. Revisiting the audio transcript and bringing in the data from the additional notetakers complemented the data analysis.

Analysis of interview data

Following Miles et al.'s (2014) three-step approach revealed the richness of data emerging from the multiple methods applied. It also aided in bringing the data into a manageable format to check for obvious flaws (Terry et al., 2017). Transcriptions were made by re-listening to the audio recordings of interviews, but also revisiting the notes taken during interviews or site visits (Step 1, Figure 4.11). With further progression of the data analysis, visualisation was used and included in the form of graphs, figures, and tables, as this serves as guidance to the reader (Step 2, Figure, 4.11). These graphics were used to draw conclusions from the data (Step 3, Figure 4.11).

Following the technique of semi-structured interviews required a structured analysis approach. Hence, a thematic analysis based on the generation of coding schemes and patterns in NVIVO was conducted. Thematic analysis is a process for encoding qualitative information (Boyatzis, 1998). In this process, data is broken into components. The researcher searches for reoccurrences in the coded text, in or across cases, but also for links between the different codes (Bryman and Bell, 2015). The transcripts and interviews or field notes were categorised to identify coding schemes. Therefore, the software NVIVO was used.

A code in qualitative inquiry is a word or phrase that symbolically captures an attribute investigated in the research. How a researcher sees codes depends on the analytical lens taken (Saldaña, 2016). Scholars have identified the advantages of codifying, a process aiding in regrouping, segregating, and relinking to consolidate the meaning of the data (Grbich, 2013; Saldaña, 2016). The coding concept of this research was inspired by Hahn (2008), who looked at different levels of coding:

> *"Like a miner panning for gold from streambed gravel, the qualitative researcher sifts through large amounts of data. The miner sees no gold when she first looks at a gold-bearing streambed—just a lot of rock, gravel, and sand. To find the gold, the miner must systematically sift through piles of unsorted material to isolate the precious metal."* (Hahn, 2008, p. 5).

Hahn (2008) introduced three levels of coding, which begin with initial and open coding as large levels of data are analysed, followed by further levels that refine the established coding themes by categorisation and thematical coding. A final coding activity can refer to the theoretical concepts underpinning the research. To enable this, the categories and coding schemes of this research have been guided by the conceptual framework developed in Chapter 3. The conceptual framework was incorporated and aided in 'seeing' and structuring the coding scheme. As a consequence, the coding follows a pattern of four coding levels, which are displayed in Figure 4.12. An example of the coding logic is given as follows: 1st level coding: identified the category of *value perspective*; via 2nd level coding, the exact value perspective was identified (i.e., *Business Model Canvas, TBL values, order of values*). Assuming the 2nd coding level identified the passage as a *Business Model Canvas*, the following 3rd level would aid in classifying to which value the passage belongs (i.e., *proposition, creation, capture, delivery*), while the 4th coding level aids in classifying whether the passage talks, for instance, about *key activities* in the value creation process. The exact coding scheme applied is displayed in Table 4.8.

To support the analysis of the interviews, the researcher includes direct quotations in this work. Direct quotations aid in conveying the research findings and conclusions to the reader. However, it must be noted that bias can occur through selective quotations (Cameron, 2009).

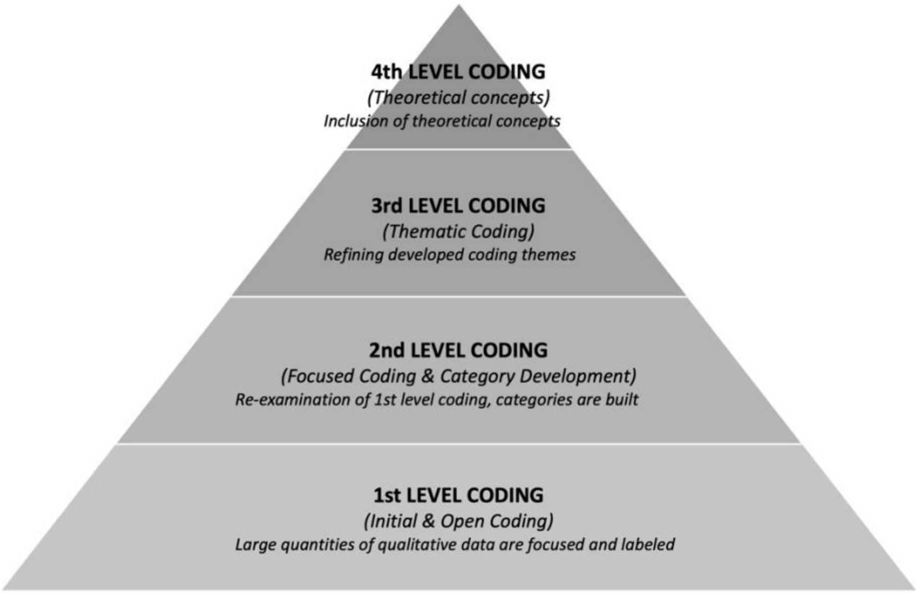

Figure 4.12 Coding levels (Source: adapted from Hahn, 2008)

CATEGORY	1ST LEVEL CODING	2ND LEVEL CODING	3RD LEVEL CODING	4TH LEVEL CODING
FACILITATION OF RESOURCE-PROTECTIVE AND CIRCULAR ACTIONS	CBM	➢ Description		
		➢ History		
		➢ Leading sector		
		➢ Start		
	Characteristics	➢ Benefits		
		➢ Impact		
		➢ Influencing factors		
		➢ Opportunities		
		➢ Wishes		
		➢ Challenges	⇒ Communication ⇒ Contamination ⇒ Customer ⇒ Design ⇒ Materials ⇒ Operations ⇒ Rigidity ⇒ Size of organisation ⇒ Transportation	
	Circular actions	➢ Energy ➢ Leasing ➢ Recycle ➢ Refurbishing ➢ Remanufacturing ➢ Repair ➢ Resource efficiency ➢ Reuse ➢ Valorisation ➢ Waste minimisation		

Table 4.8 Coding scheme (Source: Author)

CATEGORY	1ST LEVEL CODING	➢ 2ND LEVEL CODING	3RD LEVEL CODING	4TH LEVEL CODING
VALUE CONCEPT-UALISATION	Value Perspective	➢ Business Model Canvas	⇒ Value Capture	– Costs – Revenue streams
			⇒ Value Creation	– Key activities – Key partners – Key resources
			⇒ Value Delivery	– Channels – Customer relationships – Customer segment
			⇒ Value Proposition	– People – Planet – Profit
		➢ Order of values	⇒ Scenario 1 ⇒ Scenario 2 ⇒ Scenario 3 ⇒ Scenario 4 ⇒ Scenario 5	
		➢ TBL	⇒ Economic ⇒ Environmental ⇒ Social	
	Metrices	➢ General	⇒	
		➢ Outlook	⇒	
		➢ Measurements	⇒ Customer engagement ⇒ Carbon ⇒ Social value ⇒ Reporting ⇒ Indicators ⇒ Tracking ⇒ Well-being ⇒ Internal report	

Table 4.8 continued Coding scheme (Source: Author)

CATEGORY	1ST LEVEL CODING	➢ 2ND LEVEL CODING	3RD LEVEL CODING	4TH LEVEL CODING
CONTEXTUAL FACTOR	Collaboration	➢ Facilitator		
		➢ Management		
		➢ Cross-industrial		
		➢ Networks		
		➢ Partners	⇒ Associations	
			⇒ Competitors	
			⇒ Customers	
			⇒ Designers	
			⇒ Educational institutions	
			⇒ External consultancies	
			⇒ Health care institutions	
			⇒ NGO	
			⇒ Political institutions	
			⇒ Private sector	
			⇒ Public Sector	
			⇒ Social institutions	
			⇒ Sponsors	
			⇒ Suppliers	
			⇒ Tech-organisations	
	Technology	➢ Application		
		➢ Digital platforms		
		➢ Role		
		➢ Kind of technology		
	Policy	➢ BIS standards		
		➢ Campaigns and courses		
		➢ EPR		
		➢ European framework		
		➢ SDGs		
		➢ Waste legislations		
		➢ National guidelines	⇒ England	
			⇒ Netherlands	
			⇒ Scotland	
			⇒ Spain	
			⇒ Wales	

Table 4.8 continued Coding scheme (Source: Author)

4.6 Working with multiple methods

"Creative insights often arise from the juxtaposition of contradictory evidence […]. The process of reconciling these contradictions forces individuals to reframe perceptions into a new gestalt."

(Eisenhardt, 1998, p. 546)

4.6.1 Systematic combining

Case studies provide unique insights into empirical phenomena. Unfortunately, case studies are often described as linear processes (Yin, 2009). As Guba and Lincoln (2005) note, "most data collection activities are directed towards the search for specific data in line with the current framework" (Guba and Lincoln, 2005 p. 556). Often, research methodologies fail to integrate opportunities created by the intertwined research enabled by case study research. To fully understand the characteristics and consequences of abductive case study research requires an integrated approach. The understanding can be broadened by combining systems and going back and forth between one research activity and another, and therefore going back and forth between theory and empirical research (Guba and Lincoln, 2005). This is particularly important, as such a systematic combining approach can reveal unknown aspects to the researcher.

Systematic combining is described as a nonlinear process of combining efforts with theory matching and reality. Figure 4.13 displays this combining approach in the context of this research. Carefully selected research activities (i.e., expert exchange, focus groups) to develop the framework allowed a matching of theory, followed by the testing via case study interviews. The variety of different data collected allowed matching, redirecting, and directing processes in the respective analysis processes.

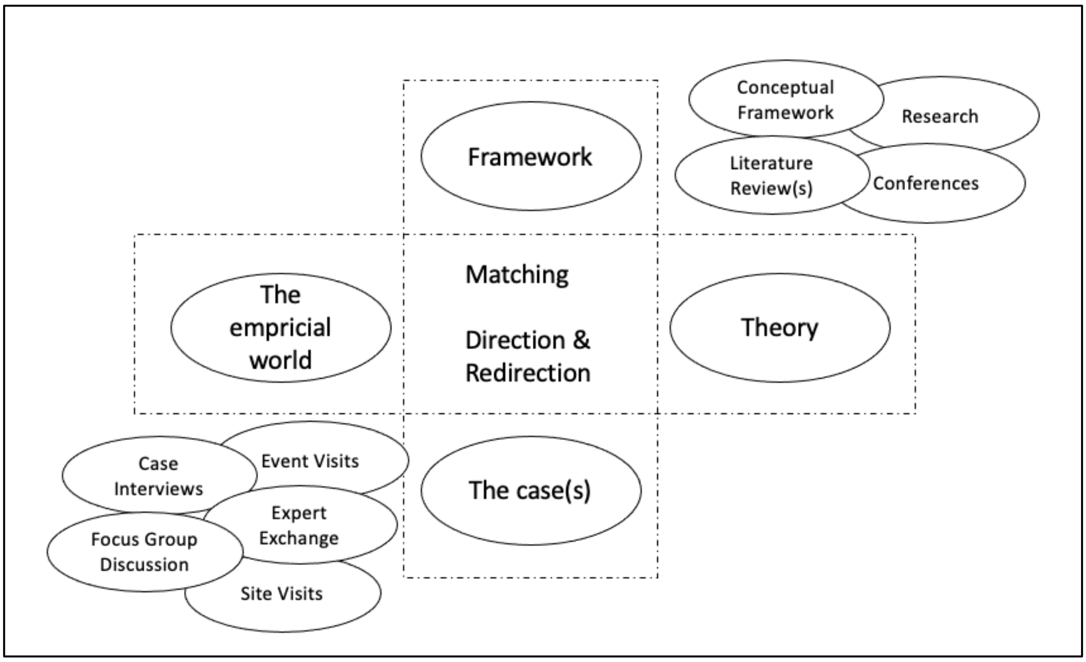

Figure 4.13 Systematic combination of research (Source: adapted from Guba and Lincoln, 2005, Eyers, 2015)

4.6.2 Contextual activities and role of the researcher

As in the previous sections, the research is foremost exploratory and qualitative in nature. To enhance the quality of the research, inspiring exchange and feedback from industry and academia are always sought. This resulted in a variety of contextual activities that accompanied the research. All contextual activities are illustrated in Table 4.9.

Exchange and feedback, internally as well as externally, on targeted conferences and industry and policy events, contributed towards a higher quality of the research. Contributing to the field with multiple conference papers and a publication in a high-impact journal aided in further enhancing the quality of the research, as did reviews and feedback from peers.

Contextual activities
Conferences
– *eLRN (2020)*
– *LOMSAC (2017, 2018)*
– *QMOD (2018, 2019)*
– *Sustainability EuroMA (2018, 2019)*
– *Welsh Postgraduate Conference (2019)*
Practitioners Engagement
- *iLEGO Workshop (2016–)*
- *Sustainability Forum London (2018–2021)*
- *Policy Forums (2018–2021)*
Publications
- *Resources, Conversation, & Recycling*
Other contextual activities
- *Journal Reviewer for Resources, Conservation & Recycling (2019-)*
- *Reviewer for diverse conferences (2020, 2021)*

Table 4.9 Contextual Activities (Source: Author)

Unlike positivistic approaches, the critical realist approach does not separate the researcher from the research. It is acknowledged that the individual researcher is part of the study. A skilled researcher is one requirement. The researcher undertook a Master's course in Social Sciences and Research Methods as part of the Doctoral training. All appropriate specific training was accomplished during the Master's degree. In addition, the researcher holds an undergraduate degree in Business Administration with a special focus on SCM and HRM and a second Master's degree in Logistics and Operations Management.

Values in research reflect the personal beliefs or feelings of the researcher (Bryman and Bell, 2011). As a critical realist, research is not value-free. The researcher brings her own values to this enquiry and needs to consider these at all stages.

One of these values is to maintain the link between academia and industry. Therefore, the researcher has been a core team member of a regular industry workshop that aims to connect industry with academia and share best practices. In addition, she has been part of a Sustainability Forum for sustainability practitioners.

4.7 Research ethics

Ethics are "norms or standards of behaviour that guide moral choices about our behaviour and relationship with others" (Cooper and Schindler, 2008, p. 34). Due to the higher degree of freedom and the potential risk of harming participants, qualitative researchers need to be very considerate of ethical issues (Bulmer, 2008; Hammersley and Traianou, 2012). All ethical forms can be viewed in Appendix D.

This research follows the code of ethics of the Cardiff Business School and Cardiff University. Therefore, the ethics application forms were submitted and approved by the University's research office (see Appendix D1 and D2). It is noted that the ethics approval for the FG discussion was approved in a separate form by the research office (see Appendix D3). All participants were informed before the start of the FG about the research project, and consent was given by the participants regarding the recording of the FGs.

For the case study interviews, organisations were contacted either at events or via email. In this initial contact, the research project was explained. As a supportive document, a project brief (see Appendix D4) was handed out. Any questions regarding participation in the project were clarified in person, via telephone, online call, or email. Before each interview, interviewees were informed about the studies and asked for their consent (see Appendices D5 and D6). It was acknowledged that interviews can expose participants to uncomfortable situations, causing pressure, duress, or inducement (King and Horrocks 2010), and relevant precautions were taken. All interviewees were asked for consent before audio recording the interviews. All audio files were transcribed and safely stored. To ensure anonymity, confidentiality and sensitivity throughout this study, case organisations and interviewees were anonymised by imaginative names.

4.8 Chapter summary

This chapter presented details about the scientific research approach applied in this work. As guidance, Maylor and Blackmon's (2005) pyramid hierarchy was used to guide the reader through the research philosophy, strategy and methods, tools and techniques. The decision for abductive reasoning was further explained, particularly the process of going back and forth between empirical research and theory matching (Guba and Lincoln, 2005).

Details about the case study strategy were outlined and further insights about the data collection and analysis were revealed. The researcher's philosophical stance of critical realism and its impact on the research was demonstrated. Figure 4.14 provides a summary overview of this methodological chapter based on the scientific approach pyramid introduced at the beginning of the chapter.

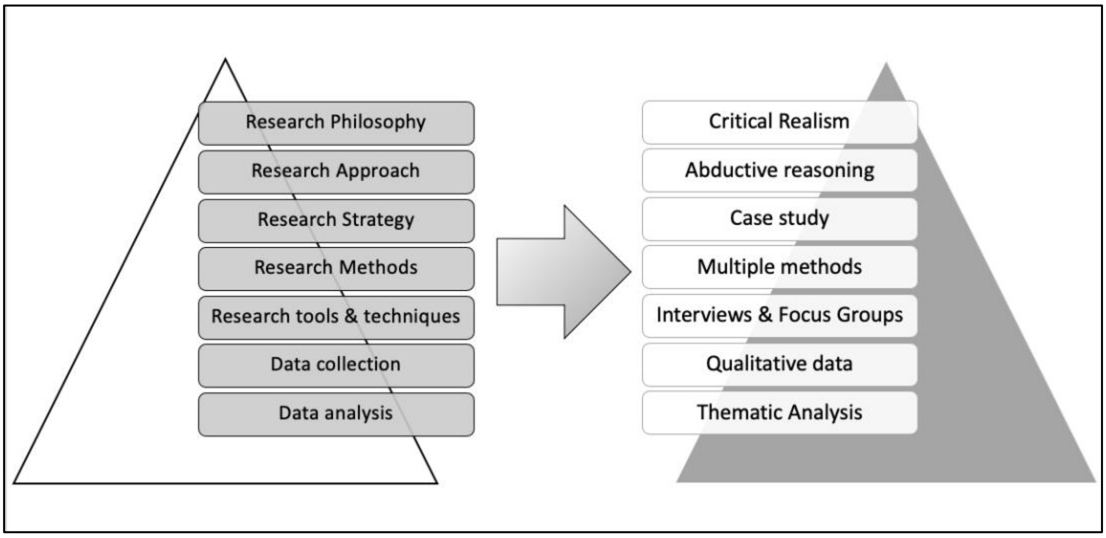

Figure 4.14 Summary of research hierarchy (Source: adapted from Maylor and Blackmon, 2005)

5 Influencing factors in Circular Business Models

Chapter aims:

a) To understand the viewpoints on circularity
b) To identify influencing factors in joining CBMs
c) To discuss the impact of influencing factors

5.1 Chapter overview

The purpose of this chapter is to identify the influencing factors of organisations in joining CBMs. The factors driving circularity have been identified in Section 2.4.4 based on the literature. However, the literature assumes that these factors equate to the factors that influence organisations in setting up or joining a CBM, without any empirical evidence. It is acknowledged that recent work has identified influencing factors in joining CBMs (Urbinati et al., 2021). However, the gap remains, as the work of Urbinati et al. (2021) focused on the automotive sector. This study, however, maintains a broader perspective by not narrowing the focus to a specific industry sector.

This chapter is based on the empirical findings of the participating case organisations and sets the findings in relation to the knowledge introduced in Section 2.4 of the literature review and identifies influencing factors in Table 2.19. In doing so, this chapter aims to answer **Research Question 1: How do influencing factors facilitate the implementation of Circular Business Models?** It is furthermore the precursor to the subsequent chapters, which take a deeper dive into the contextual factors outlining the environment to build CBMs and value conceptualisation of said CBMs.

5.2 Understanding and interpreting circularity in different industry sectors

As the literature revealed in Section 2.4.2, CE is not commonly defined. There are over 114 different definitions and interpretations (Kirchherr et al., 2017). A short extract of the academic definition is provided in Table 2.5. Before understanding the influencing factors in joining a CBM, it is important to first understand how organisations consider circularity and what circularity means for them.

As the interviews were conducted across a variety of CBMs with different circular network partners, viewpoints of circularity and CBMs were diverse. It needs to be noted that the role which is maintained in a specific CBM by an organisation has an immediate impact on how an organisation sees and understands circularity in its immediate circular environment. For instance, waste service providers consider themselves a *"link of the system [which] needs to nudge clients toward circular actions"* (WSP, Int.2), as some of their clients have not yet fully understood the circular journey they are onto. Therefore, they see their role mainly as a motivator and facilitator to gain a new circular partner in a respective network: *"We collect, we engage, we influence across the chain"* (WSP1, Int.1). On the contrary, organisations taking over a producing part in the circular network put a lot of emphasis on creating multiple material cycles. In that regard, upcycle and recycle CBMs explained that circularity means firstly, to create more cycles; and secondly, to reuse the material as often as possible (OEM6), *"re-imagining waste materials into high-quality products"* (OEM9). Technology organisations defined circularity in their business operations as *"being able to recapture the raw materials and bring it back into a circular cycle"* (Tech1).

As an extract, Table 5.1 provides an overview of how the case organisations defined circularity in their specific network. It is noted that most of the interviewee participants were unable to provide a clear answer to this interview question. In fact, most organisations provide a limited viewpoint on CE. The understanding and interpretation referred predominantly to their own applied CBM. Hence, lengthy explanations of the product cycles were given. Honest insights into the organisation's circular journey, such as the following, were given very rarely – *"At the beginning, it [annot. CE] meant segregating your rubbish in the office"* (OEM1, Int. 1). Considering that this organisation is now running an established and reputable CBM shows how important it is to inform practitioners about the true and wide meaning of circularity, and that circularity is more than segregating potential rubbish. According to the interviewee, being asked by circular partners to actively engage in the model of refurbishment, and seeing immediate benefits, provided a eureka moment of what circularity truly means to their organisation (OEM1). A similar experience was shared by NGO3, when stating, once the opportunities were outlined and visible, the interest in the approach grew: *"This is so exciting, if we work together and we collaborate and we work out, we could create a circular economy for this sector for Wales."* (NGO3).

Table 5.1 shows the definitions of circularity in conjunction with the levels identified in the literature review (Section 2.4.3). It appears that organisations are slowly starting to consider a more holistic approach by approaching circularity via systems thinking and the macro level of circularity. Nonetheless, there is still dominant micro-level thinking, where organisations solely consider their products in a restricted and less connected system. Of all interviewed organisations, the closest to actual scientific definitions of circularity were governmental institutions. Gov1, for instance, stated, *"It's all about keeping all resources and materials in productive use for as long as possible and eliminating waste"* (Gov1).

Circular Economy defined by case organisations
Connection to the macro level
"The Circular Economy is part of the natural evolution of the materials handling journey" (Interviewee 1, WSP1) "The Circular Economy is all about equally making better resources that we have" (Interviewee 2, WSP1)
"It's all about keeping all resources and materials in productive use for as long as possible and eliminating waste" (Interviewee 1, Gov1)
"To look to the principals of the waste hierarchy and work down rather than just trying to recycle more." (OEM2)
"I don't often even talk about the circular economy. I talk about opportunities and the opportunities of how we can do things differently." (OEM5)
"To achieve more cycles [and] reuse the original materials" (Interviewee 1 OEM6)
"re-imagining waste materials into high-quality products" (Interviewee 1, OEM9)
Connection to the micro level
"It's something, a key matter for our foundation" (Interviewee 2, NGO1)
"The fact that no refurbished product /material [annot. exact product and material anonymised] going to landfills and they are being reused regarding whatever we've got going on at the moment." (Interviewee 2, OEM1)
"At the beginning, it meant segregating your rubbish in the office, and that's about as far as it went. […] Until we were asked to go and have a look at a scheme[…] that sort of clicked with the community benefits side of the business as well." (Interviewee 1, OEM1)
"To replace virgin resources in the product [annot. product anonymised] and being able to recapture the raw materials and bring them back into a circular cycle. And by doing that essentially to boil a process that has environmental, economic and social benefits." (Interviewee 1, Tech1)

Table 5.1 Circularity defined by individual case organisations (Source: Author)

5.3 Influencing factors to adapt Circular Business Models

As the previous section provided an overview of the understanding and interpretation of circularity, this section focuses on the influencing factors of CBMs.

For a long time, businesses have identified themselves as profit-seeking enterprises that provide goods and services to the economic system (Medina, 2006). Despite the rise of social enterprises and NGOs, merging a market orientation with a social mission (Gidron and Hasenfeld, 2012), organisations still need to perform and produce outputs that aid in maintaining a competitive advantage (Medina, 2006). Fulfilling the shift from linearity to circularity, it is important to find convincing ways to adapt to the basic mechanisms of the economy. To secure survival in the market while equally following circularity, organisations are required to think outside the box. This section will focus on identifying the influencing factors that make organisations join the circular movement.

When coding the different influencing factors mentioned by the participants, the following themes emerged:

- *Triple Bottom Line*
- *Material*
- *(Customer) demand*
- *Business and political standards*
- *Individual perceptions and personal experiences*
- *Communication skills*
- *Other factors*

In the following sections, each theme and the responses will be introduced in greater depth. A summarising overview is provided in Table 5.2.

Summary: factors that influence joining CBMs
Triple bottom line • to raise awareness for recyclable materials *(resource and recovery)* • to contribute purposely towards the well-being of the society and community *(product life extension)* • usage of local suppliers, aiding the local community, and strengthening the region *(all CBMs)* • positive reputation *(all CBMs)* • flexible and leaner working environment *(product life extension)* • health and safety of their employees *(product life extension)* • to manage their own waste streams *(resource and recovery)* • the pressure to apply to internal guidelines and CSR standards *(all CBMs)* • aiding other organisations in fulfilling environmental requirements *(all CBMs)* • to provide another circular opportunity *(product life extension, circular supplies)* • to be able to pull one single waste stream out (*resource and recovery, product life extension)* • monetary incentives *(all CBMs)*
Material • to reuse and recycle niche material (*resource and recovery, product life extension)* • creating something novel with existing material (*resource and recovery)* • makes circular actions, such as reuse, easier and more effective (*resource and recovery, circular supplies)*
Customer demand • market demands *(all CBMs)* • demand towards more sustainability *(all CBMs)* • selecting the right partner *(all CBMs)* • higher request to establish circularity thoughts in the legislation *(all CBMs)*
Business and political standards • local and international policy *(all CBMs)* • new laws, statutory requirements, and directives *(all CBMs)* • political pressure *(all CBMs)* • funding *(all CBMs)*
Individual perception and personal expertise • personal experience *(all CBMs)* • the passion and enthusiasm of partners and colleagues *(all CBMs)* • to follow new and forward-thinking approaches *(all CBMs)* • the realisation that collaborative CBMs are fruitful *(all CBMs)*
Communication skills • communication and conversation *(all CBMs)* • network events *(all CBMs)* • the right business partner to approach *(all CBMs)*
Miscellaneous • demographics (*resource and recovery)* • missing infrastructure (*resource and recovery)* • manual skills and cultural values *(all CBMs)*

Table 5.2 Overview of influencing factors for CBMs (Source: Author)

5.3.1 Triple Bottom Line incentives

The huge variety of influencing factors was unfolded by participants, all aligned to at least one of the TBL aspects of the environment, economy, and society.

Environment

The environmental aspect of the TBL initiatives was almost instantly raised as an influential factor, independent of any CBM affiliation. **Raising awareness for a material** that would have been otherwise ended up in a landfill was an often-stated point amongst all CBMs (OEM3, OEM4, Tech1, SE1). For instance, in valorisation, circular partners were addressed to *"do a lot of investigative work and look at supply chains to identify where food waste is happening"* (OEM4), while in resource recovery models, such as recycling, circularity *"got higher and higher on the agenda. People are looking for alternatives to landfills and incineration."* (OEM6).

Another influential factor refers to the opportunity of being able **to manage one's own waste streams**. *"Understanding material flows and market demand"* (WSP1) is a key element of any CBM, compared to any linear model in which organisations are often not managing their waste streams. Being part of a CBM, however, does provide this advantage (Public2). Being able *"to pull a waste stream out, that would've gone off for incineration"* (OEM3, Int.3) is a major influencing factor.

Regularly, interviewees referred to the factor of being in a helping position. **Aiding other organisations in fulfilling their environmental requirements and guidelines** appears to be a common influence factor for organisations in Resource Recovery models. *"We can offer a service to those companies to help them reduce their environmental footprints and increase their resource efficiency credentials"* (OEM5*).* Technology organisations described their aid to partners as *"responding to the existing demand in textile supply chain and the brand cycle. Especially, the brand cycle needs to meet different standards, specifically committed to circularity."* (Tech1)

However, there is a reverse side, where organisations referred to an occurring **pressure to apply to internal environmental guidelines and Corporate Social Responsibility (CSR) standards** (OEM5, Tech1). *"What we're trying is also to meet the SCG and to report to their environmental impact, the* *sustainable product, and so forth"* (Tech1), and *"the customer has actually got policies in place to adopt this"* (OEM1), were only a few responses toward CSR.

A rather environmentally innovative influencing factor was given in Resource Recovery models. Despite these CBMs already benefitting from established waste-preventive opportunities, such as upcycling and reuse, the need is felt **to provide another circular opportunity:** *"There are still lots of volumes of non-reusable textiles that are just going to landfills and incineration. So, tackling this specific issue in the textile waste with the motivation of building up the technology"* (Tech2). The innovation aspect appeared to have a huge influence, particularly in industry sectors where CBMs are rare. OEM3 stated, *"It was to recover the resource because it could be utilised and used again and again and again. Creating a circular business model, which at the moment, has never been done in that way before." (OEM3, Int.2).* Particularly fascinating in that regard appeared the ability **to pull out an individual waste stream** and do something entirely new and innovative. Pulling out individual waste streams seems to be easier in valorisation models (OEM4).

Society

Despite current scientific discussions, social aspects are not neglected. On the contrary, they drive the idea of CBMs forward. Independent of the CBM, the respondents listed a variety of social aspects. The wish **to contribute towards the well-being of the society and community** (OEM3, OEM4, Tech1, SE1, SE2) is strongly present across CBMs. A participant summarised it as "*value set around waste having the potential as a community asset […] and having the potential to create employment, wealth and job creation"* (OEM1, Int.1). Another interviewee described it as an attempt "*to engage with the community in our city*" (SE3). These viewpoints were echoed by many other interviewees. **Usage of local suppliers, aiding the local community,** and **strengthening the region** were listed as social influencing factors amongst all CBMs. Particularly, organisations following the CBM of Reuse and Repair appear to follow these communal motives of community strengthening actions—culture and resilience (SE2, SE3). – *"Reaching out to low-income households, and fighting social injustice issues* (SE1), *"giving back and adding value to my community"* (SE2), are only a few of the collected statements.

A rather self-interested influencing factor was the irrevocably **positive reputation** received when aiding local communities, respectively, taking over communal environmental responsibility (Public2, SE1). Public2 explained that their partners were able *"to open a factory up in an area of poverty, creating employment and, it's just a wonderful story"* (Public2).

Social motives were additionally mentioned with respect to inner-organisational well-being. SE1 shared further insights. Since the implementation of the refurbishment model, a more **flexible and leaner working environment**, positively impacting the **health and safety of their employees,** was noticed. Similar occurrences were shared with partners of said model, experiencing *"a 50% reduction in sickness levels, since going agile" (Public2).* In general, social aspects were considered higher amongst CBMs once public or social enterprises were involved.

Economy

From an economic perspective, there has been common agreement amongst all CBMs that costs still matter and maintain great importance. Waste service providers stated, *"for the last 15 years waste was going from '90% to landfill' to under '9% landfill'"* (WSP1, Int.1). This development has been attributed to circular development and the recognition of value in used material (WSP1). Hence, **monetary incentives** resulting from resource recovery maintain a great influencing factor. Less waste disposal costs (OEM3) or fees systems with regard to landfill disposal (OEM1, OEM8) were only a few incentives listed amongst resource recovery models. Landfill tax announcements are an influencing factor for OEMs following circular recycling actions: *"The government has announced statutory reuse and recycling rates, that must be hit. If you don't hit them, there are penalties imposed by the central government on councils" (NGO3).*

5.3.2 Material

An inner drive for being able to promote reuse and recycling models was noticed. By now, industries have the knowledge to recycle more complex materials. Hence, **reusing and recycling niche material**, which would otherwise end up in landfills, is influential in joining a resource recovery model (WSP1). This thought process appears to increasingly influence organisations, independent of the size or CBM applied. All are characterised by features of disruptive innovators and transfer a genuine interest in **creating something novel with existing material:** *"The* *hope of something novel will turn into an alternative and later on into a norm, drives a lot of our extracurricular work"* (WSP1, Int.2).

Another influencing factor for CBMs in refurbishment, valorisation, and recycling models is related to the **handling, consistency, and quality of sustained material**. Sustained material was described as *"robust and durable in its nature"* (Public2*)*, and its handling **makes circular actions, such as reuse, easier and more effective** in the long term (WSP1, OEM2, OEM6, NGO2).

5.3.3 (Customer) Demand

Understanding the **market and customer demands** was one of the most mentioned influential factors amongst all CBMs. Throughout, all interviewees referred to a slowly changing customer and supplier landscape. Already existing and equally growing **demand towards more sustainable actions** (Tech1, OEM4) was commonly mentioned amongst CBMs to start thinking circularly.

OEMs in refurbishment models felt particularly pressured to think circularly. Often, customers demand certain percentages of remanufactured products or materials. Hence, the business entities felt they could only survive on the market when they started to consider customer specifications about circularity (OEM1, OEM2, Public1). Not to neglect in this context is the role of suppliers. It has been a common phenomenon that suppliers either push for more progress or organisations deliberately search for circular suppliers, ready to take over circular responsibility (OEM1).

Choosing the right partner seemed very important for organisations involved in a B2C market or organisations cooperating with waste service providers in recycling models. "*Are you asking the customer to do the impossible? And do you expect the customer or suppliers to do what exactly is never going to happen?"* (WSP1, Int.1) are key questions that organisations face when implementing CBMs.

Beginning a CBM with the right partner has been further influenced by external forces. The interviewed institutions felt they were approached by a **higher request to establish circularity in the legislation**, which ultimately made them join or establish a CBM. Further details about *legislations* and *political standards* are provided in the following section, and Chapter 6 (Section 6.5), when discussing in further detail policy as a contextual factor.

5.3.4 Business and political standards

As much as **CSR regulations** have been named influential factors, **local and international policy** has likewise been addressed amongst CBMs. However, a policy is seen as more of a contextual factor, which provides the basis to start circularity, compared to legislation, which is the action taken from the policy.

New laws, statutory requirements, and directives are commonly expected or known and maintain an essential role in fulfilling standards (NGO1, NGO3, NGO4) and supporting any existing CBMs (OEM1).

Investigating that viewpoint from the side of policymakers revealed a greater willingness to join a CBM network from organisations as soon as legislation opposes fees (Gov1, Int.1 and Int.2). However, this slight **political pressure** is perceived in different ways. NGOs explained, some clients are more likely to think in a circular way due to **funding** opportunities via governmental regulations, while other clients consider fees solely as a powerful governmental tool (NGO4, WSP1).

As the literature review identified policy as a contextual factor (see Section 2.6.3), a closer look and discussion of this is taken in Chapter 6 (Section 6.5).

5.3.5 Individual perceptions and personal experiences

Personal experience was a regular response, independent of CBMs, but particularly from smaller-sized or tech organisations and social enterprises. The motivation to go circular emerged from personal experience and **passion for the environment**. Typical answers were along the lines of *"the only motivation was to set up a business that recycles material"* (OEM6) or *"there was a passion there to do something in the right way"* (OEM3). Often, it has been **the passion and enthusiasm of partners and colleagues** that motivated organisations to take a deeper dive towards circularity (OEM1, OEM3, Public2). In addition, **childhood memories** cannot be dismissed. The importance of this point was even further emphasised when interviewees referred to their own children and how their love and passion for recycling has motivated them to implement CE actions (WSP1, OEM10). *"I'd grown up in an environment where my parents essentially fixed everything. If something was broken, we'd try and fix it before anything. [...] Everything was reused. So that was kind of in my heart anyway—those kinds of values."* (SE2)

In addition, a rising **awareness of the current climate emergency** was raised as a factor amongst CBMs (SE2, OEM4). TV programmes, such as David Attenborough's *Blue Planet* (OEM3, Public2), were a trigger point to begin with change.

The general proud feeling of knowing how to make a difference and contribute towards the solution for this climate crisis was listed, especially amongst social enterprises involved in a CBM (SE2). The knowledge and personal passion of knowing to do something in the right way (OEM1, Int. 1). Being able **to follow new and forward-thinking approaches** with positive long-term sustainable effects (Public1, WSP1, OEM3, Tech1) and **the realisation that collaborative CBMs are fruitful** (NGO2) is an overarching influential factor amongst CBMs.

5.3.6 Communication skills

Communication skills are often seen as a key influencing factor. Hence, they were raised in all investigated CBMs. The power and multifacetedness of **communication and conversation** came to light when the participants shared their stories. Fruitful conversations can take place behind closed doors with critical partners when discussing the merger of two separate systems into one bigger circle. The role of waste service providers in merging systems has been seen as rather controversial in valorisation models. Organisations shared, before talking to waste service providers, other options should be considered. Waste service providers, on the other hand, described their experience as a *"lynchpin, connecting all the players"* (WSP1). Seemingly aware of these issues, waste service providers emphasised the importance of staying unique and contributing to the circular cycle by seeing themselves as communicating linking facilitators in the circular model they are supporting.

According to the interviewees, conversations can also take place at open **network events**. Participants mentioned a higher level of openness and less resistance towards circularity in face-to-face conversations (WSP1, Int.2). It matters to approach ***the right* business partner**. Therefore, it appears to be beneficial to start conversations directly with clients rather than approaching via the linking facilitator of waste service providers, as there is still a superstition that most material will be lost when collaborating with waste service providers (NGO4).

5.3.7 Other factors raised by participants

Demographics were raised as a major influencing factor for the model of repair and refill. NGO3 explained the strong influence of the *'transient nature of population'* and '*cultural identity'*. *"The further west you go [annot. West Wales], there is a greater culture of the reuse and repair model"* (NGO3). An explanation for the reason was given in the **missing infrastructure** in remote areas: *"You're further away from the M4 and big shops to go and buy stuff"* (NGO3). In addition, repair **manual skills and cultural values** vary strongly in these regions (NGO3). However, SE2 contradicted that statement by explaining that it is not the infrastructure that influences the foundation of the repair model, but rather the individual policies of councils (SE2).

5.4 Discussion

The purpose of this chapter is to explore **Research Question 1: How do influencing factors facilitate the implementation of Circular Business Models?** This chapter has therefore identified a research gap regarding the influencing factors of joining CBMs. Despite scholars having identified some critical success factors for circularity (Weetman, 2017), these are equally assumed to be the reason why individual organisations join circular networks. Hence, scholars have criticised missing classifications and identifications of influencing factors for circular networks (Geissdoerfer et al., 2018), including managerial practices (Urbinati et al., 2021). Urbinati et al. (2021) noted that it is of great importance to close the gap of missing empirical research in identifying influencing factors. To contribute to this, the following two aims accompanying this research question were introduced:

- to understand the viewpoint of circularity in circular networks
- to identify influencing factors in joining CBMs

To answer RQ1, this chapter has first aimed to understand ***how circularity is interpreted and defined by the different circularity partner in a CBM*** **(Objective 1).** The results confirm Kirchherr et al.'s (2017) statement of diverse definitions and interpretations: *"CE means many different things to different people"* (p. 229).

The study showed that the interpretation of circularity depends on the actual role taken in the circular system or network. Furthermore, the levels of intervention identified in Section 2.4.3 and Figure 2.5 (macro, meso, micro levels) influence how they are interpreted. As requested in recent literature, organisations are moving towards a more holistic approach by approaching circularity via systems thinking (Iacovidou et al., 2021). Despite a noticed dominance of micro-level interpretations, where products and services are seen in a less connected system, organisations begin to consider macro-level circularity. Table 5.1 indicates the different interpretations of macro and micro-level perspectives. Addressing circularity on a macro level (e.g., policy perspective) leads to more generalised interpretations.

In fact, it appears that the macro-level perspective influences circularity more strongly than the micro-level perspective. Macro-level interpretations were almost identical to the definition provided by the EMF. *"A circular economy is one that is restorative and regenerative by design and aims to keep products, components, and materials at their highest utility and value at all times, distinguishing between technical and biological cycles"* (EMF, 2015b, p. 2). However, when being on the meso or micro level, a whole variety of interpretations and definitions appears. In this regard, the study emphasises <u>two main findings:</u>

(i) the level of intervention and its influence on the interpretation of circularity in general,

(ii) a connection between the role maintained by individual organisations in a CBM and their actual interpretation of circularity.

For instance, a waste service provider can define its role differently, i.e., as *"natural evolution of the materials handling journey"* (WSP1), while an OEM tends to refer to the reduction of virgin material and the achievement of multiple material loops and cycles. The findings emphasise the importance of SCT theory, which considers the different connections in CBMs. To explore this further, Chapter 6 (Section 6.2, Key partners) identifies main partners and their connection (bonding, bridging, linking) in CBMs.

Although Table 5.1 revealed the variety of different interpretations and the level perspective, it was remarkable that the interview question '*What does circularity mean for you and your organisation'* appeared to be difficult to answer. It mostly triggered an instant connection to the organisation's own circular product, rather than referencing to any commonly known definition, such as the CE definition of EMF.

Continuing with considerations around level perspective, there is a vast variety of academic definitions which should aid organisations in defining circularity (see Chapter 2, Table 2.5). However, scholars have very rarely incorporated the three important levels of macro, meso, micro, or the role maintained in a CBM in their understanding.

Kirchherr et al.'s (2017) definition of *"A circular economy describe an economic system that is based on business models, which replaces the 'end-of-life concept with reducing, alternatively reusing, recycling and recovering material in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish environmental quality, which implies economic prosperity and social equity, to benefit of current and future generations" (p. 229)* is one of the few definitions incorporating circularity levels (macro, meso, micro) and their role in a CBM. However, as recycling is controversially discussed in the CE community as a truly circular action, it would be against the researcher's beliefs to include recycling actions in a definition.

Based on the findings from the literature and the research findings, the researcher defines circularity in the context of CBMs as follows:

> *Circular Economy describes a restorative economic system, operating on different levels (macro, meso, micro), based on different Circular Business Models, to provide circular networks via circular actions (valorisation, recovery, refurbishment, etc.), the opportunity to keep materials, components, products at their highest utility, and as long as possible in the circle.*

The **second objective** aims **to identify the influencing factors for joining CBMs**. Previous research identified a variety of influencing factors for circularity (Table 2.19), with some studies suggesting to equate these factors with influencing factors that encourage organisations to start their circular journey and join CBM in the first place (Aloini et al., 2020). Studies undertaken recently by Urbinati et al. (2021) still pointed out the gap of empirical research systematically exploring critical success factors (enablers and barriers) for CBMs and, most importantly, the adoption of managerial practices.

Although recent studies began to classify the influencing factors based on a variety of categories (economic, environmental, social, organisational, institutional, and technological influencing factors) (Aloini et al., 2020; Urbinati et al., 2021), the findings of this study identified different classification categories. Based on the data, the following groups emerged:

(1) TBL values,
(2) Material
(3) (Customer) demand,
(4) Business and political standards,
(5) Individual perception and personal expertise,
(6) communication skills and;
(7) miscellaneous.

It could be argued that these groups fit in the wider sense the five groupings of economic, environmental, social, organisational, institutional, and technological influencing factors of recent research of Aloini et al., 2020 and Urbinati et al., 2021. However, in most cases, these categories have been identified for circularity only. As this study emphasises the variety of influencing factors to join CBM networks, the groupings have on purpose been kept wide.

As a result, as Table 5.2 illustrates, most of the identified influencing factors are shared amongst the investigated CBMs. Nonetheless, the study identified that some influencing factors tend to impact some CBMs more than others. This indicates the importance that influencing factors should be seen in the light of their individual model and environment, rather than being replicated from the greater circular context as done by Aloini et al., 2020. In the following, some are highlighted and discussed.

It appears that recycle and recovery, as valorisation models, are more driven by the idea of identifying their own waste streams and developing creative ideas in niche markets, compared to product life extension models (i.e., repair, refill, reuse), which follow an entirely different nature of creating waste streams. This could open a new research pathway, as at some point in time reuse, refill, and repair material will reach its end of life. Once the end of life is reached, these materials might need another circular solution.

Following the influencing factor of knowing created waste streams, there is still hesitation amongst resource recovery valorisation models to collaborate with waste service providers. An identified fear influences meaningful collaboration with such providers, as the material could be lost in the circle. Although other resource recovery models in this research, for example the recycle model, indicated this fear is unfounded, none of the literature has ever investigated the influence of waste service providers on CBMs.

Comparing the institutional factors identified in Table 2.19 with the factors stated by the participants of this study indicates some alignment. Similar to previous studies that identified funding as a barrier and enabler (Grafström and Asaam, 2011; Atasu and Subramanian, 2012; Rizos et al., 2016), this study identifies funding as an influential factor for all CBMs. It confirms that funding does not always positively influence the development of CBMs, especially for models that do not follow the 'norm'; for instance, when developing new technology for a new and innovative resource recovery recycling model, funding options have been limiting rather than influencing.

Most notably, cost incentives are not stated as a predominant reason for joining any CBM. As the findings in Table 5.2 suggest, environmental and social values appear to be stronger factors compared to purely economic reasons. This contradicts findings from a recent study conducted by Aloini et al. (2020), who found that 17 reviewed publications stated the potential of improving cost efficiency, profitability, revenue streams and competitiveness as positive economic influencing factors.

The finding of demographical impact and the available infrastructure for circular products has been controversially discussed by interviewees in Repair-CBM, as some say it influences their work, and some say it does not. For instance, the CBM of a *repair café* appears to be more strongly influenced by demographics and infrastructural aspects, compared to e.g., refurbishment models. This is important, as repair models usually depend on a B2C market, while most resource recovery and product life extension models are more commercialised and active in a B2B market.

In summary, the results show that the influencing factors in joining CBMs vary slightly depending on the individual CBM applied. Most influencing factors (customer demand, business standards, individual perceptions, and communication skills) are shared widely amongst the different types of CBMs, while demographics and infrastructure appear to have a strong influence on models such as repair models. Most of the influencing factors related to the TBL perspective predominantly influence CBMs in resource recovery or product life extension (see Table 5.2).

5.5 Chapter summary

This chapter investigated RQ1 by exploring the general viewpoint and interpretation of the circularity of individual organisations embedded in CBMs. It showed that the different levels (macro, meso, micro) are of particular importance in CBMs. Furthermore, it identified a variety of influencing factors to join CBMs and differentiate between the impact of these factors on individual CBM. Doing so showed that influencing factors depend on the individual CBM, respective to the circular network involved. This also showed that general influencing factors for circularity should not be equated with factors motivating organisations to join a CBM or circular network.

6 Collaborative Actions in CBMs

Chapter aims:

a) To explore the role of collaborative partnerships in circular business models
b) To explore the role of digital technology in circular business models
c) To investigate the effectiveness of political guidelines and support available to organisations that are part of a circular business model

6.1 Chapter overview

The purpose of this chapter is to analyse and discuss the underlying contextual factors of policy, technology and collaboration. These factors have been identified in Section 2.6 of the literature review. Collaboration is considered a contextual factor in achieving sustainable change (Brown and Bajada, 2018) and circularity (Blomsma, 2018; Geissdoerfer et al., 2018; Bertassini et al., 2021; Brown et al., 2021). Although the literature identifies some collaboration partners (Kirchherr et al. 2018; Millar et al. 2019), there is a gap in how these can aid specific CBMs.

Linking to collaboration, previous research stated that organisations must manage the complex interplay between institutions and organisations on a policy level to reach circularity (Ekins and Speck, 2011; Bleischwitz et al., 2012; Domenech and Bahn-Walkowiak, 2019). The literature identified governmental agencies and legislators (Brown and Bajada, 2018) as collaborating partners, which was confirmed by expert exchange No. 6 (see Table 3.1), which explored the integration of UN SDGs in circular supply chains. However, the literature is lacking in investigating the greater effects of political guidelines on CBMs.

With the third introduced contextual factor, the literature agrees that technology is a contextual factor underlying the transformation process to circularity (Lacy and Rutqvist, 2015; Bressanelli et al., 2018). However, research has focused predominantly on technological aspects such as technological innovation, eco-innovation (de Jesus and Mendonça, 2018; de Jesus et al., 2018), user-driven innovation (Baldassarre et al., 2017), sustainable technology (Braam et al., 2018), and digital and disruptive technologies (Lacy and Rutqvist, 2015, Pagoropoulos et al., 2017; Ranta et al. 2021), which focuses mainly on technology from a consumer perspective. The importance of research in this field was indicated by the fact that three of the six expert exchanges focused on technology in Circular Supply Chains (see Table 3.1). Furthermore, the focus group discussion (Section 3.3) confirmed the literature review findings by identifying technology as a contextual factor. However, it raised the question about its exact role in the different CBMs, which this chapter aims to answer.

The chapter is based on the empirical findings of the participating case organisations and sets the findings in relation to the knowledge introduced in the literature review (see Section 2.6), as well as the expert exchanges (see Section 3.2) and Focus Group Discussion (see Section 3.3). In doing so, this chapter aims to answer **Research Question 2: How do contextual factors contribute to the implementation of Circular Business Models?** Furthermore, it is the precursor to the subsequent chapters to the ultimate value conceptualisation of different CBMs.

6.2 Partners in Circular Business Models

There is a common agreement regarding the need for collaborative actions when managing material streams in CBMs. When asked what collaboration looks like at the current stage, participants explained that collaborative deals with only one OEM/client in isolation will not bring the expected outcome. The key is to start collaborating and connecting with a lot of different parties, as displayed in Figure 6.1. The following section provides further insights into existing collaborative partnerships identified by participants and the difficulties and benefits that are experienced when collaborating.

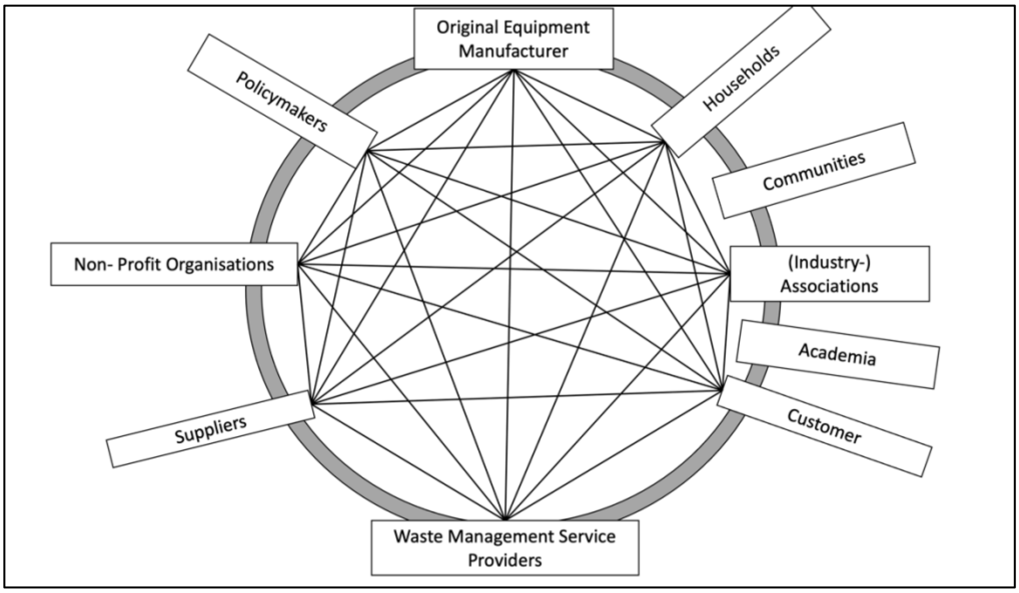

Figure 6.1 Overview Collaborative Partners (Source: Author)

6.2.1 (Industry) associations

In the interviews, **(industry) associations** were mentioned as a popular collaborative partner in resource recovery and recycle (OEM5, OEM7, OEM12), where collaborative actions with industrial associations had a beneficial effect (OEM12).

Despite the positive responses, there is agreement that collaborative actions with associations can only occur when the idea, understanding, and project goals of collaborative work are mutually anticipated (Tech1). Bearing in mind the restriction that not all case companies currently collaborate with industry associations, Table 6.1 provides an overview of successful collaborative examples with industry associations.

Examples of collaborative partnerships with industry associations

Example 1: Fashion industry

Collaborating partners:
Fashion industry associations ⇔technology provider

Circular business model
Recycle

Collaborative action:
Support in finding a technology provider to develop a machine further

Requirements for successful collaboration
- Idea and understanding for project goals are shared
- Goals need to be exactly the same

Example 2: Steel industry

Collaborating partners:
Steel industry associations ⇔ OEM

Circular business model
Recycle

Collaborative action:
Further developing CE actions in the steel market to protect the national market

Requirements for successful collaboration
- N/A

Example 3: Steel industry

Collaborating partners:
Local associations and councils ⇔ OEM ⇔ competitors

Circular business model
Recycle

Collaborative action:
Educating society and local communities about the value of steel in households

Requirements for successful collaboration
- **Trust**
- **Legal requirements (e.g. confidentiality agreement)**

Table 6.1 Collaboration with (Industry) Associations (Source: Author)

Examples of collaborative partnerships with industry associations

Example 4: Plastics industry

Collaborating partners:
Industry associations ⇔ OEM

Circular business model
Recycle

Collaborative action:
Working groups to decide on the implementation of legislation changes and requirements

Requirements for successful collaboration
– N/A

Example 5: Food industry

Collaborating partners:
Industry associations ⇔ OEM

Circular business model
Recycle

Collaborative action:
– **Monetary incentives (donations and funding)**
– **Support for carbon emission measurement**
– **P&R**
– **Funding application**

Requirements for successful collaboration
– Memberships

Table 6.1: continued Collaboration with (Industry) Associations (Source: Author)

6.2.2 Educational institutions

Collaborations with **educational institutions** included any collaborative actions with:

- *Academic institutions* (e.g., universities, research centres) for the purpose of gaining scientific knowledge,
- *Schools* for the purpose of scientific knowledge sharing, or
- *Councils* or *public institutions* for the purpose of gaining and sharing scientific knowledge.

In school projects, the main purpose of collaborative actions is to explain and educate the children about the idea of circularity (NGO2, OEM1, OEM7). Surprisingly, these school projects do not solely focus on educating but commonly applied recycling schemes related to the recycle model. Hands-on collaborative actions in partnership with manufacturers or NGOs are applied to demonstrate reducing, reusing and recycling and bring the idea closer to children. For instance, OEM1 enables school children to make site visits to see the real-life processes and experience the social and environmental benefits of a CBM (OEM1). The grand success of such linking collaborative partnerships is summarised in the following: "*they [annotation: the children] are like sponges, they just take the information on board as much as they can"* (OEM1, Int.1). Therefore, there is a common call for more such school collaborations (OEM1, OEM7).

Industrial-academic collaboration with research centres or universities is considered crucial in the further development amongst all CBMs (NGO1, NGO2, OEM12). The purpose of these linking collaborative actions is to gain knowledge. Raising awareness for CBMs by following a common objective and joint think tanks have been stated as a purpose: *"That was quite good. We bounced a lot of ideas off each other with our academic partners or with the industry as well. And just raised the profile of valorisation [annot. their CBM]. That it [annot. the CBM] exists, and this can be helpful, and this won't go away, this will become bigger in the future*" (NGO2).

From a different angle, these collaborations proved to be helpful for knowledge sharing purposes, too. *"We had somebody who sent an email that they want to include the bio-economy mapping tool in their academic application. Yes, we just get them through. Sometimes people know us already and send an email directly through to somebody else in the organisation"* (NGO2).

However, industrial-academic collaborations do not solely focus on the research side. Education and teaching responsibilities also require collaborative actions. An example was shared, in which collaborative action included lecturing students about the CBM but equally involving them in a live student project incorporated in the CBM – *"And I was kind of building this project where you were collaborating across the different schools, across the different faculties. You kind of involved both staff and students and researchers, you think long term so that the plan of this project is to make long-term decisions in terms of how this can be implemented"* (OEM12). The linking collaborative aspects have been intense, featuring the cooperation between the OEM and the academic institution plus internal collaboration in different faculties of the university: *"Engineering students were allowed, and construction students then got involved into the building or the development of the new building. The arts faculty was then invited to do interior installations and decorations of the new building in terms of specifications and stuff. Of course, I was invited to present my research project externally. And I said, 'This recycled glass material I have developed at this university. I have crossed all the faculty. I have colleagues and friendships across the faculties and schools and I can manage this and I can invite undergraduate students to participate with one dissertation that sits in their schools of teaching and learning but sits on the overall development of this recycled glass project"* (OEM12).

The benefits of these linking circular industrial-academic collaborations have been widely expressed as of educative purpose (NGO1, NGO2). *"We have collaborations with universities, and research centres to explain the benefits of energy and material valorisation"* (NGO1). Besides sharing potential economic benefits, the emphasis has been put on educating about the environmental benefits achieved. *"That's why we are encouraging people now to study projects, to throw up that there is no problem, there is no health issue regarding emissions and the use of alternative fuels. And well it's, we are trying to be the most open as possible, trying to explain the benefits of this practice"* (NGO1).

Other points raised referred to the variety of funding options offered, which enable connecting parties amongst each other (Tech1, Gov1, OEM4). Gov1 and NGO2 shared examples of shared funding opportunities and business innovation vouchers being handed out: *"There are like business innovation vouchers and collaborative funding that was really trying to connect the dots"* (NGO2). *"We do see companies* *come in for innovation vouchers on a fairly regular basis. They're quite popular"* (Gov1, Int.2). However, no pattern was identified as to whether partners of a specific CBM seek to apply for more funding than others.

Despite its benefits, there has been criticism. The general difficulty has been described as the actual building of linking networks. Finding the right contacts, establishing a collaborative partnership, and getting all relevant participants to one table to discuss ideas is challenging (NGO3). Another participant criticised the rigid academic systems, particularly when it comes to knowledge sharing with students: *"There was such a rigid system in such a way that they couldn't measure the success because there wasn't a way to measure the success into this. [...] And, of course, there was loads of room for improvement for the next cohort of students who could have continued this project. So, the challenge was basically a rigid academic organisational system that wasn't prepared and able to look into a different way of teaching"* (OEM12).

Another point claimed that academia is not prioritising, responding, or acting quickly enough. In return, the industry has been criticised for not fully comprehending how long some research processes can take. Helpful in overcoming this barrier appeared to be funding that enabled either someone from the industry to spend time in the academic institution, or vice versa. Organisations functioning as facilitators explained that the situation described above is difficult and can lead to a dead-end situation: *"We've found that industry complains about academia not being fast enough or responding quickly enough, and not being able to make this a priority. And academia, I think, feels just sort of not fully appreciated with how much time it takes. So, there isn't really an area where they touch. So, you can try and mitigate that, but it will always be tricky"* (NGO2).

All the educational institutions named, the sort of collaboration, and the reason why collaborating is essential in a circular environment are listed in Table 6.2.

Examples of collaborative partnerships between industry and educational institutions
Example 1: Research Projects
Collaborating partners: Schools ⬄OEMs /Tech **Circular business model** Recycle and valorisation **Sort of collaboration** School projects, environmental projects **Reasons for collaboration** Educational purpose of raising awareness of environmental and social issues **Purpose of collaboration** Knowledge sharing
Example 2: Research Projects
Collaborating partners: Research centres/ universities/ innovation centres ⬄OEMs /Tech/NGOs **Circular Business Model** Recycle and valorisation **Sort of collaboration** Research projects for the private or public sector **Reasons for collaboration** Results of these research collaborations can benefit the public and private sectors **Purpose of collaboration** Knowledge gaining
Example 3: Projects with public bodies
Collaborating partners: Public institutions (e.g., council) ⬄OEMs /Tech/NGOs **Circular Business Model** Recycle and valorisation **Sort of Collaboration** Projects/ events for the public **Reasons for collaboration** Education of the wider public, support of the public **Purpose of collaboration** Knowledge sharing

Table 6.2 Collaboration with Educational Institutions (Source: Author)

6.2.3 Key clients and customers

Bonding and bridging collaborations with **key clients** are crucial. It is of utmost importance that key clients fully understand and embrace circularity. This includes knowledge about byproducts' quality and their possible variation or flaws (OEM1) – "*And with Client X, they really did embrace that. So, for instance, some of the modesty panels had holes in them, drill holes where there were screws, and of course the holes weren't in the same place when you put them back together, and the client just thought, well, look, that's great it gives it a bit of character and it shows. Whereas others thought, oh, it's not perfect"* (OEM1, Int. 2). A similar experience was shared by SE1, as their clients appear to be more and more familiar about minor flaws and eventually take them into account when joining or receiving the circular products: *"I truly believe that we've come to a tipping point in terms of consumer, where consumers are demanding different options, they are demanding better options "*(SE1).

Difficulties experienced with key clients included attracting and convincing clients about CBMs in the first place and building a base for long-term relationships (OEM2, OEM4). An example was shared from valorisation and the phenomenon regarding further processing of byproducts. Some businesses producing byproducts are unaware of the potential of their byproduct or any bonding or bridging collaborative opportunities. Often, they overlook the problem and new market opportunities (NGO2, OEM4). In addition, there is an unawareness or absence of supporting technologies (Tech1, OEM1). Hence, the biggest difficulty appears to be the search for, and the gathering of, experts and equipment, respectively technology (WSP1, NGO4).

Furthermore, convincing end customers for a circular collaboration is difficult. Clients need to be trained in the skillset of reusing material, which includes the characteristics and quality of circular products (OEM1). In that regard, all CBMs fear jeopardising customer relationships if minor failures occur on circular products (OEM1, OEM2, OEM12).

Having business development teams is of advantage as these teams can actively engage with customers and receive first-hand information about clients' concerns or preferences. This method is predominantly applied in CBMs, such as remanufacturing, and is considered an easy way of bridging relationships with customers by finding answers to operational and strategic business matters. It aids in answering questions about the end of life for scheduled products, the availability of material for reuse, and the knowledge of clients about remanufactured requirements and opportunities (OEM1, OEM2).

6.2.4 Health care institutions

Depending on the exact CBM, in this case, resource recovery recycle, acknowledged collaboration partners of all levels (bonding, bridging, and linking) are **health care institutions.** In the UK, these institutions belong, in most cases, to the National Health Service (NHS). Some organisations emphasised the benefits and importance of collaborating with NHS institutions (OEM1, OEM3 and SE1). Openness and trust towards the individual CBM in the starting phase of the circular project were named. *"They're [annot. the client] the ones, they're so enthusiastic and they really want to recycle as much as they can, and it spurs you on really. Sometimes, you think, 'Do I want to carry on with this?' But then you meet with people who ooze enthusiasm, and you think, 'Yeah, OK, let's keep going and together we'll get there.' […] They are really, really enthusiastic and it does make it all worthwhile then."* (OEM3, Int.2).

Nonetheless, due to the special position and objectives of health care institutions, especially public health care providers, perspectives about byproduct material re-usage and costs can differ compared to other clients. The difficulties revealed different viewpoints between the collaborating OEM and the health care institution, but also inter-organisational differences.

Public2 shared their position as a health care institution. In the set-up phase of the collaboration, concerns were raised; changing to a CBM might not be approved by the top management level. Health care institutions have an obligation to the public and attempts to change a BM relate to risks. Different departments look at these risks from different perspectives. Top management, administration and finance departments look at waste treatment in a health care institution from a different angle than environmental experts employed at individual hospital sites (Public2). *"I was concerned that with us being a health care organisation, and everyone knows what the finances are like in the NHS. For the decontamination lead and the head of facilities and I, we were looking at it basically from a waste of circular economy perspective. Obviously, the small waste savings that we have were financially beneficial, too. But for us, that wasn't what it was about. We were more concerned with the environmental aspect of* *it. So, we were concerned that the board who must approve us spending the money on it would say no because the savings wouldn't be great enough for them" (Public2).*

In another example, the importance of decision making for linking collaboration was emphasised. Already-existing networks with suppliers, for example, can be an issue when new linking collaborations are established. In that regard, deeply interwoven networks of suppliers and the reliance on these is a huge impact factor on the success of these collaborations (Public2) – *"Obviously there are people that have been pushing for circular collaboration for a while that have not necessarily got very far because of the purchasing systems in the NHS. And a lot were being driven to purchase as much as possible through the NHS Supply Chain, who were like the central suppliers for us, and they source all the products, so we're kind of reliant on them, and if they don't see the importance of the new CBM, then they don't look for products that fit into the circular economy model, and there's not a lot we can really do. And I think that's changing now. How fast that will be, I don't know"* (Public2).

A similar argument was put forward by NGO4 when explaining that the hardest part of any collaboration, independent of the level, is to come together and identify the options that a partnership can have. *"When we work with a different brewery and we come together to do a beer, it's just figuring out, how we talk about it and how it looks, the branding element, the story. It's just getting the messaging, right, that reflects well on all parties"* (OEM4).

Another difficulty is the fear of costs when investments need to be made. It was interesting that the two linking organisations referred to the same matter when their investment costs were rising. Public2 stated, *"Obviously, you're spending public money on this machine, it was a bit of a risk because it might not have worked as we thought that it would"* (Public2), while OEM3 explained, *"And they thought we were charging the NHS a fortune for doing what we were doing for nothing. So, there were a lot of issues there, but we had to have a meeting and we called the directors in, and we had all the staff there, who were a bit militant. And we spelt out to them that we funded the whole thing ourselves and the reason we couldn't get the machine to operate properly in the first place was that we didn't have enough material outside of the hospital environment to process"* (OEM3, Int.3). Hence, mutual trust between the different partners involved, bespoke quality processes and circular products, leeway for a circular test, and a strong commitment from senior-level management need to be provided in circular partnerships.

Fear of change, or change management, was another aspect addressed in collaborative actions. Public2 stated that they had to convince their staff members about the technology that was newly installed in the CBM. Fear that the circular technology (e.g., machines) could take away jobs was immense (Public2). Convincing shop floor workers appeared to be challenging and often ended in reticence towards new technologies or processes (Public1, Public2, OEM3). *"The shop floor workers, they were a bit sort of reticent, to say the least. They thought it was going to cost jobs. But we overcame that"* (OEM3, Int.1). It is noted that the occurring problem regarding fear of job loss or redundancy is not entirely restricted to circular collaborations between OEMs and health care institutions.

Despite the hurdles that need to be overcome when collaborating in the sensitive health care sector, all involved parties listed costs and monetary incentives as a huge plus. The idea of being able to return the saved money into new revenue streams seems to be very appealing. Public2 explained that the money was brought back into patient care or was used to employ new members of staff. OEM3 praised the individual enthusiasm around the CBM. *"People in the NHS, who are really keen and encouraged to get involved in this, are really pushing to make this change"* (OEM, Int. 3).

6.2.5 Political institutions

Despite rarely being mentioned, political institutions are popular linking partners. First and foremost, these linking collaborations aim to achieve a financial advantage for non-political partners. Collaborations with the outcomes of grant funding and monetary vouchers appear to be popular (NGO4, OEM1, OEM6). Other collaborative relationships referred to consultancy-like situations, where political institutions provide advice on, for example, machinery and equipment (Gov1, Int.2).

A welcome side effect of political linking collaborations is the wider scope of the audience that can be achieved. In this regard, media attention has been noted as very useful. NGO4 and SE2 explained that the (media) attention received because partners know that their actions are backed up by the government has helped a great deal (NGO4, SE2). In doing so, press releases on different channels (e.g., social media, LinkedIn) from political bodies were mentioned as useful tools for the partnerships, too (OEM1, NGO4, SE2).

To establish such linking collaborative partnerships, specialised governmental departments, such as technical innovation departments, are established. These departments have the time and human resources to support organisations throughout their circular journey and aid in finding tailored solutions as well as collaborative partners (Gov1). In fact, political bodies often act as linking facilitators aiming to match organisations and supporting them in the realisation of their projects.

Nonetheless, some participants wished for more collaborative support from political institutions (Tech1). On occasions, when governmental and economic opinions differ, collaborative actions can get difficult (NGO1). Additional criticism referred to the view that governments still push for capital assets on balance sheets, instead of promoting circular actions, especially in service-related CBMs. However, these *"encourage and promote circularity and longevity" (OEM4).*

Table 6.3 provides a brief overview of the options for collaboration with political institutions.

Collaboration examples with political institutions
Political institutions build the following collaborations with other organisation – Monetary collaborations in the form of grant funding and vouchers – Collective marketing campaigns – Consultancy-like collaborations (advice on machinery and technology, financial advice) – Facilitator role (matching partners with each other) **Reasons for collaboration** – **Financial support**

Table 6.3 Collaboration with Political Institutions (Source: Author)

6.2.6 Other institutions

Other collaborative partners that have been named as actively seeking circular collaborations on all levels are **product designers, architects, commercial and marketing managers, and project managers**. Often, these groups of practitioners seek collaborative actions because they need to fulfil a set of sustainability requests. Also mentioned were **consultancies**. In that regard, organisations prefer to use consultancies to have a circular model externally evaluated, or provide guidance in terms of carbon emissions, jobs safeguarding and creation (NGO2). In addition, they are very useful to SMEs since they know the different (regional) markets and can aid in the facilitation between the right partners. However, finding the right consultancy is difficult and expensive (SE1, Tech2).

Investors were named popular linking partners, especially for SMEs or start-ups beginning to settle a CBM (OEM4). Although their role in the collaboration purely refers to money provision, to initially start the CBM, they appear to be a welcome partner. *"I think that from the beginning the excitement and the fact that the investors were excited to come on board. It's because they could really see the potential there"* (Tech1). Similar experiences were shared by SE1: *"They [annot. client] might potentially become an investor in us as well, which is great because we've been on a sort of six-month trial, sort of accelerator programme with them, and based on that we're putting a business plan together now*." (SE1)

Waste service providers and NGOs specialising in waste management are another opportunity for collaboration (NGO3). The advantage in collaborating with these service providers refers to their deep knowledge of material re-usage and in being a facilitator to link all partners together. In other words, collaborations with these partners save time, resources, and availability. *"I was the regional waste coordinator, so I coordinated waste. […] The nature of the waste changes. So, when you look at the data, it's quite interesting when you look at the types of waste that are produced […] or understand what their [annot. Organisations'] issues are. So, time, resources, and availability to go and find circular economy solutions, they don't have that. I have had it. When I've talked about a business that's in South Wales that provides a circular economy solution for waste materials and the products they make could go back into the public sector, and I will tell the chief officers in the councils this. And they'll say that's interesting. I'm so glad you've told me that because we don't have the time to find out about stuff like that." (NGO3)*

6.2.7 Competitors

One of the foundational principles of a linear economy relies on market competition. To survive in the market, business entities need to be able to benchmark and be better than their competitors. Considering that CE is a highly interwoven business concept that relies on networks and collaborations, questions around the topic of competitors arose. To establish the perception of business entities towards collaborative actions with competitors, interviewees were asked to elaborate on their collaboration actions with competitors.

Most surprisingly, competitors as linking partners in circular partnerships are considered potential partners. Despite a small minority of organisations being against the idea (OEM6, OEM7), the reactions of participants were positive. However, it is noted that none of the case organisations is currently collaborating with a direct competitor. Nonetheless, OEM1 shared an experience: *"We did try a collaboration with a London company. [...] So, what they do is they bring the furniture into a warehouse and then they put them on their website to try and sell it maybe at a third of the price or whatever, and they try and reuse that furniture. We tried to utilise that, but because of the logistics side of it, it didn't really work. We did it for about a year and a half, found that it wasn't making that much money, and as I said right at the beginning, the business must make money to bring jobs and benefits to the area. So, we tried it; it didn't work."* (OEM1, Int.1)

The openness toward the approach of working together became more visible when OEM2 shared their viewpoint and explained, *"We happily refer people to organisations like that. We believe in partnering with others particularly in the sector because we need to all support becoming the right business practice, and as long as people have strong ethical and sustainable principles such as those organisations"* (OEM2). Furthermore, the interviewee emphasised that a clear dialogue and sharing best practices is the way forward towards such special collaborations. This includes a high level of honesty when, for example, working together on innovative development. *"Rather than become defensive about it or secretive about it, we've now started to say right. What can we do to work together to bring in our strengths so that we're not becoming competitors and that we're actually doing something that's good for the communities?"* (SE3)

Notably, not only social enterprises but also OEMs foregrounded the community sense emerging of these special collaborations. *"It's about finding and sharing your strengths together"* (OEM10). *"We're more than happy to talk to anyone, because at the end of the day, this technology needs to grow, and the more people that utilise this technology, the more of an impact it will have, and we're willing to have our competitors utilise our technology"* (OEM3, Int.2)

The variety of further linking collaborations possibilities was revealed by OEM2, when working together with competitors on the development of BSI. *"We are collaborating with competitors around the industry standards. The BSI standards. We've got furniture manufacturers and other refurbishes and remanufacturers, and we've all got slightly different business interests in it but we're able to meet and talk about what would be best for, what would be best for the industry and where are the points that we can agree on"* (OEM2). This collective viewpoint of guiding an entire industry path towards a certain direction was shared by Tech1: *"At the moment, we are not competitors, we are more like companies that are driving in the same directions and that are trying to mobilise the industry in the same direction. So, if one is successful, all the others will be successful."* (Tech1).

Generally, it appears that the perspective taken has a huge influence on the willingness to collaborate with direct competitors. OEM5 explained that since they are producing a similar product, they do not see each other as competitors, more as collaborators. OEM12 argued similarly: *"We see them as collaborators. And the thing is, if you're working in the circular economy, if you see anybody as a competitor, you're not really a circular business, again."* (OEM12). This statement was emphasised by SE3, as CBMs are a straightforward and sort of vibrant community, rather than bitter competitors. "*We are not unique. But we don't see them as competitors. We see them as part of a vibrant community doing what we all need to do. So that's not competition."* (SE3).

A model prone to collaboration with competitors is valorisation. Clients are prone to share knowledge, learning, and technology, depending on the sensitivity of the occasion and case. An example was shared by NGO4, who observed an already existent collaboration between their clients of the drinks sector. Although all of them are whiskey distilleries, they are willing to share knowledge and technology as well as mutual learning. *"Although they're all making the same product, they don't really compete with each other necessarily because they all have a different location or brand attached. So they do work really well together*." (NGO4)

Another example was shared, where their clients allowed other organisations of a similar nature to use their technology (technology sharing) in order to turn waste into a valuable resource. Their reason for collaborating directly with competitors was explained as the technology used, in this particular case specific machinery, is only lent to competitors when it would not be in use for the company itself. *"They do often allow other companies who are looking at different, but similar processes, to use some of the kit that they have on site. So, they're sort of offering up their services or offering up their technology when they're not using it, to other businesses."* (NGO4).

OEM4 confirmed the sector's advantage and referred to old habits. *"Breweries love collaborating with each other on a kind of one-off basis. We love doing it because we learn whatever is their [annot. the competitive brewery] passion, and we kind of bring our unique knowledge about ingredients."* (OEM4).

Negative responses were rare, and if raised, emerged from SMEs located in niche markets. Their interest in collaboration with competitors is rather less enthusiastic. This is understandable, as their business idea is based on confidential internal knowledge (OEM6). Nonetheless, these organisations are not completely against collaboration. Cross-industrial collaborations, or overseas collaborative actions, are collaborations that are up to debate in the future.

From a governmental perspective, a collaboration between competitors is greatly appreciated and considered as one of the future goals. *"Trying to get whole sectors and regions interaction at the same time is also helpful, because that gears up the multiple supply chains today. Instead of doing it for one company, all of them do it."* (Gov1, Int.1).

Table 6.4 provides an overview of the discovered collaborations with competitors.

Collaboration with competitors

Example 1: Collective byproduct collection

Form of collaboration and CBM

Byproducts are collected in a joint collection effort of waste service providers
Valorisation model

Partners involved (linking collaboration)

– Waste service providers
– Providers across all brands (for instance, all coffee pod providers, independent of brand name)

Requirements

N/A

Reasons for collaboration

– Future systems are expected to require such collective collection systems
– Geographical location of clients allows collective collection of byproducts
– Maximise infrastructure for by-product collection
– Cost savings when using a collective collection.

Examples:

Coffee by-product collection

Example 2: Collective sharing of machines

Form of collaboration and CBM

Sharing of machinery during off-peak times, when machinery utilisation is low or the machine would run empty.
Valorisation

Partners involved (bonding and bridging)

OEMs amongst each other

Requirements

– Unique selling point
– Collaboration is possible because each product still maintains its unique selling point

Reasons for collaboration

– Optimal machinery usage
– Revenue via machinery utilisation during off-peak times
– Collaboration is possible because each product still maintains its unique selling point
– Knowledge sharing during the shared use of technology

Examples:

– Sharing of machinery amongst whiskey distilleries
– Sharing of machinery cross-industrial (beetroot organisation shares machinery with paint organisation)

Table 6.4 Collaboration with competitors (Source: Author)

Collaboration with competitors

Example 3: Signposting and recommendation

Form of collaboration and CBM
Signposting or recommendation of direct competitor
Diverse range of CBMs

Partners involved (bonding and bridging)
OEMs amongst each other

Requirements
Specific attributes
- Openness
- Transparency
- Strong market position
- Ethical mentality

Reasons for collaboration
- Circularity only works with such collaborations
- Competitors are not seen as competitors, but rather as collaborators
- Necessary attributes: openness, transparency, ethical consent

Examples:
- Recommendation of direct competitor active in different areas but in the same sector
- Recommendation of competitor who serves the same model or product in premium market (or vice versa)

Example 4: Industry movement

Form of collaboration and CBM
Moving an entire industry in the same direction
Diverse range of CBMs

Partners involved (linking, bonding, bridging)
- OEMs amongst each other
- NGOs
- Policy bodies

Requirements
Attributes:
- Trust
- Open dialogues
- Confidentiality

Reasons for collaboration
- Thrive to achieve circularity

Examples:
- Lobbying
- Joint collaboration on governmental consultations or industry standards

Table 6.4 continued Collaboration with competitors (Source: Author)

6.3 Challenges and benefits of collaborative partnerships

This section looks at the benefits and challenges that participants identified when being part of a circular collaborative partnership. As seen in Section 6.2 (especially Section 2.6.2), collaborative partnerships are essential in CBMs for circular settings. However, the challenges and benefits of collaborative partnerships (Leipold and Petit-Boix, 2018; Millar et al., 2019) in the literature have not been identified. This section identifies the challenges and benefits of collaborative partnerships in circular settings. Summarising Table 6.5 concludes this subchapter.

Beginning with identified challenges, the point was raised: there are many businesses developing the technology in the first place. The difficulty lies in establishing collaborative networks, finding new partners, and convincing them about new production methods. There is noticeable rigidity towards established production methods, ingredients, or habits. Convincing possible partners to change these well-established production methods is difficult. *"I think it's quite difficult sometimes to get the right people in the room, because there are a lot of businesses actually developing technologies and solutions that would use co-products. Meanwhile, organisations that are producing the co-product are not necessarily seeing it as a problem, so they're kind of like, well, why would I take time out of my day to come along and hear about a technology that isn't up and running*?" (NGO4). In addition to the volume and quality of the material, some circular models require a specific texture of the byproduct material, suitable for the existent machinery (NGO4). It was emphasised that the challenge of possible contamination with established production methods is huge, especially when sharing production lines and machines. This difficulty expands in cross-industrial collaboration environments. An example was based on a circular network of grocery production and animal food production. As soon as their partners work in different industry sectors or sectors with high hygienic regulations, collaboration is more challenging (NGO4).

Furthermore, material difficulties can be a hurdle due to the inconsistent quality or volume of byproducts (OEM1, SE1, NGO2). *"We had a phone call from our supplier a few months ago, and obviously they had got their hands on so many chairs, could we take them? Well, with our supplier, it's quite feast and famine. Some months, we wouldn't have anything, and we're literally chasing them."* (OEM1, Int.3).

Transportation of by-product or material-to-be-refurbished in valorisation and refurbishment models remains a multifarious challenge. Geographical issues that might hinder collaboration in the first place are common. Addressed challenges in that regard referred to the geographical dispersion of partners, which can cause problems in transporting the waste material in the first place, followed by haulage issues and general transportation problems when considering safety issues for hazardous classified products (OEM1, OEM3, Public2, NGO3). *"We have a collaborative problem that is geographically dispersed. This is a problem because certain materials have different haulage and transportation issues. For instance, you can't crush waste paint, obviously. You can't just crush liquids; you mix them all up and put them in a tanker. You end up in certain material streams by preserving the quality of the waste product, transporting air around, and air is very expensive and has a high carbon footprint of measuring."* (NGO3)

Another solution was introduced by the collaborative resource recovery recycle model of Public2 and OEM3, where Public2 was asked to store their byproduct material on site until it was economically reasonable to be collected and transported: *"To save on transport really, they ask that we have at least 100 blocks before they come and collect just so that they're not taking a half-empty van back."* (Public2). This finding was interesting because it considers the controversial discussion about CO2 emissions. Although a lot of CBMs pay more attention to CO2 emissions (OEM1, OEM3, NGO3), the true contribution of CO2 emission reduction to CBMs and circularity is not yet established. *"The interesting thing is that there's some research that's come out, that out of all the environmental benefits that we can do with the circular economy, only one-tenth of that is CO2 emissions. Yet nine-tenths of it is resource management. Now, I know that carbon is again easy for politicians and the media to grab onto because it's something that people can kind of understand; it's a bit like money. Reduce your spending, reduce your carbon emissions"* (OEM12).

Other difficulties were addressed in the operative execution, which raised issues toward ethical and sustainable handling of SCs. *"Some of the collaborations we're having to do are when we're working with maybe manufacturers who need to put a sustainable offer in or where we need to try and meet a client need that sometimes just can't be met sustainably. The economics need to stack up and there needs to be transparency, so that we're not competing unfairly against them in some way or other"*

(OEM2). Therefore, an emphasis was put on fair and ethical working manners in circular collaborative networks. *"To me, the sorts of collaborations we need to have are through our supply chain and our demand chain. It's just looking for where decision-making processes are being made and to see if we're disadvantaged in some way. Can that be amended by more open books or more transparent trading*?" (OEM2). However, fair and honest trading requires building commercial confidentiality, which was identified as a hurdle (OEM11, Gov1). *"We have to get everyone's agreement to do it. In Campaign X [annot. campaign anonymised], we are working with a competitor material, we're working with people in the supply chain whom we don't supply, and perhaps a competitor will supply. There is quite a lot of governance around that, and we have to be careful in some meetings. Perhaps there has to be a solicitor present to make sure there's no anti-competitive rules. That's a really big element now"* (OEM11).

The size of the organisations to collaborate with appears to be a challenging factor, too. On occasion, it appears more difficult to collaborate with smaller organisations. Criticism was raised in the refurbishment where networking and collaborating with smaller organisations appears to be more difficult, as their awareness about the quality of refurbished products varies strongly. On the contrary, global players, organisations or councils have been identified as easier collaborative partners. Possible explanations for the said phenomenon are given in more developed and stricter KPIs, CRS rules or accreditations of bigger clients (OEM1).

When considering the process of establishing collaborations, the starting phase is challenging. Finding information about adequate CBMs and access to potential partners, as well as initial knowledge about material cycles, is difficult to gather (NGO2, NGO4). Therefore, stronger CE mapping is wished for. *"There needs to be more mapping of what's going on and who is doing what and what services are out there.*" (SE1).

Once collaborations are established, moving projects forward in a timely manner due to possible uncertainties and external factors appears to be difficult (Tech1, SE1). Hence, communication and knowledge change have been prioritised. *"We're not yet clear on exactly how to do that, we need to get some feedback first. Software development is expensive so anything we do; I need to be sure that it's needed* *and that it can generate value or encourage more people to use the app." (*Tech1). But even once collaborations are established, CBMs are not *one-size-fits-all models*, collaborative needs need to be identified. What is necessarily useful in one collaborative partnership can be neglected in another. NGO3 shared their example: *"It is helping different councils get the same level of knowledge at different times. As I say, different councils have different needs at different times; they're not all the same. They have different collection systems."* (NGO3)

In another example, the collective approach that needs to be built has been claimed as challenging. To overcome different viewpoints and agree to a collective approach is challenging, especially with regards to a strategic decision in product marketing or product innovation. *"We work with a different brewery, and we come together to do a beer, it's just figuring out, like, how we talk about it and how it looks, the branding element, the story"* (OEM4).

Occasionally, possible collaborations are turned down, because the client's vision is impossible to realise. *"Can be difficult to realise, often the collaboration won't work because the vision of the customer can't be realised*" (OEM1). There is also the problem of not seeing an immediate benefit in the CBM, which makes collaborative actions difficult (NGO2).

Fear of failure is still one of the points listed that hamper circular collaboration. Hence, the importance of finding like-minded partners who are willing to collaborate was emphasised. Interestingly, country boundaries do not appear to have an effect on such collaboration. Notably, the original purpose of collaboration does not always have to be business-driven. It appears that organisations value the social interaction between like-minded circular-affine organisations. This results in organisations having close contact amongst each other and inviting each other to their sites to do communally beneficial activities. OEM1 shared their experience when being invited to travel to the Netherlands, visit their business partner, and participate in a mutual plastic collection activity (OEM1).

One of the major benefits of circular collaborations is the presence of facilitators. Facilitators can act as lynchpins and *"connect them [annot. the parties] together" (*WSP1, Int.2). Voluntary initiatives are most welcome by policy representatives, as those *"get everyone to work in the same direction "*(Gov., Int.1). Benefits are additionally seen when policy bodies collaborate and across different departmental sections. In addition, the positive press when organisations collaborate with policy bodies has been noted as beneficial and attracted even more consumers (OEM1). Furthermore, platforms such as swap shops are listed as beneficial (OEM2).

Another named benefit referred to cross-industrial collaborations. NGO4 addressed that a lot of their clients work on a cross-collaborative basis, while NGO4 functions as a facilitator in establishing these collaborations. Examples were provided based on a collaboration between the drink sector and the fishing industry, where fish farmers were convinced to use byproducts created during whiskey brewing processes (NGO4).

From a supply chain network perspective, suppliers are pleased to see their materials being used, including the publicity they could reach by being part of a CBM (OEM4). This was confirmed by OEM6, who stated that their partners are pleased with the positive publicity around attained environmental benefits. In terms of benefits, charities can have a significant advantage in the collaboration of a CBM. NGO2 explained that being able to offer circular services free of charge was received positively by clients in joining a CBM. Collaborations also have a greater reachability range for external funding and investors (Tech1, NGO2).

Table 6.5 provides an overview of the challenges and benefits of collaborative partnerships identified in Sections 6.2 and 6.3. The following section will look at the second identified contextual factor in the literature review, technology (Section 2.6.4) and its connection to CBMI (Section 2.5.2). The subsequent section will furthermore aid in fulfilling research Objective 2b—to explore the role of digital technology.

Challenges and benefits of collaboration	
Difficulties	**Benefits**
• **Rigidity** towards established production methods, ingredients and habits • **Contamination** via sharing of production lines and machines • **Operative execution** Commercial confidentiality, openness and transparency • **Organisation size** • **Policies and guidelines** CSR, policies, guidelines • **Materials** volume, quality, quantity • **Communication skills** time, collaborative need, collective viewpoints over strategic decisions • **Transportation** geographical dispersion, haulage problems, hazardous products, transporting issues	• **Having facilitators** • **Voluntary initiatives** • **Cross-departmental collaboration** Particularly in policy bodies • **Positive press** When collaborating with governmental bodies • **Platforms** Such as swap shops • **Access to charities** • **Access to investors and funding**

Table 6.5 Overview of Challenges and Benefits of Collaboration (Source: Author)

6.4 Technology as an enabler of circularity

As identified in Section 2.5.3 (circular business model innovation—the transition to CBMs), technology is versatile and in the form of Business Model Innovation, playing a major role in the transformation to a CE (Geissdoerfer et al., 2020). In the following section, the role of technology is investigated in greater depth. Since the selected case organisation followed a variety of different CBMs, the questions about technology have been kept purposely broad. Each interviewee was asked how they would describe the role of digital technology in CE and how they apply digital technology in their CBM. In the following, the main findings are listed. It is noted that, due to the wide meaning of technology, some participants found this question difficult to answer.

6.4.1 Role of technology

The findings of the FG discussions (see Section 3.3.2) have identified technology as a critical contextual factor and enabler of any CBMs. In this section, participants shed light on the role of technology in CBMs by sharing precise viewpoints and examples. Participants shared the idea of seeing the role of technology as a supporting tool in the transition phase towards CBMs and beyond. Technology has the rare power to merge two different approaches to achieve the maximum outcome. Hence, some participants called for twin approaches, which include technological considerations right from the beginning. *"We need a twin approach as technology and business models, and then the two have got to go side by side. In some cases, technology can dominate, in others the business model can, but obviously involving the two."* (Gov1, Int.1). An example of such a twin approach was promptly given by Gov1: *"I try to get business schools to work with engineering departments."* (Gov1, Int.1).

Organisations following a remanufacturing CBM interpreted the role of technology in a similar twofold approach, in the form of asset distribution and collaboration enabler. *"I think it's absolutely critical in two ways. One is the ability to get the assets where they need to be in the first place. [...] I think the collaboration piece, the technology piece has got an important role because it's, in the long run, it's very much logistics and assets and if you don't know what the items are, where they are and what they look like, it's very difficult to try to come up with the next step or the next solution for them."* (OEM2).

In its role as a supporting tool, technology is considered to support the current transition phase from LBMs to CBMs in a variety of ways. Public1 shared an example of circular workspaces: *"Technology has played an important part of people going through the transition into agile working because everyone was on desktop PCs before. So, we've had to roll out the agile kit, which is laptops, smartphones for people, so, we can allow them to have the kit to work remotely"* (Public1).

A variety of participants from refurbishment-and-recycle CBMs referred to the support in waste management handling in the transition phase that technology offers. *"Technology would help going forward, and I'd like to think as well that technology would help in the stuff that we're not doing, anything which would end up being recycled properly."* (OEM1, Int.3). *"The impact that our technology has on the waste, to recapture the resources and make new outputs, new raw materials"* (Tech2).

The support provided in the design phase of circular products and its strong influence on the outcome of the circular product has been listed. *"Certainly technology has been designed to consider the full lifecycle. But we need to understand what the impacts are, to understand what the design needs to be, and to eliminate the negative impact.*

[...] And we're looking at integrating systems, technology systems, into the existing production." (OEM5). In this regard, a warning example was given. Fear that technologies use or bring exotic or toxic materials into the cycle and consequently fail the initial idea of contributing to truly circular products is not uncommon (OEM5).

Furthermore, the support given by technology as a connectivity tool to keep engaged with clients and partners of the CBM was addressed. "*The role of technology is really important in this day in age. It's creating innovation. You need technology to be able to allow customers to report simple reporting features. So, yes, technology in the circular economy is an absolute must."* (OEM3, Int.2). Besides the support in reporting, and in this way connecting with customers, technology supports connectivity by being able to foster remote data extraction. An example was provided based on remote technology, which is installed in the circular product, to provide live data (OEM3). Other organisations alluded to the connectivity aspect, that social media, press, and websites are a welcomed technology: *"The role of technology in driving or in helping the circular economy, it's massive, it's everything from businesses producing packaging that can be reused to bringing that awareness to society, whether that's through the written press, media, social media, council websites, the sides of collection vehicles"* (NGO3).

As the last point, technology as a supportive tool in the development of adequate packaging opportunities was listed by participants (NGO3, OEM12). *"Technology for me is that it makes the old-fashioned technology of reusable packaging, we can use modern technology to bring that into the 21st century."* (OEM12). An example was provided on the usage of QR code technology to enable each customer to trace packaging; in this case, reusable cosmetic bottles were named (OEM12).

All findings about the role of (digital) technology are summarised in Table 6.6.

Role of technology in CBMs
Role: Supporting tool in the transition phase from LBM to CBMs and beyond **Focus area(s):** Business model approaches (twin approach) Product design phase Connectivity to customers and clients; and beyond the point of sale Packaging

Table 6.6 Role of Technology in CBMs (Source: Author)

6.4.2 Application of technology

As the role of technology has been identified as a supporting tool in the transition phase and beyond, interviewees were asked whether and how they apply any digital technology in their current CBM. As a result, different categories of digital technology applications could be listed independently of the sort of CBM applied. Respective connections to SCT are indicated in brackets.

As the first category, digital technology is applied as a **communication tool** to clients and customers. In this category, the following examples included online portals, social media technology, digital media, and common office technology *(bonding, bridging)*. A popular response referred to the usage of obvious digital communication technology, such as emails and phone calls, or office programmes, such as Microsoft, for internal and external use *(bonding, bridging)* (WSP1, OEM1). Besides these easy, on-hand tools, more complex digital technology was identified. This included specialised mobile applications for reuse, circular online portals, web presence and digital newsletters *(bridging, linking)*. Some of the advantages included the strong linking ability in reaching a more targeted audience. This referred especially to digital newsletters, but also the usage of digital mobile applications (NGO4, Gov1).

Social media technology (*focus on bridging, linking)* has been identified as valuable digital technology, especially to reach out to the B2C market, but equally to educate clients about the wider philosophy of circularity. The example of a social media post receiving more attention than a photo the circular product on their webpage was shared (OEM1, OEM2). *"When we put a poster on Facebook, our Facebook page or any social media platform, we get a lot of hits for what we're doing through our* *sustainable practices. Whereas, if you just put a chair on there and this is for sale and it's a bargain, we don't get as many "*(OEM1, Int.1). NGO2 added an example of educative work done via social media campaigns. While non-digital campaigns did not bring in the success for valorised products, a social media campaign on material and energy saving did: *"We had a campaign […] about banana peels and teabags, how much of which you need to put a light bulb on, or run a technical equipment, and we still get requests back on that."* (NGO2). Despite common agreement on using these technologies to connect closer to the customer, criticism emerged regarding data access and evaluation purposes. It is very difficult to interpret, for instance, data received from social media accounts. Other access to data, for instance, from supermarket chains, is expensive. Furthermore, access to data on people buying and consuming circular products is impossible to obtain, since it is not stored (OEM4). The predicament is explained by OEM4: *"We lack access to data about people who are buying our product. We know that if somebody follows us on Instagram, we can see the demographics. And we can see the content that is engaging people. But if somebody goes and buys us [annot. our circular product] in a pub, we don't know anything about them."* (OEM4).

A second category emerged as digital technology in the form of **tracking tools**, which allow organisations an easier implementation of multiple reuse cycles. Usage of RFID technology, online databases, or barcodes is popular when it comes to second or third reuse and refurbishment. Track and trace systems, bar code technology *(bridging, linking)*, or any other labelling system could aid in enabling more loops for refurbished products (OEM1).

Digital platforms *(bridging and linking)* have been another category addressed by participants. Their usage and application are very much dependent on market and industry sectors rather than the CBM itself. Overall, however, the interviewee's viewpoint reflected that digital platforms maintain a promising and aiding role in the future of circularity. Hence, they were named as facilitating tools, emphasising the advantage of staying connected after the end of life *"to pull all information to an easily accessible format—that will enable all the systems to talk to each other and allow customers to easily interact"* (WSP1, Int.2).

Interviewees identified a variety of digital platforms, including sharing, refurbishment, reuse, or exchange platforms. Important for the success of these platforms is their individual growth, applicability in the boundaries of the respective CBM, and options for collaboration opportunities. In that regard, it is not uncommon for organisations to collaborate in the development of such platforms. *"It is a digital platform that I found really interesting. That's also something that we're collaborating on which is like helping the brands to understand to design for circularity"* (Tech1).

OEM2 provided another example of collaboration via such platforms. Their clients have built an internal exchange system on the platform. In doing so, employees from one location can upload circular products, which are in the following, available for exchange at any other location of the client (OEM2).

Furthermore, digital platforms were used to facilitate asset distribution. Particularly in the refurbishment sector, the mix and match schemes of these platforms allow a higher asset distribution of refurbished products and other materials at very low costs (OEM2). It is possible to track and monitor products, and if needed, return them after their usage cycle (OEM2, Tech1). Particularly, the opportunity of tracking the products, and to ensure their safe return at the end of use, is a motivational factor in establishing such platforms (Tech1). Other advantages listed referred to the user's flexibility to search for circular products in their own time and based on their own preferences: *"organisations could look at the furniture and order out what they wanted"* (OEM2).

Notably, participants differentiated between external and internal platforms. Internal platforms mainly supported logistical movements. Like their new raw material and products, circular products required solid storage and warehouse management. Accurate forecasting for reused material is vital, as is considering circular products coming in for second or third cycle treatment, for instance, second or third refurbishment cycles (OEM2). External platforms, on the other hand, explained any exchange with external clients or customers (OEM2, Tech1). Creating such platforms requires sophisticated apps or websites that engage customers. The emphasis should be on a customer-friendly interface (WSP1). Some organisations stated that instead of developing new platforms, they are using already-existing ones, such as eBay, for customers of the B2C market (SE1).

Although the overall advantage of technology platforms is seen in products not being pushed out of the circle (OEM2), the current awareness and usage of platforms could be expanded. In this context, awareness issues of finding a fitting platform or missing customer demand and acceptance were raised (OEM1, SE1). More detailed criticism came from the CBM of Repair Cafés. Their *"magic emerges by people getting in a room together"* (OEM9). Hence, some digital progress and changes are seen as threats and only done to a minimum extent (OEM9, SE2).

Organisations handling sensitive material or predominantly one material have stated further criticism: *"We're only dealing with a single polymer opportunity, it's much easier for us to communicate directly with the big polymer exchange."* (OEM3). One case does not rule out the other. An openness towards platforms is still visible. *"We're definitely open to looking at, and possibly working in the future with digital platforms to extract the best possible prices and best possible working practices."(*OEM3).

Other concerns referred to the safety and hygienical guidelines of a product that has been marketed via a platform. Food safety guidelines were particularly emphasised (OEM4, OEM5). Furthermore, constraints have been addressed as the difficulty of having to integrate technology into an existing production process. Changes are unlikely to be done very quickly (OEM5). SMEs added that they are often back-office driven. Despite their wishes for more technological use, reality looks different. Implementation processes are difficult and expensive (SE1, OEM1, OEM4).

Table 6.7 summarises the findings of the three identified application forms of technology.

Application of digital technologies in CBMs *(including theoretical links)*
Communication tool *(bonding, bridging, linking)* 1. **Online portals for reuse** – swap shops – sales platforms 2. **Social media technology** – Instagram and Facebook – LinkedIn – Homepages – Other social media 3. **Office technology** – Meetings, emails, phone calls – Microsoft Office 4. **Online and offline media** – Print media – Newsletters
Tracking tool *(bonding)* 1. RFID – Barcode systems 2. Warehouse technology – Storage systems
Platforms *(bonding, bridging, linking)* 1. Virtual platforms for product and material exchange

Table 6.7 Areas of Application of Digital Technology (Source: Author)

6.5 Impact of (political) guidelines and support available

This section focuses on the third identified contextual factor of (political) guidelines (see Section 2.6.2) and the support provided by political bodies to other organisations. The following themes emerged from the findings:

- International and EU guidelines
- National guidelines
- Local guidelines

Findings of each theme will subsequently be introduced in the order from broad to specific, beginning with the UN and EU regulations, Welsh national guidelines and other local campaigns. Specifically, Welsh national guidelines were selected, as most of the case organisations are based or active in Wales. In addition, it is noted that the governmental bodies interviewed are based only in the Welsh Government. Hence, the findings can show limitations.

6.5.1 International Level—United nations and European union guidelines

Asking organisations about the influence of the SDGs on their work revealed mixed answers. Policymakers describe the SDGs as a supportive tool, leading and guiding the way forward, particularly as campaigns can be targeted to one SDG. An example was given based on recent developments in targeting SDG 12 on responsible consumption and production in Wales. Targeting food waste reduction was especially welcomed by organisations following a valorisation model. *"We've led the way on sustainable development with the United Nations, their SD goals. SD goal 12 was sustainable consumption production, is obviously helpful"* (Gov1, Int.1). *"And the valorisation work that we used to do in the past, that was focused on Wales and was directly funded by the Welsh Government."* (NGO2).

Interestingly, it is claimed that local policies, such as the Well-being of Future Generations Act of Wales, have not been influenced by SDGs. In fact, it is claimed to be the other way around – *"The Well-being of Future Generations Act came out before or at the same time than the SD goals. The Well-being of Future Generations Act goals were developed independently of the UN SD goals."* (Gov1, Int.1). The impact of the Well-being of Future Generations Act is further investigated in Section 7.5.2.3 when a closer look at Welsh policy is taken.

Looking at the different CBMs, it appears that the viewpoint on SDGs in remanufacturing and refurbishment models has changed over time. Before the announcement of the SDGs, organisations were more focused on waste hierarchy (OEM2, Int.1). Once SDGs got more promoted, this viewpoint changed. Notably, both interviewed OEMs following a refurbishment model explained that they had started to track their performance against the goals (OEM1, OEM2). However, there is still some clarity needed regarding the true role of SDGs. In that regard, questions were raised regarding which rules and regulations should be benchmarked in the future (OEM2, NGO3). *"Do I benchmark against the UN goals? Do I use that as a framework for capturing all of this activity?"* (OEM2)

Case organisations more active in the CBM of recycling appeared to be more hesitant against the SDGs, stating that they are not at all influenced by the SDGs (OEM3, OEM7). "*In terms of us looking at the UN directly, no."* (OEM7, Int.1). It is noted that the hesitation is not connected to a specific industry sector, as OEM3, active in the health care sector, argues similarly: *"No, not really. It's all been done of our own volition."* (OEM 3, Int.3)

Nonetheless, both organisations see the policy system as a cascading system. Hence, governmental policy is mostly influenced, and national policy is adapted to a local level. *"UN policy would influence government policy, which in turn cascades down to us."* (OEM7, Int.1)

Organisations applying a valorisation model appear to be more prone toward the idea. In fact, organisations active in the food and drink sector consider their business operations very much influenced by the SDGs, mostly by goal 12, target 3:

> *"12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses."*
>
> *(UN, 2015)*

It seemed that SMEs and start-ups felt more guided by this specific goal (OEM4). Reasons were listed in the greater social aspect and responsibility that the food and drink sector displays (OEM4, NGO2) – "*The food system is designed, at the moment, for profit. We are producing excess food, but we also have huge numbers of people who are undernourished and don't have enough to eat. And so, if we can use our bit to address food waste and use our profits to support charities that are looking at some of the systemic problems." (OEM4).* It is noted that these efforts can also relate to SDG 2, 'zero hunger'. However, despite the intention and efforts to improve the food system, SDG 2 was not stated as the primary goal or motivation by any case organisation.

Moving from the broad perspective of the UN to the European perspective, it needs to be noted that when conducting the study, the United Kingdom was still in the transition phase of leaving the EU, and European law still applied. Hence, it appears useful to look at European guidelines and their impact on CBMs, especially as the EU Action Plan had just been announced as completed (European Commission, 2019).

Overall responses towards the guidance given by EU regulations were mixed. Most of the interviewed businesses stated their awareness about the action of the EU. *"The* *first driver is the European legal framework, and then we establish a legal framework"* (NGO1). Others stated their involvement was limited: *"As a large company, you have been able to see that the circular economy package in Europe was already starting to bubble. The dates and details didn't really matter to us. You could see a trend happening, but the UK decided to go faster and quicker and bigger and better" (WSP1, Int.1).* The responses indicate that the impact and effects on EU regulations and directives are implemented and executed by the respective countries and their national institutions and regulations, rather than directly by the EU as a collective.

As one of the case organisations had its headquarters in Spain, they were able to share more details about the influence of EU legislation on their business. They stated that they were influenced by EU policy. Nonetheless, to advise their clients, Spanish national guidelines are preferred (NGO1, Int.1). All the more interesting is the expressed dissatisfaction and urge for immediate and stronger progress for CBMs in Spain and Europe. *"Waste management policy needs to incentivise more advanced waste treatment methods than landfilling; and production of high-quality pre-treated waste"* (NGO1, Int.2). Solutions and wishes urge stronger support in a variety of topics. Bureaucratic hurdles hampering the issuance of needed valorisation permits were one of the critique points. Other points raised referred to the stronger implementation of the EU Waste Framework Directive, more support in the coordination of waste management between various regions in the country, landfill bans, taxes, and gate fees (NGO1, Int.2).

Some organisations stated that they were not influenced by the European Commission at all. Rather, it is them influencing the EU's businesses (Tech1). This viewpoint was particularly shared with start-ups in the technology sector. However, looking at upcoming sector-specific frameworks and directives from the EU side leaves the impression that the work and the influence are more aligned than initially presumed. An example was provided from the textile sector. The European Parliament introduced the upcoming textile collection law for all EU Member States (European Parliament Briefing, 2019). Based on this legislation, all European countries are obliged to offer textile collections. The impact on the textile sector from the perspective of costs and environmental savings will be immense. Expected to be equally high is the impact on smaller tech organisations that have developed technologies to reuse old textiles and who have now a reasonable foundation to promote their CBM.

6.5.2 National level—national policies and guidelines

A higher level of mindfulness of policy regulations is noticed towards national and local regulations. 11 of the interviewed organisations stated they were influenced and guided by their local policy guidelines. Hence, the following section takes a closer look at the impact and effectiveness of national and local policies in Scotland, England and Wales. As most case organisations operate in the Welsh market, a special focus is put on Welsh policies.

6.5.2.1 Scotland

In 2016, Scotland introduced a CE strategy to align the country's economic and environmental objectives and to lead it towards circularity (Scottish Government, 2016). Retrospectively, developing such a strategy seemed to be an effective driver for the country. The strategy is considered "*Scotland's ambition to enable a CE"* (NGO4) and a welcoming aid in the implementation process. It provides helpful guidance by pointing out four main areas to focus on:

- Food and drink—the broader bio-economy
- Remanufacture
- Construction and built environment
- Energy infrastructure (Scottish Government, 2016).

Knowing the areas, to receive additional support from the Scottish Government was received as helpful by Scottish NGOs when developing their own supporting programmes alongside. *"Scotland have their own circular economy strategy. So that was kind of our starting point in a way, in terms of where our focus would be." (*NGO4)

Additionally, clear and structured guidance towards funding aided OEMs and NGOs in supporting other organisations in applying for governmental funding. NGO4, for instance, felt it easier to provide adequate professional support for their clients. Based on the governmental strategy, the NGO had developed further criteria that are applied when choosing the clients and their circular projects. Interestingly, the criteria followed the TBL approach. Decisive is the carbon impact of the client's project (environmental), the job creation (social), and the investment that the project draws to match funding or other investment options (economic) (NGO4). *"For identifying* *which companies to support or which projects to support, we're looking at three criteria that we try to fit. Thus, one is the carbon benefits of a project. So, using one material over another. The other is job creation and the other is the investment that it draws in, so it might be in terms of match funding or other investments"* (NGO4).

6.5.2.2 England

Due to the shortage of interview participants from English governmental bodies, responses are limited to the viewpoints of interviewees from English organisations only. Viewpoints do not replicate or comment on English political bodies.

The Department for Environment, Food and Rural Affairs (DEFRA) and the Local Authority Recycling Advisory Committee (LARAC) have been named, throughout the interviews, as governmental bodies in England, pursuing the idea of circularity. Organisations consider DEFRA a supportive tool, especially due to its published consultations (WSP1, OEM2). In that regard, case organisations shared their experience of working collaboratively with these governmental bodies to ensure the usefulness and practical applicability of political consultations (WSP1, OEM2, NGO2). Although lobbying can be seen as controversial, linking collaborative actions with political bodies, such as DEFRA or LARAC, are widely considered as positive action. *"Our work has fed into submission that we put to DEFRA, when DEFRA would be looking at how they assess the performance of the system and where the costs might lie in the future."* (WSP1, Int. 1). It is noted that the policy guiding England towards circularity, called the Resources and Waste Strategy for England, has not been named by case organisations in England or active in the English market.

6.5.2.3 Wales

Most case organisations were either based or conducting business in Wales. Therefore, Welsh policies, specifically the Well-being of Future Generations Act and its impact on CBMs, were addressed by interviewees. Thus, the author took a deeper dive and investigated the impact and effectiveness of Welsh policies and guidelines from an organisational but also governmental perspective.

Despite the Well-being of Future Generations Act (referred to as the Act) being introduced five years ago, the organisation shared the common viewpoint, to be widely independent of guidelines emerging from it – *"it never caused us to make business* *decisions based upon what they're looking to do"* (OEM5). Nonetheless, the Act is fully respected amongst businesses, and they work alongside it. *"The Act is welcomed"* (OEM5). Organisations especially value the Act's linking collaborative intentions. Leading industry associations and Future Generations commissioners come together to design and discuss consultation papers: *"The Future Generations Act is a fantastic platform for us to really do some good stuff"* (OEM5). NGOs shared similar viewpoints, although emphasising that the influence is more on their clients rather than on themselves. *"Influenced by the Welsh Future Generations Act, as a body? No. But our members are"* (NGO3).

Organisations that have successfully applied for governmental funding stated that the Act was of immense value and guidance. However, funding applications had to be aligned to, at least, five out of seven goals of the Act (Tech2). Notably, the economic and environmental value in the Act seems to be preferred. *"They were all about the economic goals but also the environmental ones, as well"* (Tech2).

From a public organisation perspective, although awareness is not an issue, the influence of the Act is less intense (Public1, Public2). *"We had an awareness of it but when the conversation started with our partner, that's where it all came about. Since then, we actually attend quite a lot of circular economy events"* (Public2) *"No, so that didn't really have any influence on us"* (Public1)

Since interviews have also been conducted with politicians from Wales, the following section provides an insight into the political perspective of circularity in Wales. The politicians' area of action was limited to Wales. Hence, the opinions stated reflect only on Welsh legislation and political decisions.

In general, the Act is seen as *"exceedingly helpful"* (Gov1, Int.1). In relation to the SDGs, its role is considered two-sided. On the one hand, the Act contributes towards the SDGs, while on the other hand, the SDGs aid in delivering the Act in Wales. Incorporated measurement tools, such as the well-being appraisal, ensure a secure contribution towards resource efficiency. Therefore, the Act is seen as an important driver of resource efficiency. *"We are using it as a vehicle to do that [annot. to drive resource efficiency]"* (Gov1, Int.1).

Governmental support is provided to organisations in the boundaries of the Act in a variety of ways. On a national level, designed programmes, such as the former *envirowise-programme*, are listed as support options. In the boundaries of Wales, more localised support and locally based NGOs, such as WRAP, were listed. Using the aspect of locality brings the advantage of a regional-based systems approach, (Gov1, Int.2), targeting specific local regions or industry sectors (Gov1, Int.1). In Wales, the regional-based system approach offers the opportunity for economic development and funding by dividing the country into the following four regions: Southeast, Southwest, Mid Wales, and North Wales (Gov1, Int.2). The industry-specific approach, on the contrary, supports specific industry sectors, region-independent.

In their latest strategy, the Welsh Government focused on the two industry sectors of food and drinks, and plastics, and their consecutive development and improvement (Gov1, Int.1). Proactively deciding on an industry sector in need of improvement appears popular. Tailored advice and the natural competition between the entities applying for funds were valuable points that spoke for such a proactive approach (Gov1, Int.1). Furthermore, experience has shown that a client-targeted approach is more (cost) effective compared to providing free-for-all information in the form of leaflets or other (Gov1, Int.1). Nonetheless, such a tailored approach might not be inclusive of all CBMs.

A typical process of support with regard to funding was described as follows:
The business entity approaches the respective government department with an idea. In the case of the interviewee, it would be the innovation department. In the following section, the idea is further explored and tested. Therefore, a commercial and feasibility study is conducted. Considering the positive outcome of the feasibility report and the nature of the idea, small-scale industrial trials are started (Gov1, Int.2).

Another scenario shared covered the eventuality when an idea is already in a later development stage, and applicants only require monetary support to cover relevant costs. In this case, a thorough check, which includes comparing and testing application forms against the criteria of novelty and innovation, is conducted. This includes testing against environmental (e.g., decarbonisation) points as well as the return of waste to a chain of utility. It is noted that these are only a few examples; the list is not exhaustive.

Another route of support is provided by an innovation voucher. Business entities can receive capital for machinery or similar when applying for said vouchers (Gov1, Int.2). Innovation vouchers appear to be popular in demand, as application processes are quick and easy (Gov1, Int.2). Furthermore, businesses can receive immediate support for questions relating to an improved waste management system (Gov1, Int.1).

In recent times, support and guidance towards new or upcoming regulations has been improved by distributing surveys. These surveys should ensure the awareness of business entities toward possible changes in legislation and any required preparation, as well as support and guidance available. The surveys are additionally considered a new initiative to make Welsh businesses more competitive on the market. More proactive guidance towards legislation is listed as conferences, workshops (Gov1, Int.1), web presence, and front-end teams that go out to discuss matters with clients in person (Gov1, Int.2). Advertising in media and trade press as well as other publicity campaigns are further instruments to ensure entities are aware of funding and available support (Gov1, Int.2).

Criticism regarding the available support was expressed in the complexity and opacity of funding options. Pairing this with governmental staff that are inadvertently unaware of special funding options, can lead to lost support for business entities (Gov1, Int.2): *“If I’d known about it some years previously, I could have joined a lot of loose ends up more effectively than I did”* (Gov1, Int.2). In that regard, the tendency to work in silos and less focus on cross-collaboration in departments was criticised (Gov1, Int.2). Wishes were expressed that more structured support mechanisms for entities are needed, particularly since entities are getting more mainstream (Gov1, Int.2). Furthermore, missing networking skills and collaboration options (internally and externally) were addressed. Not enough cross-departmental collaboration, which fosters more exchange and ultimately leads toward a more competitive environment for applying business entities, was noted. Additionally, an exchange with other departments to compare cases and share knowledge will foster a more competitive and transparent environment. The idea is to create more competitive and comparable funds as a supporting tool for organisations (Gov1, Int.2).

Measuring the effectiveness of the current support in place was classified as an obvious area of development. In earlier days, surveys had been carried out to establish how many entities are aware of the available support. However, at this moment in time, no surveys or other tools to measure the level of awareness are in use. Nonetheless, the number of entities using the support available is satisfying. It was emphasised that their feedback was taken on board in a positive manner: *"No complaints have been raised by entities that haven't received the support they wanted"* (Gov1, Int.1).

Another, but older, way of measuring effectiveness refers to the collection of data from waste arising from permitted industries. Previously, these studies were conducted in collaboration with NGOs, closely investigating the amount and kind of industrial waste produced and processed. These reports were considered as a basis for a closer look at waste streams and waste products, with the hope of identifying more processing options for material (Gov1, Int.2).

6.5.3 Local level—other local campaigns

In the following local campaign, consultations and guidelines aiding in establishing CBMs are introduced.

To begin with, political **statutory recycling targets** were named helpful for realising resource recovery, and especially recycling models. Introducing such an economic driver had a huge impact on clients, asking for support with recycling and reuse models (NGO3). In addition, clients began to look for alternatives to landfills and incineration. Hence, the legislation is considered a start in the right direction (NGO3, OEM6).

The health care sector, as well as the plastics industry, referred to the change in **Welsh waste policies** in the years 2008, 2010 and 2015. Those changes, combined with a growing interest in the reduction of plastic waste, aided in further establishing recycling CBMs (OEM3, OEM6). With regards to political interference, OEM2 explained that they were involved in an all-party parliamentary sustainability document about remanufacturing. Being involved in this document was seen as very helpful, since it offered the opportunity *to "understand what people were doing in other influences"* (OEM2).

Considering the number of industry standards that organisations already need to apply (i.e., European product requirements), notably few interviewees referred immediately to the **British Standards Institute** (OEM1, OEM2, OEM5). The sentiment around BSI and BS 8001 conveyed a mixed message amongst CBMs.

As a first impression, BSI standards are taken in a positive light. They have the power to provide confidence and equality to the market (OEM2). Interest was shown by considerations to send relevant teams to BS 8001 courses, despite BS 8001 not yet having reached the status of an official BSI certificate (OEM1, Int.1). Even given Brexit, organisations showed an interest in signing up for these standards (OEM5). The genuine interest in standards was furthermore conveyed by the huge number of employees who are, voluntarily, part of relevant committees and institutions, aiding to develop standards and unified processes. Interviewees explained that a great extent of collaboration and enthusiasm exists due to the diversity of the committee members (OEM2, OEM5). Nonetheless, concerns are raised about the standards hindering the dedication of *"coming up with the best, sustainable output*" (OEM2). The risk is evident in standards being misused as tick boxes to receive environmental accreditation.

Another campaign referred to the discussion around extended producer responsibility (EPR) and deposit return schemes (DRS). WSP1 shared deeper insight into this campaign. With the current discussion around EPR, it was stated that the policy evolution in that field is important. EPR in a CBM is strongly related to the material and its composition. From a waste contractor's perspective, incorporating EPR is of utmost importance. However, observing and understanding new and upcoming materials at an early point is a necessary requirement, since difficulties could occur due to the composition of individual materials (WSP1, Int., 2). Hence, the upcoming regulations put pressure on all involved parties. In addition, funding has been identified as a necessity for its implementation. *"We can see changes in curbside collection funding coming"* (WSP1, Int.2).

Since the idea of EPR is still in its infancy planning phase, organisations are asked to help by investigating how an EPR system could be set up in the first place, as well as the performance assessment of these systems, costs, and other important characteristics (WSP1, Int.1).

6.6 Discussion

The purpose of this chapter is to explore **Research Question 2: How do contextual factors contribute to the implementation of Circular Business Models?** This chapter has therefore aimed to fill the identified lack of empirical research and to investigate collaborative processes in CBMs. The literature by Brown et al. (2018) indicated that future research needs to identify stakeholder collaboration and include drivers and barriers of such collaborations (Brown et al., 2018). In doing so, the research incorporated the contextual factors of technology and policy.

Technology is claimed to be lacking in further empirical research (Pagoropolous et al., 2017), specifically in the value creation context (Ranta et al., 2021). On the other hand, the policy is claimed to lack evidence showing how political guidelines contribute to CBM development (Leipold and Petit-Boix, 2018).

To contribute to the field, the following three objectives accompanying this research question were introduced:

- To explore the role of collaborative partnerships in Circular Business Models (including challenges and benefits)
- To explore the role of digital technology in collaborative actions
- To investigate the effectiveness of political guidelines and support available to organisations being part of a Circular Business Model

To answer RQ2, this chapter has taken a separate look at the diversity of different collaborative partners (see Section 6.2), including their challenges and barriers (see Section 6.3). As mentioned in the literature, circularity is identified as a critical success factor (Blomsma and Brennan, 2017; Geissdoerfer et al., 2018; Brown et al., 2021, Bertassini et al., 2021), however, the exact role of collaborators, the size of the partnerships and networks, their connection (bonding, bridging, linking) as well as the approaches taken, for instance top-down or bottom-up, remain unclear (Brown et al., 2018). Therefore, this research has first and foremost looked at the different collaborative partnerships emerging from circular partnerships. Figure 6.1 shows the grand variety of collaborating partners. Unexpected were the strong contribution linking industry associations in CBMs and the inclusion of private households in CBM partnerships. Furthermore, the study was able to identify five precise examples of linking collaborative actions between OEMs and industry associations. Notably, all these collaborations took place in the recycling CBM.

One unanticipated finding referred to the willingness to bond and bridge collaboration with competitors. This finding was unexpected, as there is a normal rivalry between business entities selling the same product. However, the CE community appeared to be more open towards any bonding and bridging collaboration with competitors if the collaboration fosters a circular context and is based on specific attributes. The listed attributes included, but are not restricted to, openness, honesty, respect and strong ethical commitment.

In accordance with current results, previous studies conducted in a linear environment have demonstrated that most organisations collaborate for offensive rather than defensive reasons. Innovation and mutual learning experiences are reasons for collaboration with competitors rather than corner market or price raising (de Man, 2005). The results of this study agree with this argument. Clear dialogue and sharing of best practices were mentioned in this context as the most important points to ensure that a bonding, respectively, bridging collaboration with competitors is successful. The perception conveyed is the belief that every business can find its own unique business niche and offer circular benefits to customers. In fact, the literature has stated that collaboration between competitors can reduce product distinctiveness, but it still increases the awareness of the product created between competitors compared to a non-collaborator's product (Ghosh and Morita, 2012). However, in the current study, none of the case organisations actively collaborated with competitors at the time of the interviews being conducted. Hence, at this stage, collaborations with competitors are not implemented but are not excluded. In fact, recommendations and referrals to competitors working in the same sector but different catchment areas are common occurrences. Close dialogue and exchange with competitors can further help to ensure the higher quality and better value of the circular product. Table 6.4 shows some opportunities for collaborations with competitors, as well as the requirements needed.

Investigating how circular collaborations are managed revealed similarities with the influencing factors, as identified by different studies (see Table 2.19). Cross-contamination of the product and availability of material volume, quality, and quantity are not only factors considered when discussing CBMs, but remain present when linking, bonding, or bridging collaboration in relevant models are discussed. Furthermore, the study indicates the importance of facilitators in collaborative partnerships of any CBMs. As the findings suggest, facilitators have been seen by participants as actual business entities, bodies, institutions, NGOs, or charities. This result is in alignment with research from Dokter et al. (2019). A facilitator's main tasks are seen in tying loose ends together, using networking events or their developed network and knowledge. These facilitations take place independent of the circular level (micro, meso, macro). A facilitator can take over its role in a micro environment and facilitate linking relationships on a macro environment level.

Furthermore, the findings demonstrated that being a facilitator in a CBM means taking over a certain level of responsibility. With responsibility, however, often comes pressure. First and foremost, the pressure of understanding what members value, and second, to understand their issues immediately. The findings suggested that a tool aiding facilitators in setting up their bonding, bridging, or linking collaborative circular networks is technology. This is in alignment with findings of the focus group discussion, where participants discussed and concluded digital technology as a tool to enable circular partnership on all three levels (see Section 3.3.2).

In fact, recent studies have repeatedly stated that there is a gap in demonstrating the extent of (digital) technology favouring CBMI and collaborative aspects of CBMs (Pagoropolous et al., 2017; Bressanelli et al., 2018; Ranta et al., 2021). A recent study by Ranta et al. (2021) investigated value perspectives, still stating similar gaps, and urged investigations into digital technologies and their contribution to value and collaboration in CBMs. Therefore, this study further investigated the role of technology. In fact, one of the main findings of the study revealed that the role of technology is seen as a supporting tool in the transition phase from linearity to circularity. In doing so, a specialised focus is put on BM approaches, the product design phase, connectivity with partners, and product packaging. An unexpected finding was the focus on packaging materials and the application of technology. So far, the scientific literature has not discussed this matter. However, responses revealed that technology needs to focus on packaging development and usage, as it is an area of greater potential.

To further investigate the role of technology, interviewees were asked to share their current levels and applications of technology. A cluster of three categories emerged: technology as (1) communication tool, (2) tracking tool and (3) digital platforms. Comparing these findings with recent work by Bressanelli et al. (2018), who identified eight digital technologies functionalities, confirmed product design stages and the connectivity with customers and clients, beyond the point of sale, are important focus areas, respectively functionality areas.

Noticeable amongst the technology findings is a greater affinity towards social media platforms. Other platforms that are currently less in use but of greater interest are so-called digital platforms for exchange. These platforms allow byproducts to be uploaded and exchanged quickly, and maintain a growing interest amongst all interviewees. Although excluding online sales platforms, none of the case organisations was using such a digital platform for exchange.

The literature review in Section 2.6.2 identified policy and political regulations as influencing factors towards collaborative actions in any CBMs, as a third contextual factor. In fact, previous research claimed that circularity can be reached when organisations manage the complex interplay between institutions and organisations, on a policy level, in their CBMs (Ekins and Speck, 2011; Bleischwitz et al., 2012; Domenech and Bahn-Walkowiak, 2019). However, the collaborative impact of such legislation on collaborative actions in CBMs is lacking empirical research. Hence, this study investigated this gap.

To investigate the influence of political guidelines, all participants, independent of their headquarters location or countries of business activities, were asked about the extent of political influence on their CBM and circular partnership. The structure of international, national, and local policy emerging in the findings was consistent with the levels identified in the literature review in Section 2.6.2. Although international policy seemed generally less influential, organisations active in valorisation models claimed, as an exception, to be guided by international policies, such as the SDGs. All the other organisations stated that despite any popularity of the SDGs, these are not directly influencing their circular or collaborative actions.

This differed from the findings regarding European policies, as these replicated a mix of opinions. A slight tendency towards higher effectiveness of European policies was observed with start-up organisations, smaller technology providers, and NGOs. This suggests that organisations setting up a circular business consider political guidelines to a greater extent than well-established organisations on the market.

Furthermore, a strong awareness of national and local policies has been observed. Organisations active in Scotland or Wales referred to national policy strategies, as the ones identified in Table 2.22 of the literature review.

At the local level, the intensification of accreditations was unexpected. Among others, a strong focus appeared on the BSI standards. Despite being identified as helpful in achieving circularity and partnerships, concerns were raised about the standards hindering dedication toward sustainable action. The risk of the standards being misused as a tick box to receive an environmental accreditation is feared. These fears are confirmed by Pauliuk (2018) in his critical appraisal of BS 8001, where he wrote, *"The guidance on monitoring CE strategy implementation, however, remains vague. The standards stipulate that organisations are solely responsible for choosing appropriate CE indicators. Its authors do not elaborate on the links between CE strategy monitoring and the relevant and already standardised quantitative tools […]"* (Pauliuk, 2018, p. 81). He criticised the neglected link between CE strategy monitoring and standard qualitative measuring tools, such as life cycle assessment or material flow cost accounting, which, in his view, are unbearable when thinking of the long term. Furthermore, there is strong criticism of CE performance indicators (Pauliuk, 2018). Indicators need to be chosen by rigorous scientific measurements and assessments (Saiddani et al., 2018; Pauliuk, 2018). BS 8001, however, bears the entire responsibility to the organisations, not including any independent expert, as foreseen by the ISO 14040 standard for life cycle assessment (Pauliuk, 2018).

Investigating influencing factors in Chapter 5 and contextual factors in Chapter 6 allowed us to update the developed framework, which guides the research, in accordance with the findings. The revised framework is displayed in Figure 6.2.

Major changes refer to the display of CBMs. Collaborative action in the form of bridging and bonding activities is important and can be done in and beyond individual CBMs. As identified in Chapters 5 and 6, circular partners can include a greater variety than only suppliers, OEMs, and clients. Therefore, the box has been updated and is from now on identified as a *CBM collaboration*.

As the findings in Chapter 6 revealed, linking activities are predominantly with collaborative networks of an external nature, such as industry, policy, associations, or NGOs. These include a variety of partners, which, on the one hand, have been discussed as part of the literature review in Section 2.6.2, and on the other, have been identified in the empirical research undertaken in Section 6.2.

The diversity of political institutions (see Section 2.6.3 and Section 6.5) and the role of technology (see Section 6.4) have been identified as contextual factors believed to be contributing to the value-adding circular action in CBMs. This value conceptualisation is investigated in Chapter 7. As this research follows an abductive approach, the value conceptualisation has been updated and is now displayed in further detail in subsequent Chapter 7.

6.7 Chapter summary

In response to RQ2, this chapter contributed to filling the identified gap in empirical research investigating circular collaborative processes in CBMs. The main collaborative partners have been identified, as well as the role of technology in circularity identified as a supporting tool in the transition process from LBMs to CBMs and beyond. Policy influence has been investigated, showing that there is a bottom-down approach in which rules and regulations are more guiding, influential, and effective when cascaded down to the respective local level.

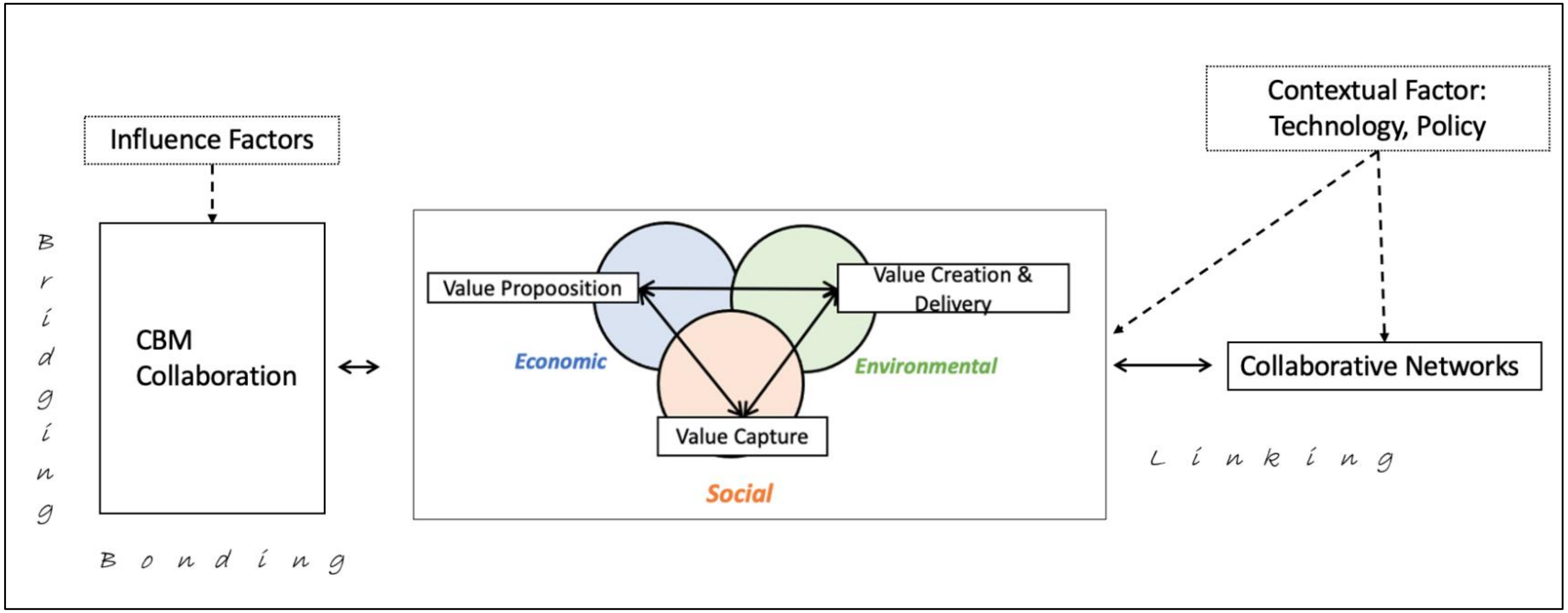

Figure 6.2 Updated Framework (Source: Author)

7 Value Conceptualisation and Measurements in Circular Business Models

Chapter aims:

a) To identify the value perspectives in CBMs
b) To connect the value perspectives with the sustainability pillars
c) To identify and understand value measurements in CBMs

7.1 Chapter overview

The purpose of this chapter is to conceptualise value and value measurements in CBMs. The literature review identified that value is vitally important for any BM. Osterwalder and Pigneur (2010) are famously known for their value canvas in the field of BM research (Figure 2.7). Hence, this study builds on Osterwalder and Pigneur's (2010) business model canvas and aims to identify the value perspectives of CBMs.

The business model canvas, originally introduced by Osterwalder and Pigneur (2010) and further developed by Bocken and colleagues (Bocken et al., 2015; Bocken et al., 2018), enjoys increasing popularity. The canvas was incorporated into the framework, which further developed as the research progressed. For instance, sustainability research often foregrounds the TBL values (economic, environmental, and social value). In the context of CBMs, the literature review identified that research is predominantly investigating the TBL values separate from the value perspective (Kristensen and Remmen, 2019). Therefore, this study aims to close this gap by identifying value perspectives and connecting them with TBL values.

In the boundaries of the value discussion, it was noticed that value measurements in CBMs are rarely addressed. Academic and grey research focuses solely on CE indicators rather than identifying unified measurements. Previous research by Manninen et al. (2018) identified a gap regarding the assessment of value creation in CBMs. Hence, the second half of this chapter will focus on closing the research gap on value measurements in CBMs.

This chapter is based on the empirical findings of the participating case organisations and sets the findings mainly in relation to the knowledge introduced in Section 2.5 of the literature review, as well as the updated framework (see Figures 3.3 and 6.2). In doing so, the chapter aims to answer **Research Question 3: How is value conceptualised and measured in Circular Business Models?** It will first introduce the findings of each value perspective (Section 7.2), before the TBL values are introduced and ranked (Section 7.3). In the second part of the chapter, the focus shifts towards the investigation of value measurements (Section 7.4). The chapter closes with a discussion, in which the two value sorts are being merged (Section 7.5).

7.2 Value perspectives

To analyse the findings, a deeper dive into the value perspective of BMs is necessary. Therefore, the researcher refers to the value framework (introduced in Chapter 3) and the value canvas by Osterwalder and Pigneur (2010) (introduced in Figure 2.7).

As guidance, Figure 7.1 illustrates the enlarged part of the framework's value perspectives. It indicates the four value perspectives (value proposition, creation, delivery, and capture) and their individual characteristics based on the business model canvas of Osterwalder and Pigneur (2010). For example, *Value perspective no.1: Value proposition* consists of the three value characteristics *people, planet, and profit.* As the study aims to connect these perspectives with the TBL values, these values are displayed in coloured circles in the framework (see Figure 7.1).

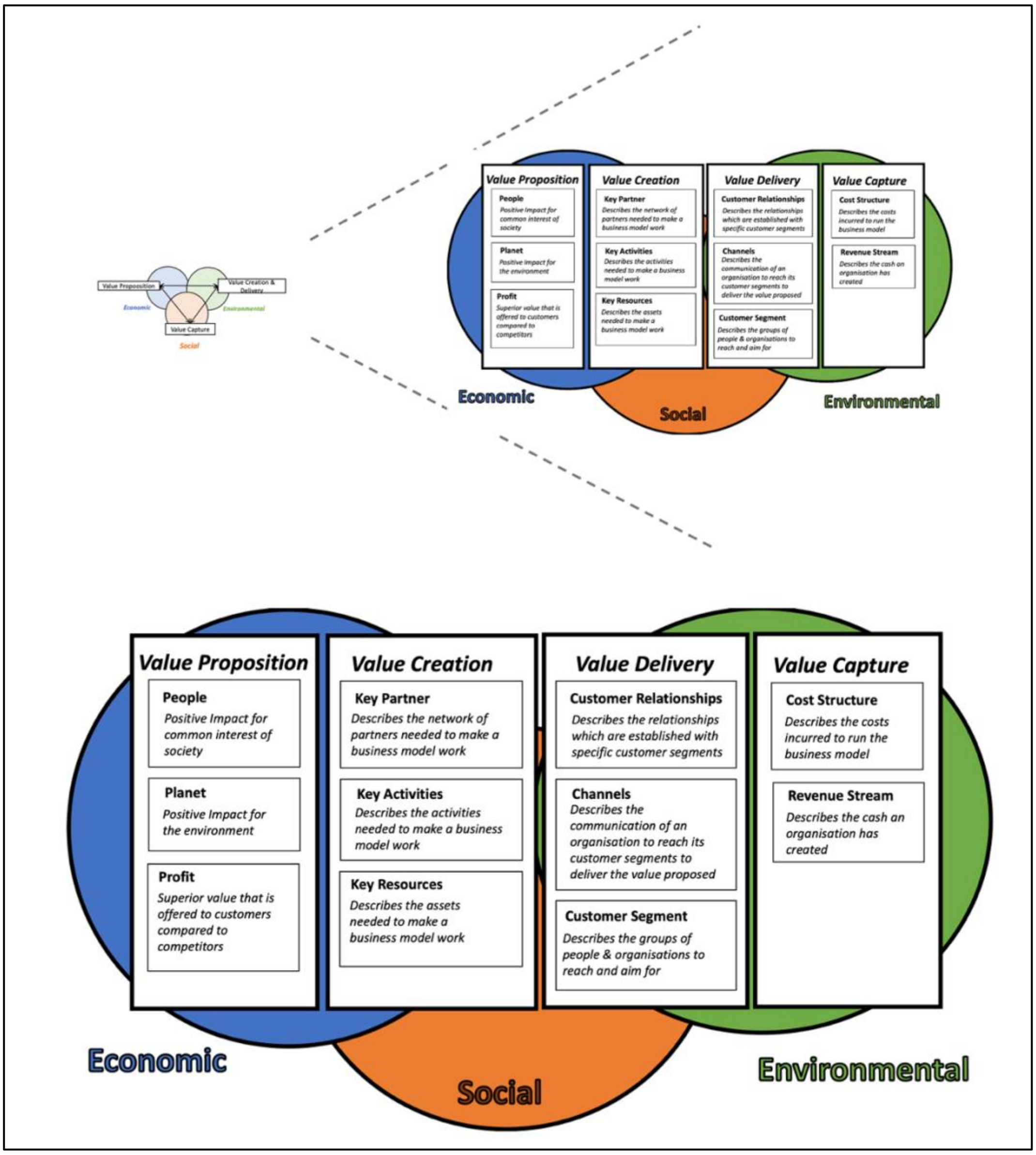

Figure 7.1 Enlarged Framework (Source: Author)

7.2.1 Value perspective no. 1: Value proposition

The first value perspective, *value proposition*, *"should describe the value of product/service, regarding its economic, environmental, and social aspects."* (Cardeal et al., 2020, p. 5). Therefore, it consists of three components: *people, planet and profit*. The following sections introduce the results of each component individually. A summary of the key findings is provided in Table 7.1.

7.2.1.1 People

"*People: positive impact for the common interest of society*"

(Osterwalder and Pigneur)

As positively impacting, society was mentioned throughout all CBMs, although there is a higher impact noted on CBMs that involve a social enterprise or are having bonding or bridging collaborations with social entities. The impact was described as able to connect closer to local partners and communities and, in doing so, contribute to their well-being. Sponsorship of local sports associations, or work with disaffected children, who might otherwise end up unemployed, are a few examples mentioned (OEM1). In other activities, organisations had an impact on the common interest of society by supporting school programmes (OEM1, OEM7). School classes are invited for on-site visits to provide insights into circular organisations (OEM1). The hope is to arouse the children's curiosity for the environment, but also for work experiences and apprenticeships in the field of CE. In addition, the design of specific eco-school programmes at which children are being taught about circularity is another value proposed (OEM7).

The diversity of the proposed positive impact on people became obvious when participants referred to the development and application of new technologies in local communities (SE3, NGO4). SE1 referred to its mission statement of *"community wealth through extending the life of materials."* (SE1). A few examples were given by social enterprises. The fight against digital poverty in the resource recovery model of refurbishment, via the refurbishment of digital devices and its subsequent distribution to people in need, was addressed (SE3).

Another example of the refurbishment model was given based on flooring in social housing estates. This includes the support of local councils by adequately equipping the houses in such estates. *"There is no obligation for a social landlord to put carpet down […] in this country, you need carpet, you need warmth"* (SE1). Hence, equipping social housing with refurbished flooring creates a positive impact on society.

Another positive impact referred to the societal work environment achieved. Being part of a CBM adds value to the cleanliness of workspaces. Public1 noted, since adapting the refurbishment model, *"nice vibrant environment—less cluttered, and less paper."* People are keener on chatting and engaging with each other due to workspace changes conducted as part of the transformation to a CBM.

Criticism of the value proposition perspective of *people* was based on the difficulty of its implementation process, which is often misinterpreted. Despite the value being proposed quickly, the main challenge is to identify and understand where the CBM could aid society, as well as to understand what clients or the public truly value, respectively, their long-term aims (NGO3).

7.2.1.2 Planet

"*Planet: a positive impact to the environment***"**

(Osterwalder and Pigneur)

For almost all CBMs, resource efficiency is key. *"Using the resources that are available in a better, more efficient and sustainable way"* (NGO2) was a common response amongst participants. Hence, thoughtful material selection in the SC is a key element of the value proposition process. First and foremost, it is important to use materials that can be kept in the loop for a long time (NGO2, WSP1). In addition, the wishes and demands of clients need to be considered. OEM5 shared that their clients prefer materials and feedstock that are reusable. In this regard, the origin of the selected material is of great importance. CBMs are seen as an opportunity to satisfy the demand for more domestic material rather than imported raw material (OEM5).

Other positive impacts listed, especially in resource recovery and product life extension, referred to the saving of office material, such as reduction of paper usage (Public1) or the sustainable handling of material on site, which reduces CO2 emissions due to a decrease in transport methods (OEM3).

The model of valorisation appears to demand the most changes to the environment and society. A value proposition is achieved by attracting a dietary change in society and by reducing the damaging impact of the feed system on the environment. In valorisation models, food waste, which in earlier days was used as animal feed, is nowadays kept in the loop. Complementary dietary changes in society (i.e., reduced meat consumption, more organic products) led to a variety of organic replacements, prioritising plant-based or fermented food alternatives (OEM4).

7.2.1.3 Profit

"*Profit: superior value that is offered to customers compared to competitors*."

(Osterwalder and Pigneur)

In this value characteristic, NGOs, in the form of charities, claimed to have an advantage. Services free of charge, a huge network of clients, and strong commitment from involved funders were listed as superior value available for clients (NGO2). Other business entities named the understanding of the value propositions of customers as a superior value that differentiates them from competitors. Specifically mentioned was the skillset of precisely listening to customer wishes (OEM1 and 2, WSP1), and in the follow-up, to bring into account the expertise about material knowledge and material travelling (WSP1) was mentioned in resource recovery and product life extension models. Therefore, it is vital to understand what value is in the marketplace and how it can be used to provide superior value to customers. An explanatory example was provided based on refurbishment models. So, refurbished furniture could be used at construction sites, where the product life of furniture is shorter, and the client's financial expenses are lower, or refurbished furniture could be used for another client who values the product more highly, and the product life is longer (OEM2). Nonetheless, it is important to understand the different markets of the CBM applied (OEM2), but equally the characteristics that clients value (NGO3), too.

Another superior value is product price in resource recovery models. A refurbished product costs a fraction of a new product. Both case organisations active in the refurbishment sector stated that any refurbished furniture is sold cheaper than their non-refurbished counterparts, but quality levels are the same. For instance, a refurbished chair has the same functions and therefore provides the same quality as its non-refurbished counterparts, as springs and other essential parts undergo a quality check and are replaced if necessary (OEM1). SE1 argued similarly with flooring. The price of reused flooring tiles is significantly cheaper, although the quality is equally the same. Hence, the product prices of circular products are considered as a basis for opportunities (SE1).

7.2.1.4 Summary

The emphasis of this value perspective focuses on value proposed to or achieved by *people*, *planet,* and *profit.* People value is achieved by considering communities to a greater extent. In that regard, the emphasis has been on local communities, as well as the educative support of local schools and societies.

Contrary to the value of *people*, which appears to focus more strongly on local society in the CBMs of resource recovery and product life extension, the value of the *planet* extends its focus to the entire society. Valorisation models aim to create high value by proposing value by change. Diet and its impact on feeding systems via CBMs creates value for the environment. In addition, a strong emphasis was on material procurement, selection and usage. In that regard, a special focus is placed on keeping materials in a cycle.

Value proposed based on *profit* emphasises the importance of customer and market understanding. The knowledge of market and consumer demands has been criticised as often underdeveloped or misinterpreted. For a CBM, however, said knowledge is important in the value proposition process. Table 7.1 provides a summarising overview of the key findings of this value perspective.

Key findings **Value Perspective No. 1.** **Value proposition**
People *(described as a positive impact for the common interest of society)* <u>Communal support</u> - sponsorship of local (sport) association - support of local communities (i.e., tackling technology poverty) <u>Educative support</u> - support of (Eco-) school programmes - site visits - offering job prospects in the sector of CE <u>Office and shop floor environment</u> - cleaner, more efficiently used workspaces - more interaction with colleagues - raise in well-being rates
Planet *(described as a positive impact for the environment)* <u>Material procurement, selection, and usage</u> - origin of material matters (less imported material and more local material usage) - less paper-based approaches - emphasise on material cycles - CO2 emission savings due to material being processed on site <u>Fostering changes in society</u> - (triggering) dietary changes in society - change of impact on feed systems (i.e., reduction and usage of food waste)
Profit *(described as a superior value that is offered to customers compared to competitors)* <u>Service capabilities</u> - services free of charge - benefits of using already-existing networks - strong commitment from involved funders <u>Skills offered</u> - understanding of the value propositions of customers - expertise in material knowledge and material travel streams

Table 7.1 Key Findings Value Proposition No. 1 (Source: Author)

7.2.2 Value perspective no. 2: Value creation

The second value perspective: *value creation* consists of three components: *key partners*, *key activities*, and *key resources*. The following section introduces the results of each component individually. A summary of the key findings is provided in Table 7.2.

7.2.2.1 Key partners

> **“***Key Partners: the network of partners needed to make a business model work***”**
>
> (Osterwalder and Pigneur)

The value creation process was referred to as being able to adapt to key business partners. Experiences were shared about how quickly business partners can change and how new circular options appear. This included examples such as changing markets from private to public sector (OEM1) and cross-industrial initiatives, for instance, in valorisation models (NGO4).

Realising how beneficial and valuable partners can be for any CBM opened minds in the search for linking networking possibilities. Experiences were shared from the recycle model of WSP1. As their CBM is still in a testing phase, it is important to select the right partner and to keep a watchful eye on the feasibility of the infrastructure of the CBM. “*I don't think we are going out, collecting bags from every household on every corner in the UK. That infrastructure would just make that far too expensive"* (WSP1, Int.1). Instead, being flexible and making use of *"local networks under a national branded scheme"* (WSP1, Int.1) aids in the value creation process.

The value created is expressed as bonding and bridging partnerships of organisations that follow a similar (bridging partnership) or the same CBM (bonding partnership). OEM2 stated that they are happy to recommend a social enterprise 200 miles away to their client, *"as long as there are strong ethical and sustainable principles in the recommended organisations"* (OEM2).

Most interestingly, participants were not only addressing the search for the *right partner*, but were also considered to be the *right partner* for a CBM in general. In that regard, communicating internal values and regulations to external parties aided in being an attractive linking circular partner. It appeared that organisations select each other as linking circular partners because they follow similar (social) aspects (OEM1, Int.2).

Following similar aspects or even applying the same CBM allows an unexpected opportunity to grow, the opportunity to see possible competitors as key partners in the value creation process. As this topic collides with the collaborative actions of CBMs, further details about collaborative actions with competitors were introduced in Chapter 6 (see Section 6.2.7).

Once established, the availability and effort of partners is critical for the value creation process. OEM2 emphasised this in explaining that their partners need to be able to take a certain number of refurbished products in a short period of time to make the refurbishment model successful (OEM2).

As additional value-adding partnerships, all investigated CBMs referred to local charities, schools, universities, or research centres (NGO1, OEM1, OEM2, OEM4, Public1, WSP1). NGOs were described as a particular popular linking circular partner when describing the need to measure environmental guidelines (i.e., CO2 emissions). *"An NGO brings the necessary expertise in providing a clear way forward on how to find markers and measure those"* (OEM1 Int.1).

Other options referred to bonding and bridging partnerships with local organisations that might be able to accomplish the circular work or product. OEM1 stated having a bonding partnership with a local social enterprise specialised in the refurbishment of indoor flooring. As both organisations are active in indoor furniture flooring refurbishment, their work accomplishes.

Furthermore, chartered institutes, which encourage and facilitate the search for local collaborative partners, were emphasised as value-creating linking facilitators for all CBMs. Local partnerships (at all three levels) reinforce value directly to the local economy (NGO3, OEM1, WSP1), not least because of easier material procurement (NGO3, OEM1, WSP1, SE1). Local agencies are considered helpful linking partners in the founding stages of circular business entities (SE1, NGO2). However, hiring agents or environmental consultants can be an expensive endeavour (Tech2, NGO2) – "*What would be needed to create a synergetic sort of industry hub that connects certain industry types and would work well together. How much that would cost, how much time it would take to set this up, and how you could set it up in a modular fashion, so it could grow over time once you have established a solid business case. So that was getting quite exciting"* (NGO2).

Another problem was the impact of local councils. Rules and regulations set up by local councils can be helpful but equally hindering when clients are incapable in their implementation. This was particularly mentioned in the Resource Recovery Recycle model. A solution to address this problem encourages the promotion of a greater network between textile collectors/-sorters with governmental bodies. Ultimately, to share the necessary insights from different perspectives (Tech1). However, internal organisational rules can often lead to frustration and disappointment instead of a value-creating network of partners. *"We had a few instances or examples where we realised actually this company would really benefit from working with each other. And then, when getting them in touch. You can see that they're working in different ways, at different speeds and with different priorities, so they don't always match, and it's very hard to make them meet in the middle somewhere."* (NGO2).

One of the wishes expressed throughout the investigated CBMs was the creation of a synergetic industry hub that can establish bridging partnerships amongst different industry types. Providing the opportunity to reach out to each other was one of the ideas that would help organisations develop these valuable key partnerships. However, working in these synergetic partnerships requires crossing boundaries and a willingness for collaborative networks (NGO2).

As the topic of key partners collides with the collaborative aspects of circular actions, the individual partners were investigated in Sections 6.2 and 6.3.

7.2.2.2 Key activities

"*Key Activities: the activities needed to make a business model work***"**

(Osterwalder and Pigneur)

NGOs and OEMs appear to have different key activities in the value creation process. NGOs consider their role as linking facilitators in CBMs. Therefore, key activities referred to supporting activities, as NGO4 explained, to focus particularly on the bio-economy side in finding appropriate technologies and identifying suitable circular material for their clients. In doing so, an emphasis is put on linking partners, such as local areas and local markets (NGO4). Other activities listed referred to the service of gathering and comparing the options that clients have with their material or product, and accompanying clients throughout the delivery stage (NGO1, NGO4).

Interviewing policy institutions revealed that their linking value-adding activities find stronger reception when **advice is tailored to individual needs**, rather than generic information offered to everybody. *"It is better to get a voluntary initiative and cohorts of people doing the right thing in a particular sector and then very tailored advice can be provided, as opposed to just free-for-all generic advice to all"(*Gov1, Int.1).

Technology organisations working on digital platforms to share byproducts said that it is key to sell the benefits of being registered with their platforms to clients. However, that can be a tedious process, since registration fees are included and clients either back off or want face-to-face meetings, which often do not add up with regards to the costs of travelling and time spent (Tech2).

OEMs referred to a whole set of other value-adding activities. The following paragraphs describe examples provided by at least one interviewed organisation. To begin with, employees must **understand the circular vision**. WSP1 mentioned its eagerness to ensure that every single employee has understood the vision of the organisation and which aims they are working towards (WSP1, Int. 2).

Renting out space that is not needed to an external organisation was listed as bridging value-creating activity. OEM5 stated that they are looking for ideas to create a hub with office space that is used by them. In that way, other organisations in need of office space would have an opportunity. In an ideal circular world, Hub users could support and benefit from each other, almost already building a CBM themselves (bonding activities). These hubs were also introduced by NGO2, who stated that this is an opportunity to connect different industry types with each other and work in a circular way (bridging activities). However, it was also mentioned that setting up such hubs raises the questions of costs, time, and layout, which allows continuous growth over time (NGO2).

Lobbying in CE is understood as an important bridging and linking activity that creates circular value (WSP1, Int. 1). Furthermore, it is important for organisations to be first movers and *"be ahead of the curve in this movement"* (WSP1, Int.1). Besides lobbying activities, regular circular **audits** have been identified as a bonding value-creating activity to gain a better understanding and usage of circular products. Audits can foster internal multiple reuses (OEM2).

Ensuring the scalability of circular products has been identified as one of the key activities across all investigated CBMs (OEM1, OEM2, OEM6, SE1, NGO2, WSP1). In that way, it seemed essential to understand what clients want from a procurement perspective (OEM2). A clear dialogue with clients and the option of sharing best practices with other organisations and mapping out circular actions in the region have been listed in this context as particular bonding activities (OEM1, OEM2, SE1, NGO2).

Creating **networking opportunities** of all natures (bonding, bridging, linking) is an important value-creating skillset required to establish and broaden CBMs (OEM1, Public1). In doing so, **online and offline presentation** of circular products is not to underestimate. However, to their disadvantage, circular products are often not adequately displayed online. *"You could see a sad, blue operator's chair in a warehouse and you'll always look at that and think you're buying someone's waste"* (*OEM2).* To avoid this, it is necessary to inform clients and customers about the true value of circular products. This includes informing about potential flaws that the product could include. *"It is very, very important, the organisations do need to embrace it [annot. flaws] and understand that a remanufactured product isn't perfect. […] So, for instance, some of the modesty panels had holes in them, drill holes where there had screws gone in. And, of course, they weren't in the same place when you put them back together. And they [annot. our customers] thought, well, look, that's great it gives it a bit of character"* (OEM2, Int.2).

At the same time, acceptance and understanding of clients that refurbished products are not perfect is required (OEM1, Int.2). In that light, the importance of brand reputation and brand identification from a customer perspective was shared (OEM4).

Other listed value-creating activities included the promotion of **leasing** rather than buying models and adequate **data maintenance**. This was addressed by keeping a database about the circular products and offering, were possible, warranty options (OEM1, Public1).

7.2.2.3 Key Resources

"*Key Resources: assets needed to make a business model work***"**

(Osterwalder and Pigneur)

Management and sector support was described by many organisations as a crucial resource needed to back up circular activities. However, passion at the top management level needs to be combined with the passion and openness of ground staff and shop floor members to make a final difference (OEM3, Int.1 and Int.2). It is observed that most CBMs are inspired by individuals in the organisation to run them. If these experts leave the organisation, there is a gap to fill (OEM2, OEM5, NGO2) – *"if you have the right individual in an organisation, you have the right mindset* "(NGO2). Start-ups and smaller organisations argued similarly. What is described by bigger organisations as top management level support is, for smaller organisations, the support of the sector in general. *"We were a little bit disappointed after our studies to see how architecture really is, and we wanted to do things a little bit differently and try to be positive, take care of each detail of the process, and be careful that there is no waste. It's like how you can connect all these little dots, which are today not connected, to make a beautiful loop."* (NGO8)

Service provision and support for bonding, bridging, and linking partners is another resource in the value creation process. Equipment and technology ready to fulfil design wishes are required (OEM2). In doing so, strong (local) networks and bridging partnerships were identified as assets that are needed, especially in resource recovery models, such as recycling (WSP1).

Smaller organisations rely on the individual support and permission of local business entities to make their CBM happen. The two case organisations active in the architecture sector independently indicated that local coffee shops and pubs are a valuable bridging partner, as the by-product used in these upcycle models is collected from the partners on a weekly basis. *"We collaborate with many coffee shops. So they collect it. And once a week we come, and we take it and, we have organisations sometimes that give us a lot in one. But our regular supplies come from coffee shops or markets, or things like that. Sometimes, we go for them, sometimes they contact us, so it's a bit like this. A mixture. An unspoken collaboration. We don't have... I think there are happy to have us because, actually, I think they pay something to get rid of* *this waste, and we do it for free."* (NGO8). A similar example was given by OEM10: *"And they cared, and they became really good in selecting these bottles because they knew I was coming every week. And one day I had made a panel—like a big one—and I came, and I showed it to them and said, "By the way, these are bottles from your pub that you have helped me with." And they were so excited about it and they were so proud" (OEM10).*

Another resource emerging was certificates provisioned to clients. For instance, SE1 explained that offering clients a certificate with regard to the embedded saved carbon was very useful. Patents on any specific circular technology that organisations have developed (OEM6, OEM7) as well as any environmental certificates, i.e., BSI or ISO standards, gained by the organisation were described as essential assets that bring value to the organisation (OEM1).

7.2.2.4 Summary

The emphasis of this value perspective focused on value created by *key partners*, *key activities*, and *key resources.* Value creation via *key partners* emerged as a wide topic. Identification of the right partners is essential when aiming to create a valuable CBM. The variety of partners listed, aiding in the creation of value, is immense and has been addressed additionally in Sections 6.2 and 6.3.

Viewpoints of *key activities* interestingly varied based on the perspective taken. NGOs traditionally considered their task as being a linking facilitator on the micro, meso and macro levels for any CBM. Hence, searching for suitable clients and material, as well as being an accompanying facilitating partner for newly established CBMs, were stated as value-adding activities. OEMs, on the other hand, identified their value-creating activities as more of a bonding nature by connecting to the successful running of a business. This included, but not exclusively, points such as lobbying, development of circular working hubs, scalability, adequate presentation, and networking opportunities.

Key resources were identified as support from the top management level, respectively the sector. This included collaborative activities with bridging partners to procure the byproducts in the first place, but also possible certificates that have been achieved or are provided to customers to verify the actions in the CBM. Table 7.2 provides a summarising overview of the key findings of this value perspective.

Key findings Value perspective No. 2. Value creation
Key partner *(described as the network of partners needed to make a business model work)* Partnership/ Collaborative networks - Identification of the right partners - Adaptability and flexibility towards key partners - Ability to be the right partner Circular business model collaboration - Recommendations in the same or similar CBMs - Accomplishing an existing CBM Specific partners - national branded scheme - schools, universities, research centres - charities - (environmental) agencies, NGOs - local political institutions (i.e., local councils)
Key activities *(described as the activities needed to make a business model work)* Production and product-related activities - to ensure scalability of the circular products - to ensure appropriate presentation and marketing of circular products - warranty options for products - data bases of circular products - regular audits - promotion of defined CBMs (i.e. promotion of leasing) External supportive activities - Accompanying organisations at all stages of implementing a CBM - Support in finding suitable technology and suitable material Staff-related activities - employees need to understand the circular vision - lobbying - usage of networking opportunities Organisation-related activities - being a first mover - transparency about positions and relationships taken - sharing of best practices cross-industrial - appropriate usage of office space (i.e., renting out office space)

Table 7.2 Key Findings Value Perspective No.2 (Source: Author)

Key findings Value Perspective No. 2. Value creation
Key Resources *(described as the assets needed to make a business model work)* Equipment - Machines - Certificates - Patents Human resources - Individual members of staff who drive the change Management - Top management level support - Local networks

Table 7.2 continued Key Findings Value Perspectives No. 2 (Source: Author)

7.2.3 Value perspective no. 3: Value delivery

Based on Osterwalder and Pigneur's (2010) model, the third value perspective: *value delivery* consists of three components: *customer relationships, channels,* and *customer segment*. The following section introduces the results of each component individually. A summary of the key findings is provided in Table 7.3.

7.2.3.1 Customer relationships

> **"***Customer relationships: the relationships which are established with specific customer segments.***"**
>
> (Osterwalder and Pigneur)

Talking about this specific value, most interviewees described how to set up customer relationships in the first place and all the difficulties that come with it. In doing so, it is not only about relationships with businesses and the public. Considerable effort is needed when establishing linking relationships with policy institutions (WSP1, Int.1). Most examples, if not stated differently, refer to customer settings in a B2B environment. A general understanding of the other party and their (work) processes is essential when aiming to deliver value via customer relationships. Value is delivered when both parties understand "*how they fit in a modern world"* (WSP1, Int., 1). When establishing these relationships, facilitating linking partners stated their role as the lynchpin connecting all different parties together. WSP1 stated that, on a regular basis, they are approached by customers seeking help when a circular product should be launched or when resistance towards the circular product (or material) is experienced. Occasionally, they are approached when customers aim to learn more and improve their knowledge about products and materials (WSP1, Int.1).

Using the customer's voice as a critical partner when identifying the circularity level of the actual model was another point raised (WSP1, Int., 1). Particularly in the starting phase, continuous conversations and communication are needed to further tighten the relationships (WSP1, Int., 1).

Often customer relationships in a B2B setting are established in informal settings, for instance at events – *"You're speaking at an event, and somebody asks you that they've got a lot of fish byproducts and what can they do […] I work with that sector, so I know of some technology providers that might be of interest […]. […] sometimes it's* *a bit of an unofficial kind of link or sometimes if we don't have any kind of thoughts on, we'll kind of fire that out to our different partners and ask them*." (NGO4). By establishing these relationships, either as a linking facilitator or as a bonding and bridging partner of the CBM, the value delivered via these cooperation ships is made immediately visible (NGO4).

In another example, a growing and strong business relationship was claimed in the atmosphere created in the circular network. Vital abilities, such as openness, respect, and honesty, are reflected in a mutual understanding of how partners are working and what their needs, standards, and level of requirements are. Public1, as a customer in this CBM, values that *"they [annot. the circular partners] listen to what we have to say"* and *"they know when they come into our environment, they have to abide by our working rules"* (Public1).

7.2.3.2 Channels

"*Channels: the communication of an organisation to reach its customer segment to deliver the value proposed.*"

(Osterwalder and Pigneur)

A broad variety of answers were given regarding the channels applied. The answers are introduced in the following sections.

To begin, **cooperative marketing strategies** with any circular partner were named. WSP1 explained that their marketing strategy is essential when aiming for any CBMs. In that regard, a cooperative marketing strategy is considered a useful channel to reach out to clients. Advantages are seen in the collective approach amongst partners for advertisements, promotion, and branding toward circularity (OEM11, WSP1).

Events, market fairs, and exhibitions have been named as channels to aid in value delivery. NGOs supporting clients in realising CBMs stated that speaking at events is a medium of communication and does help in approaching new clients, as well as being approached by potential new clients regarding support requests (NGO1, NGO3, NGO4). Conversations at these events can often lead to bonding, bridging, and linking partnerships, since recommendations of partners can be made immediately and at a personal level (NG04). In the refurbishment model, similar experiences of networking events were shared. *"It was possible to share the success story with others and ultimately attract new clients."* (OEM1). Another opportunity to communicate was stated as simple email contact. NGO2 explained that it is quite common to reach out for clients and vice versa when attracting value for a CBM.

Another value-delivering channel is seen in **charity work**. Charity work is essential when aiming to communicate and send the message of circularity (OEM2, OEM4). OEM2 shared a proactive approach to the refurbishment model. They went out to their cooperating charities, well in advance, asking what sort of refurbished product would be helpful for them and creating a wish list. In doing so, they were able to redirect refurbished products that were no longer planned to go to the client to charities.

Slightly different, but still with the aim in mind of delivering circular value to the customer segment, was OEM4's approach in the model of valorisation, by supporting and collaborating with a charity related to circular food issues. *"Well, I guess food waste, as an issue at that time had been, it was quite high profile, relatively speaking, in people's minds. The charity [annot. name anonymised], had kind of been the pioneers of talking about it as an issue and when we launched it was on prime-time TV, well-known guests talking about it as an issue* (OEM4).

(Commercial) **Online platforms** and other online tools have been addressed by a variety of CBMs. Online platforms have been a common way of communicating and reaching out to existing partners (OEM2, SE1). OEM2 explained that their own online customer portal runs well, and customers are shopping for refurbished products as they would for non-refurbished products. Apart from online platforms, web presences have been generally mentioned as a helpful communicative tool (NGO1).

In addition, **social media** was addressed as a communicative tool to reach customers (OEM1, OEM2, SE1, OEM4). However, in the refurbishment model, it mattered how social media was used. An example was given, only posting the refurbished product would not receive as many views, compared to a posting that included information about sustainable practices (OEM1, Int.1). OEM4 praised social media as a multi-faceted tool. On the one hand, value is delivered by using it as a communication channel; on the other, it is used as a data analysis tool. *"We use social media quite heavily. And really work and take the analytics and lessons from that, to help us to adapt what we're doing, and use it also in the other direction. So, use those* *communication channels to communicate with customers about what we're doing and educate people to an extent about some of the issues. To take one of the emerging techs that we're working on is this idea of consumers being able to engage more deeply in the products that they're buying"* (OEM 4).

Environmental accreditations are communicative tools aiding in delivering value to clients. Once gained, these accreditations are a big support since they can be taken as official approval (OEM2, Tech1).

Despite their simplicity, meetings with clients have been stated as a helpful way of making sure to deliver the value proposed to clients. Discussion in terms of wishes, demands, and visions about circular products can in this way be expressed, realised, or modified (WSP1, OEM 1, OEM9, NGO1, NGO3).

7.2.3.3 Customer segment

"*Customer segment: the group of people and organisations to reach and aim for*"

(Osterwalder and Pigneur)

This value can be seen as twofold. It includes the partners in a CBM and the customers to whom the circular product is sold. In addition, considerations about the market (B2B or B2C) need to be considered. Hence, selecting the appropriate people and organisations to ultimately deliver value is essential. Therefore, exchange with potential clients and a general understanding of their organisational hierarchy, product and byproduct streams is vital.

An example was shared by SE1, when describing that they originally aimed for the private market. However, being active in a niche area, they started to aim for public or local authority markets that combine the TBL values *"to satisfy an economic need, social well-being and environmental benefits"* (SE1).

Cross-industrial collaboration and reaching out to potential customers or clients outside the own sector is not new. OEM5 shared an example, in which they are aiming to establish office hubs for organisations outside their sector.

7.2.3.4 Summary

The emphasis of this value perspective focuses on value delivery by *customer relationship, channels,* and *customer segments.* Value delivery via *customer relationships* is possible if mutual understanding, as well as honesty, respect, and ethical behaviour, is shown.

Channels, aiding to deliver value to customers and clients in CBMs, compromise cooperative marketing strategies, events and exhibitions, charity work, and environmental accreditations. Furthermore, social media maintain an unsurprising growing role in the value delivery process.

Value delivered via the component of the *customer segment* has rarely been addressed. If at all, cross-collaborative actions were explained as an emerging opportunity. Table 7.3 provides a summarising overview of the key findings of this value perspective.

Key findings **Value perspective No. 3.** **Value delivery**
Customer Relationship *(described as the relationships that are established with specific customer segments)* <u>Differentiation of customers</u> – Recognising the different customers is important for the value delivery process – Being approachable for all customers and partners in the value chain <u>Understanding each other</u> – Mutual understanding of each other – Honesty and respect in relationships – Be a linking partner or facilitator – Critical Relationships to drive improvement
Channels *(described as the communication of an organisation to reach its customer segment to deliver the value proposed)* <u>Marketing</u> – Development of joint marketing strategies – Events and fairs – Web presence – Social media <u>*Charity work*</u> – Support of charities with monetary incentives – Support of charities with creative ideas <u>*Environmental accreditation*</u> – Certificates for customers – Certificates gained by the organisation <u>*Communication*</u> – Regular meetings with customers and partners – (Commercial) Online platforms
Customer segment *(described as the groups of people and organisations to reach and aim for)* <u>*Cross-industrial collaboration*</u> – Collaborative actions with organisations from other sectors <u>*Public market*</u> – Stronger usage and focus on the public market <u>*Management*</u> – Top management level support – Local networks

Table 7.3 Key Findings Value Perspective No. 3 (Source: Author)

7.2.4 Value perspective no. 4: Value capture

The fourth value perspective: *value capture* consists of two components: *cost structure* and *revenue streams*. The following section introduces the results of each component individually. A summary of the key findings is provided in Table 7.4.

7.2.4.1 Cost structure

"*Cost structure: the costs incurred to run a model***"**

(Osterwalder and Pigneur)

Capturing value created by looking at the cost structure of running a CBM was not one of the predominant topics addressed. In fact, for most CBMs addressed, the material costs of running a CBM are very low. Any material is received as byproducts with discounts (mostly in refurbishment models) or if applicable, free of charge from other organisations (resource recovery models: valorisation, recycle, upcycle) (OEM1, OEM9, OEM10, OEM11, OEM12, SE1). Particularly with resource recovery models of valorisation and upcycle, supplying partners are relieved to have the material disposed in a cheap and cost-effective way. *"It's interesting to work in a business that recycles because the raw material is kind of free—it's not free because we need to collect, but it's like really cheap compared to woodwork or something like that. So, from nothing, you almost create value."* (OEM8). *"We end up working with waste management companies and brokers. We're very specific about the types of material that we source to get the product." (*OEM9)

In addition, cost-saving calculations are considered another form of capturing value amongst CBMs. Linking facilitators shared, it is not uncommon for clients to expect such cost-saving calculations. Showing them the cost savings to justify when to keep the material in the system or when forward it to landfills (NGO3).

7.2.4.2 Revenue streams

"*Revenue streams: the cash an organisation has created***"**

(Osterwalder and Pigneur)

Cash and revenue streams emerging from CBMs have often been addressed as the creation of communal assets (OEM2, SE1). There is no doubt that a business needs to create cash from any material it is processing. However, there is a strong sensitivity to looking at byproducts as an asset. An asset that many organisations are throwing out, or considering as non-reusable, while in truth it can create wealth in a different form. In addition, further using byproducts puts the revenue stream category on a new level, as it unlocks social value aspects, such as job creation and communal benefits (SE1, Tech1).

Value captured in the form of created revenue streams was explained based on a current example in the fashion sector. Clients of Tech1 are caught in a downwards spiral; as current textile quality goes down, partners (and end consumers) pay less; however, the volume of textile on the market steadily rises. A new legislative action bringing in mandatory clothing collections for retailers is seen as problematic. It is feared that textile collectors need to deal with higher amounts of textile, but worse in quality. A smart, circular solution that can help retailers and collectors to ease in with regulations without economic loss is aimed for (Tech1).

From a SC perspective, Public2 explained that before applying a CBM, their waste was disposed in normal waste streams. Unavoidably, this created costs to cover with regard to landfill taxes (Public2). As their new CBM treats byproducts on site, value is now captured in the form of saved transportation costs and landfill cost savings. Nonetheless, a minor disadvantage revealed is that treating byproducts on site requires more storage space, which must be economically considered (Public2).

Such cost savings as a value capturing method appear to be popular amongst all CBMs, as case organisations shared their experience. For them, material costs are kept low, since their suppliers considered it as a waste, and welcome the opportunity to dispose of the material in a cost-effective manner: *"It was a no brainer of a door opener"* (OEM1, Int., 3) *"Since the material appeared in a good condition, there was no reason to think why the product could not have a second or even third life"* (OEM3, Int.3). This attracted interest from a more comprehensive model of valorisation – *"cost curves of producing alternative food products, particularly as an ingredient in processing food, have come down significantly"* (OEM4). A development has been noticed, which raises hopes of making plant-based alternatives more cost-competitive to animal products over the next 10–15 years. This would ultimately mean a huge change in the entire sector (OEM4).

The diverse interpretation of revenue created was made obvious by Public1. They described the revenue as having transformed the way an authority works. Newly created space provides an option of cost savings plus new collaboration options. For instance, a capacity of unoccupied rooms and office spaces is rented to local organisations, generating income for Public1 in return. This fosters bridging and linking activities throughout the network.

The creation of new revenue streams can make a tremendous difference to a company when trying to survive on the market. NGO2 shared an example where one of their clients knew their main products were going to lose value over time on the market. In fact, market pressure was so high that there was no possibility of selling it at the same price in the near future. NGO2 suggested the new idea of using the product in a circular valorisation model, which ultimately created a new revenue stream for the client (NGO2).

7.2.4.3 Summary

The emphasis of this value perspective focused on value capture by *cost structure* and *revenue streams.* The findings convey the impression that value capture is not a prioritised value in any CBM. Organisations have rarely focused on the *cost structure* of a CBM. In fact, it appeared that costs are a confidential topic and only start-ups or SMEs that receive their products almost free of charge revealed this as a value capturing point. The focus is unsurprisingly stronger on the cost-saving aspects rather than on the costs incurred to run a model. Revenue streams are addressed in a broader variety. However, it still appears that it is more driven by cost savings than the open mindset of revenue creation. The interpretation of generated revenue streams was broad and included different approaches, such as material reuse or new usage of office space.

Findings **Value perspective No. 4.** **Value capture**
Cost structure *(described as the costs of running the business model)* <u>*Material procurement*</u> - Material procurement is often free of charge since it is considered to be waste
Revenue stream *(described as the cash an organisation has created)* <u>*Cost savings*</u> - Landfill cost savings - Production cost savings <u>*Additional revenue*</u> - Renting out office space

Table 7.4 Key Findings Value Perspective No.4 (Source: Author)

7.3 Triple Bottom Line Values

This section focuses on the TBL values of economic, social, and environmental value. Findings of each value are introduced before looking at the ranking of the TBL values in CBMs.

7.3.1 Economic values

Economic values are still assumed to be one of the most important driving factors. Organisations of all CBMs appear to prioritise economic values, such as scalability and costs. NGO4 explained that their driving factor is still financial, aligning with their vision statement. Their purpose is to support clients in receiving funding for CE. Hence, rather than anything else, they want *"to see the business standing on its own two feet"* (NGO4). The interviewee elaborated, *"The way we operate is that the actual monetary economics probably have a higher weighting in this scenario. Therefore, we monitor the potential value created and then, down the line, if a business is successful, we'll look at the actual value"* (NGO4).

An interviewed funder revealed the importance of economic value. Financial support is provided to applicants. However, business figures and goals are part of the evaluation process and need to be revealed. Potential cost-cutting issues on the side of the funders make the decision process more stringent and decisive in terms of whom to support (Gov1, Tech2).

Economic value also meant the necessity of having an overarching economic model independent of the CBM, background, or size of the organisation (SE2). An economic model helps to keep the business idea running and avoids unnecessary costs. The versatility of economic value becomes apparent in the repair model. SE2 receives decommissioned equipment as donations from other businesses. While the business entities themselves save disposal costs, the social enterprise saves material costs and their clients the acquisition costs when choosing a repaired product. Particularly, the latter point was echoed by refurbishment model partners. *"The price of our reused product is a fraction of the price of a new product. So, we work very much on that basis."* (SE1). Similarly, *"They're not having to pay for a top dollar price for a brand-new product." (*OEM1, Int.1).

Customers of both markets (B2B and B2C), value to a great extent the economic value (SE1, NGO3, Public2). Particularly, online customers in a B2C environment look after the economic value of price (SE1). The B2B market is of no difference. NGO3 shared an extreme example. If their clients consider any mandatory fine for disposal as economically reasonable, they will rather pay the fine than follow any circular idea (NGO3). Similar observations were shared by other case organisations. Natural discrepancies between Environmental Managers and Trust Boards or Finance Departments lead to a growing emphasis on economic value (Public2). Additionally, pressure from funders or investors was listed as reasons – *"It's fundamentally rooted in the environment and the environmental challenges, but we are a commercial business and we've got investors and we've got our customers. We've got all of these different stakeholders, and we have to make money."* (OEM9).

Convincing clients to move away from purely economic toward environmental values requires convincing arguments and a lot of effort from NGOs plus incentives from funders. Additionally helpful are indicators, such as landfill taxes (Gov1), recycling rates (NGO2 and NGO3), deposit return schemes (WSP1), or Packaging Recovery Notes (OEM9, Public2).

Nonetheless, it is not only the client's side that needs to be examined. The whole SC network relationship is of greater importance. Producers are in constant negotiation with their suppliers. If the delivered product is quality-wise and not suitable for adequate refurbishment or reuse, a discount is debated (OEM1, OEM3).

A different viewpoint emerged when the by-product was obtained free of charge, as part of an agreement to save it from landfills, or as a courtesy act of local venues that collect the material for the respective OEMs. In those cases, the cost pressure appears less intense (OEM4, OEM6, OEM8, OEM10).

In general, a solid understanding of cost is vital (OEM1, NGO2). Initial considerations about joining a CBM are often balanced against the economic value of amortisation (Public2). Once the decisions need to be made over publicly used money (Public1, Pulbic2, NGO1, NGO4), the cost pressure rises tremendously, and fears and uncertainty about (additional) costs drive the decision process: *"Will our high disposal costs sink when we join this CBM?"* (Public2).

Despite having to handle rising economic pressure, criticism about the system and economic thoughts has not come short: *"We've created such a mess based upon the economics and how economic structures are all based upon the linear economy."* (OEM5). Hence, it was interesting to see that slowly the environmental value, combined with economic values, is more represented in the decision-making process. NGO4 stated that in their decision process, the environmental and economic value can overlap and be considered as equal, or at least as an influential factor. In fact, the secret is to have the overall goal of circularity in mind—reduce, reuse and refill. *"We don't want to enable lots of businesses to develop new products that are never going to make it to market, so the economy side of it has to come into play. However, at the time, carbon benefits are one of our main criteria, too. That is the main way we calculate whether we want to support or are able to fund something." (NGO4).* Tech1 agreed with these considerations. Processes must be economically viable and the price and costs ratio marketable to ensure market competitiveness. At the same time, it needs to be ensured that the circular process is sufficiently efficient from an environmental perspective (Tech1). Nonetheless, the difficulty of meeting both values in the middle was addressed as occurring contrasts between the management board's more economic views compared to the more circular economy perspective of the environment department (Public2). As an overview, Table 7.5 provides an extract of interview statements, indicating the predominance of economic value.

Predominance of economic value
OEMs • **“***There needs to be that business acumen initially and the client needs to understand that as well, that the business has to make money out of it.” (OEM, Int. 1)* • *“So, you’ve got to be careful that it [annot. the product] doesn’t travel too much, otherwise you lose money.” (OEM1, Int.2)* • *“It used to be cost… If it’s not cheaper, I'm not interested.” (OEM6)* • *“It frustrates me when I’m only going to be compared on price.” (OEM10)*
Social Enterprises • *“Always cash flow, like any business.” (SE1)* • *“The real impact is money, because it puts people on the ground and moves the organisation forward.” (SE2)*
Non-Profit and public organisations • *“And for the businesses, I think it’s really the financial focus more.” (NGO2)* • *“From an economic point of view, we're making money out of the circular economy side of it, so that's got to be a benefit.” (Public2)*
Technology Providers • *“The circular economy for them would represent another profit stream. So, the economics is actually the drivers there.” (Tech1)*

Table 7.5 Predominance of Economic Value (Source: Author)

7.3.2 Environmental values

Environmental values play an important role in the shift towards circularity. The common viewpoint shared refers to the growing environmental impact that organisations had over the years (OEM6). However, when fulfilling the shift towards circularity, there is the risk that organisations only see the temporary aspects of managing waste and sustainability matters (Public2). Or organisations only create environmental savings but neglect the bigger picture and idea (NGO4, Public2).

Notably, CO2 emission reduction was regularly mentioned as a circular environmental value amongst all CBMs (OEM1, OEM3, WSP1, NGO2, NGO4, SE1, Public1, Public2). However, the true circular value of CO2 emission deductions is controversial and faces criticism. *“There’s research that’s come out that out of all the environmental benefits that we can do with the circular economy, only one-tenth of that is CO2 emissions. Yet, nine-tenths of these are resource management. Now, I know that carbon is again easy for politicians and the media to grab onto because it’s something* *that people can kind of understand; it's a bit like money. Reduce your spending, reduce your carbon"* (OEM12).

Other instantly addressed environmental values referred to resource efficiency and waste reduction. Resources efficiency included an outline of resource recovery and waste saving actions to organisations (OEM1, NGO2, Tech1), as well as discussions around product life cycle extension (OEM1, WSP1), certifications and accreditations (Tech1, SE1, SE2, OEM11). In particular, waste reduction actions were addressed in the context of getting to know and dealing with occurring waste streams (NGO4, SE2) and pushing material further up the waste hierarchy via multiple actions (repair, product life extension, resource recovery) (Tech1, SE3). Especially in the health care sector, morality and moral reasons to protect the environment and health of the public were more frequent. *"We have a duty to make sure that we're not damaging the environment and damaging the health service"* (Public2). *"We need to protect local water supplies from potential chemical pollution"* (NGO2).

Nonetheless, criticism was raised when partners are only approached to fulfil inter-organisational environmental policies, but the honest reason is economic benefits as a consequence of environmental activities. In that case, there is the danger of greenwashing (SE1) – *"Where there's not a solution, there's not a solution, […] in a really good model they [annot. organisations] should be true." (SE1).* Particularly, there are networks that are claiming to be green but do not do any action: *"I go once a year to this conference, and nothing happens." (*SE1).

Table 7.6 provides a summary overview of the environmental values addressed in this section. The assumption was made that the level of environmental value creation highly depends on the perception and value prioritisations of an organisation. The discussion about value prioritisation in light of TBL is followed up in Section 7.3.4.

Environmental value
CO2 emissions • display of a clear linkage towards reduction of greenhouse gas emissions as a 'circular action' (OEM1, OEM3, WSP1, NGO2, NGO4, SE1, Public1, Public2)
Resource efficiency • outline of waste recovery and saving actions (OEM1, NGO2, Tech1) • product life cycle extension (OEM1) • certifications (Tech1, SE1)
Waste reduction • reduction of waste streams (NGO4, SE2) • pushing material up the waste hierarchy (NGO4, SE2, Tech1)

Table 7.6 Identified Environmental Values (Source: Author)

7.3.3 Social values

The statement of organisations about social value varies a lot. It was not uncommon, interviewees pausing and thinking, when being asked what social value their organisation creates. In most cases, interviewees began to list aspects of social value. However, some organisations openly admitted that they did not create or measure any social value at all. In these cases, it was claimed that social value creation is more something for their clients, which are bigger or more experienced in sustainability and social value identification (OEM7).

Social value appears to be still in its infancy, with a lot to explore and learn. Organisations confirmed having already invested significant time in social value, but still exploring its adequate meaning (WSP1). The importance of social value creation became clearer when organisations emphasised a growing need to develop social value further (NGO4, WSP1). In the following paragraphs, the author explains the social value aspects most often addressed in the interviews.

Social value has mostly been named in conjunction with **job creation** independent of the CBM (OEM1, OEM2, OEM5, OEM6, OEM9, NGO4, Tech1, Gov1, SE1, SE2, SE3). Interestingly, this reaches different levels and perceptions. On one hand, there is a discussion about evidencing a job that has been created in a CBM. This ambiguity is described in finding a comparable way of measuring and reporting the jobs created

(NGO3). On the other hand, the perception moved from a more business-driven perspective towards the psychological side. In the currently growing green awareness, the decision processes of employees have changed. Employees tend to accept meaningful and purposeful jobs compared to other non-meaningful alternatives. In fact, employees are likelier to work on their personal pursuit of happiness than on the pursuit of wealth. Hence, jobs in CBMs provide stronger opportunities to fulfil these dreams about more sustainable and dematerialised goods and ultimately create *"meaningful happy jobs for people"* (Gov1, Int.1).

Another social aspect of job creation has been emphasised as employing mainly the people furthest from the job market. This includes, but is not limited to, people with disabilities or a criminal background (OEM1, OEM2, OEM6 NGO3). Immediate positive side effects of employing people who would experience difficulties in finding a job were described as the publicity that the CBM received from the public and governmental sides. But also, initiatives of local councils, such as social engagement (OEM1, Int.2).

Looking at the argumentation of councils or governmental bodies, social value is described in a two-sided way. First, finding use for a recyclable material and second, helping an area that has high social deprivation (SE1), high poverty and unemployment rates (Public1). Besides employing people with disabilities, people with missing or minor education, minor criminal offences, or long-term unemployment are considered valuable employees (OEM6). *"We're employing people that weren't in jobs when we took them on. They came off not having really, hardly any experience, so we've created five jobs out of that. So, it's had a good impact. Some of the guys were from rough backgrounds. They'd had a hard life, less than brilliant home lives and now one of them is our team leader, two of them were apprentices that came through us, and they're all still with us. And they're a good bunch of kids. Really good."* (OEM6)

Ultimately connected to the social value of job creation are **education** and the **reskilling of people.** Social value was identified as **personal development** for members of staff in all CBMs. This is not only limited to the training of employees (OEM2, SE2), but also includes reskilling members of the public (SE2, SE3; NGO4), as well as educative actions at schools (OEM1, OEM7) and collaborative action in higher education institutions (NGO1, NGO4).

In this social aspect, the model of *repair café* stood out. Skill sharing is most likely taking place at such events (SE2, SE3). People of the community who join a repair café are encouraged to watch the volunteer fixer at his/her work. In this way, members of the public learn why an item is broken and the many possible ways of fixing it. The gained knowledge and skills could be applied in the future to keep materials and products in the loop (SE2).

In the repair café model, **educative workshops** training people in a casual and fun environment to repair their items or make an item out of recycled material appear useful, too. Using a casual and fun environment helped to encourage participants to take part. *"We weren't necessarily ramming the idea of the circular economy down people's throats but, in doing so, it planted a seed and that was income-generating" (SE3).* Most importantly, it is about **creating skills** that might have been forgotten by time. Furthermore, offering informative **webinars** to show how to set up a (social) circular business and retaining first-hand information was addressed as reskilling people (SE3). Additionally, fostering and offering **internship places** and positions in the social value environment creates value while equally spreading the word further (SE3).

Incorporating educative programmes about circularity in schools and academic institutions (OEM1, OEM7) is another way to boost social value contribution. Company visits (OEM1) and the aim of close collaboration with linking partners, suppliers, and clients, turned out to be beneficial when creating and executing school programmes (OEM7). NGO2 indicated that working with schools, universities and student unions is an essential part of education. Special training, webinars, and workshops provide a social benefit in the long term (OEM10). Collaborations with universities provide a social benefit to the learning curve of students (OEM10).

Besides a connection between the social value of job creation and education, respectively reskilling (OEM1), the social value was discussed in light of the **well-being of staff members** and clients. Again, the CBM of a repair café was standing out (SE2). The following positive aspects are listed:

- Reduction of isolation and loneliness
- Reason to get out of the house
- Conversation opportunity

- Social interaction (fostering communication skills and confidence building)
- To do something new and different
- A feeling of adding value
- Positive feelings after having helped someone
- Learning new skills
- Friendship building

Ironically, a repair café still has positive considerations even if an item cannot be repaired. In that case, the clients get the feedback, they have done everything to bring about the longevity of the material, and they do not need to feel guilty when disposing of the item (SE2).

Organisations following CBMs, such as refurbishment, addressed social value with regards to well-being, resulting in a better work-life balance when changing the office layout and work environment (Public1).

Another very interesting point raised referred to **community resilience.** Community resilience was described as the *"sense of resilience because people can fix things themselves"* (SE2). Repairing items at repair café events can take some time. Hence, many people enjoy the atmosphere of the event while sitting down, drinking a cup of tea, and getting to know other people. The interviewee emphasises that the concept of meeting and mingling with other people provides a big social benefit replicated in community resilience. *"You end up chatting to people that could have been in your same community for twenty years and you've never come across them." (*SE2).

In this regard, the socio-ethical value was discussed. People visiting the repair café are from a broad ethical background. People who sit together while the item gets repaired are genuinely interested in each other, and a lot of conversation is shared between the fixer and person using the service of a repair café (SE2). Community thinking is additionally shown via local businesses contacting repair café organisations, asking how they could help and do good in the community (SE3).

The community sense was even further emphasised by stating that CBMs can form bonds and bridges between businesses (OEM5) and can have a positive impact on problems of the community, such as homelessness, social housing education and the well-being of the community as a collective (SE1, SE3). The vibrant communal sense appears to be strong and heartfelt: *"We're here to help the community and educate the community and involve the community and be community-led"* (SE3). The importance of community resilience and well-being is rated more highly when organisations bond or bridge with organisations active in the public (OEM3, Public2). For instance, Public2, based in the health care sector, stated that all their decisions are based on protecting the health of the community and wider public (Public2).

Creating **community wealth** through extending the life cycle of a material (SE1, OEM1) is in many organisations' minds. However, the occurring problem refers to how to feed back to the community (SE1). **Monetary donations** have been claimed as one option. Donations to (local) charities that could use the money directly to create social and communal value (OEM4). Furthermore, the provision of product equipment is used to provide feedback to the community. Donations to local schools or low-income households are made to tackle poverty. SE3 explained that they are tackling digital poverty by donating refurbished IT equipment to clients who would not be able to afford IT equipment (SE3).

The gap in social value is visible between OEMs and social enterprises. Obviously, OEMs do not have said strong intention of creating social value than their social counterparts (OEM2). *"We're creating skills and we're creating employment, but we don't have the stronger social message piece around it, although it does deliver social value"* (OEM2). Hence, social value appears to be created to a greater extent in CBMs with a social background, such as repair cafés.

Nonetheless, OEMs in other CBMs begin to collaborate with social enterprises, employ disabled members of staff and have the social aspect internalised in mission statements to work around this value (OEM2). Furthermore, organisations have begun to employ special positions, such as Social Value Lead, or offer internships in social value (WSP1, SE3). Additionally, definitions and indicators of social value, which had been set up by consultancy, organisations, and associations, have been used (OEM2). An example was provided by the Institute of Workplace and Facilities Management, which has been developing a definition and indicators to measure social value in facility management.

Furthermore, the use of portals is helpful (OEM2). There is also a stronger drive to publish about social value in the form of company reports (SE2, SE3).

However, criticism about lacking examples or uncertainty which social value indicators to select has so far hampered the practical execution (SE3).
This section closes with a closer look at all the TBL values. Table 7.7 functions as a summarising overview. The subsequent section will investigate whether organisations prioritise one of the three TBL values.

Summary TBL value		
Economic Value	**Environmental Value**	**Social Value**
CBMs are driven by the economic value of: - Scalability - Costs - Funding - Having an overarching economic model - Production costs of a reused product	*CBMs are driven by the environmental value of:* - CO2 emissions - Resource efficiency - Waste reduction - Morality	*CBMs are driven by the environmental value of:* - Social value development - Employment creation - Education - Minimising modern slavery - Reskilling of employees and members of the public - Tackling social injustice and poverty - Well-being of public and employees - Community resilience - Community wealth - Donations

Table 7.7 Summary of Triple Bottom Line Values (Source: Author)

7.3.4 Ranking of Triple Bottom Line Values

As participants were asked to share the created value, a follow-up question probed if they prioritised any of the TBL values. Therefore, participants rated the three values. Looking at the results, the following three scenarios emerged:

⇒ Scenario 1: Only one value is prioritised

⇒ Scenario 2: Two values were rated of the same importance

⇒ Scenario 3: All values have an equal importance

In the following paragraphs, each scenario is examined in greater depth.

Scenario 1: Only one value is prioritised

Scenario 1 refers to participants prioritising only one value. This prioritisation is done in many ways i.e., seeing this one value as the driving factor of the business or allocating major importance to it. Notably, all three TBL values were considered at some point by an organisation as a top priority. Nonetheless, creating business revenues or economic value is still the predominant focus of most organisations (NGO4). The motives mentioned lasted from business considerations, such as creating a cash flow and cost reduction, to concerns of misusing public funding. The reasons and statements can be seen in Table 7.8.

Significantly fewer organisations appear to prioritise purely environmental value. Nonetheless, it appears that organisations signing up for waste exchange platforms prioritise stronger the creation of environmental value.

Organisations focusing purely on social value are driven by adding value to communal benefits and achieving social aims (OEM1, Int. 1).

There was only one organisation that provided an outlook based on its customers. Their customers would rate the values as follows: social (health and safety of employees), economic (cash flow), environmental (achieving circularity) (OEM11).

Scenario 2: Two values were rated of the same importance

Notably, organisations weight two of three values with the same importance. In the boundaries of the chosen case organisations, some rated environmental and social value equally /and before economic value, while others rated environmental and economic value equally / and before social value.

Interestingly, all interviewees rating the values in such a way showed that the individual viewpoint is highly influential. For instance, Public2 explained that the Sustainability Department would always choose environmental and social values before economic value. The colleagues in the finance department, however, would always prioritise economic value over the same idea.

Reasons for economic value prioritisation
Accounting and finance perspective • Cash flow *"We want the business to stand on its own two feet as a business." (NGO4)* *Funding* *"Money, economy, has been the most—that's because there's no money in the public sector." (NGO3)* • Cost cutting *"So that was always the biggest draw for the businesses […] getting rid of costs that they don't want to pay." (NGO2)* *"I would suggest it's the economy first because of the money that they're saving." (OEM3, Int1)* *"I think the biggest driver for them was to just see how they can reduce their costs if there is a way and how they can make money from something they already have." (NGO2)* **"**We still collect on the cheapest cost per household."(WSP1, Int1)
Quality management perspective • Product quality *"I think what drives them is economics. And I'm seeing that they're losing money currently as companies because the quality of textile is going down." (Tech1)* • Service *"It directly impacts patient care; there's more money for patient care." (OEM3 Int.2)* *"We want a product or service to be a viable option." (NGO4)*

Table 7.8 Reasons for Economic Value Prisonisation (Source Author)

Scenario 3: All values have equal importance

In the last scenario, the case organisations mentioned, they would rate all three values as equal. This appears to be a firm inner belief of some organisations. *"There's no one reason over another and governments, councils, funders—everybody can try and dictate that. It'll never make a difference to us because we will always value them all equally.*" (SE2). Other organisations explained that there is beauty in being able to create and see the impact of all three values (Tech1, SE2, SE3). Hence, *"Why not rate them equal"* (Tech1). SE1 explained that the power of being able to create all three helped in setting up and running the business (SE1). OEM3 further elaborated, in the end, "*It all goes into a big pot"* (OEM3, Int.2).

Table 7.9 summarises the four different scenarios in terms of value prioritisation in the limitations of the data set.

Order of TBL—overview of ranking
Scenario 1: Only one value is prioritised ⇒ Economic value ⇒ Environmental value ⇒ Social value
Scenario 2: Two values were given the same importance ⇒ Environmental and Social before Economic Value ⇒ Environmental and Economic before Social Value
Scenario 3: All values have equal importance

Table 7.9 Ranking of Triple Bottom Line Values (Source: Author)

7.4 Value measurements

> “*As the circular economy grows in momentum, it is imperative for companies to prepare for their transition based on insights into their circular performance and associated risks and opportunities. To do this, business needs a universal and consistent way to measure its circularity.*”
>
> (World Business Council for Sustainable Development, January 2020)

The need for metrics to measure circularity has been growing for years. A variety of indicators have been created mostly by industrial or political institutions. Industry-specific guidelines, policy metrics, and even sustainability goals have been initiated. However, questions about the existing current measurements, awareness of the range of measurements, and their application remain.

The expert exchanges revealed that organisations amongst all CBMs are interested in circular measurements. However, there is a level of insecurity about the implementation process. Some organisations measure circularity, some do not. Some follow their own metrics, while others follow publicly announced indicators, such as the SDGs. Therefore, the researcher aimed to gain a greater understanding by investigating the status of value measurement in different CBMs.

In the following section, the measurements named and applied by the participants are thematically grouped and introduced. At the end of each section, each measurement is summarised in a table based on the following criteria: range, industry sector and wishes, tools, examples, and effectiveness.

7.4.1 Measurement #1: Customer engagement

Measurement #1 refers to customer engagement, which includes tools such as surveys, questionnaires, testimonials, or any other sort of customer feedback. It appeared that these tools are a common metric to investigate the value delivered to the customer. WSP1 made use of customer engagement interviews in a two-stage process. They started interviews before and after the implementation of their CBM to understand the perception of the customers, as well as their potential engagement and service experience throughout the testing phase of their model. This aids in finding inaccuracies in the data, as well as in discovering challenges in the system.

The importance of customer feedback became obvious when Tech2 started to use customer feedback to figure out how useful and easy the usage of circular software is for the customers. To test the effectiveness of the feedback taken on board, networking events are essential for this organisation. At those events, changes and actions can not only be demonstrated but also obtained directly by (potential) clients.

In addition to external feedback, internal feedback appeared to be a strong metric. Public1 explained that their way of implementing a CBM relied heavily on the commitment and feedback of their employees. Official actions, such as consulting rounds with members of staff, internal surveys and questionnaires, but also unofficial chats and paying attention to office grapevine in regular time intervals, helped measure the circular performance. Table 7.10 provides an overview of Measurement #1.

Measurement #1: *Customer engagement*		
Includes: - Customer interviews - Customer feedback - Surveys - Testimonials	***Industry Sector:*** - Manufacturing - Public sector - Waste management	***Wishes*** - N/A
Tools: - Surveys and questionnaires - Oral and written feedback - Questionnaires ***Example(s):*** - Two-stage process: Speaking to customers before and after to understand their perception, potential engagement, the service experience (WSP1) - Acquiring external feedback, testimonials, etc. from clients (OEM2, Tech2) - Acquiring internal feedback from employees (Public1) - Feedback on circular software (Tech2) ***Effectiveness:*** - Aided in discovering the challenges of the system (WSP1) - Reflecting on inaccuracies in the data (WSP1) - Networking events and fairs where changes in technology can be introduced to clients (Tech2)		

Table 7.10 Overview of Measurement #1 (Source: Author)

7.4.2 Measurement #2: Carbon dioxide emission

Measurement #2 describes the measurements taken by organisations with regards to CO2 emissions. Surprisingly a lot of organisations, independent of their CBM, named

CO_2 savings as an instant measurement for circularity. NGO4 emphasised the advice provided to clients on how to measure CO_2 savings in their CBM. OEM1 confirmed that they are measuring the carbon saved in their remanufacturing model, while emphasising that they are very glad to be accompanied by an NGO that is providing useful support in that regard. Also, measuring the value created, but not supported by any other consultancy, was OEM7. OEM2's approach seemed to be a little more settled and mature when stating that they are working based on a Carbon Disclosure Programme.

Since OEMs are already familiar with carbon-saving metrics, it was interesting to see that even public institutions are applying this as a measurement of circularity. In the case of Public2, they measured the carbon emissions saved from the agile work environment. As employees are not obliged to come to the office, this contributes positively to the carbon footprint.

As an alternative to measuring the classic carbon footprint, organisations also mentioned measuring the embedded carbon footprint. This means that they would not measure the transport that has been done in the first life of the product, but rather the second life. Even though this measurement takes place in conjunction with an academic research institute, there is still some nervousness when applying it in real life (SE1). However, challenges in measuring are not rare. Political institutions explained that trying to measure embodied carbon *"is rather difficult and does not happen overnight"* (Gov1).

With regard to the effectiveness of the metrics, NGO1 was the only organisation stating that they are comparing the figures against EU guidelines and in that way monitor developments. None of the other organisations gave a measurement and did not know how effective their applied measurement tool is. Table 7.11 provides an overview.

Measurement #2: *Carbon dioxide emissions*		
Includes: - Classic carbon footprint - Embedded carbon footprint - Carbon savings (as opposed to new materials)	***Industry sector:*** - Manufacturing - Public sector - Construction and Steel	***Wishes*** - Easier methods for measuring embodied carbon
Tools: - Carbon footprint report - Carbon disclosure programmes ***Example(s):*** - General consultancy service provided to help clients measure CO2 (NGO4) - Metrics of carbon disclosure programme (OEM2) - Metrics to identify the carbon saved when using remanufactured products or components (OEM2, NGO1) ***Effectiveness:*** - Aided in discovering the challenges of the system (WSP1) - Reflecting on inaccuracies in the data (WSP1) - Networking events and fairs where changes in technology can be introduced to clients (Tech2) ***Effectiveness:*** - UN and EU guidelines as a fixed comparable indicator (NGO1)		

Table 7.11 Overview of Measurement #2 (Source: Author))

7.4.3 Measurement #3: Social value reporting

Measurement #3 refers to social value reporting. To start with, OEM2 stated that they measure the social impact mostly based on job creation. Particularly when looking at figures to bring long-term unemployed back into work, or when minimising modern slavery and reskilling employees, this metric appears to be effective. OEM1 mentioned measuring a similar social impact. They employ impaired or disabled employees who would have difficulties in finding a job. OEM4 monitors and measures how much is spent and given to local charities to support local circular projects.

The variety of social impact metrics is wide. In addition to job creation, organisations make use of local networks and collaborations as measurement indicators, such as the Social Profit Calculator (OEM1, WSP1).

However, measuring social impact is one thing; the more difficult consideration comes along when having to prove the effectiveness of the social impact measured. NGO3 explained that they ask for evidence of the social value created. An example was given based on the measurement of job creation. "*If a client has created two jobs, they need to prove that"* (NGO3).

Having those developments in mind, organisations started to wish for standardised social and human metrics for better comparability (OEM2). However, sometimes metrics appear too difficult and complex in their application (OEM1, Int. 3). Not seldom, organisations admitted, *"We weren't good at measuring our social value, our social impact, and I'm sure that's the case for a lot of people. It's nice to do, but we don't do it."* (SE3).

Another reason is the missing resources to develop and explore appropriate measurement schemes (SE2, SE3). Assumptions and fear of complicated processes are hindering organisations from starting to look at this. SE1 was one of the rare organisations stating that it did a social impact report. Their ideas sent a strong message outside. The idea was not to adhere to anybody's standards, but rather adhere to what is believed and known in the organisation (SE1). However, in the near future, they are planning to use recognised social impact accounting systems rather than their own metrics.

Measurement #3: Social value reporting		
Includes:	***Industry sector:***	***Wishes***
- Job creation - Helping long-term unemployed - Support for local charities - Social impact reports - Avoid modern slavery - Reskilling people	- Manufacturing - Public sector - Food and drinks	- Standardisation of social and human metrics - Easy to implement indicators -
Tools: Social Profit Calculators ***Example(s):*** - Nominal economic value donated to charities (OEM2 and OEM4) - Metrics to define social procurement value (OEM2, SE1) - Usage of a Social Profit Calculator (WSP1) ***Effectiveness:*** - Report back to stakeholders (NGO3) - Investments are put back in the area (Public1) - Request for evidence, i.e., for jobs created (OEM2, NGO3) - Avoidance of modern slavery (OEM2)		

Table 7.12 Overview of Measurement #3 (Source: Author)

7.4.4 Measurement #4: Technical reporting

Measurement #4 referred to all sorts of (technical) reporting, meaning the physical numbers that are counted by an organisation. Since the variety is so broad, the different reporting measurements are listed as follows:

Number of returned products

WSP1 counts the number of bags containing the refurbished material that are collected. Being able to estimate how much material is in one bag helps to decide important variables for the client, who is further processing the collected material. In addition, Life Cycle Analysis (LCA) has been named as additional help (WSP1, NGO4).

Annual reports about recycled material

Annual reports are a popular tool for measuring the value created. NGO1 stated that they publish the figure of all the waste valorised in their plant every year. This includes *"the amount of alternative raw materials, alternative fuels, CO2 emissions that we save because we are using biomass but also all the companies measure each amount of waste "*(NGO1, Int.2).

In the manufacturing sector, OEM1 creates two reports. One is measuring the amount of refurbished product that they are taking in. The other report is about the amount of material that has been disposed of. Some important measurement for the future would be to look at the savings that could be achieved when suppliers hand over the furniture to OEM1 rather than disposing it to landfills.

OEM7 mentioned that they measure their circular actions in two ways. One option is to look at yield rates, meaning that they are looking at how much material they can get out of one bale of plastic material. The second option looks at the amount of recycled material used.

In the valorisation model, OEM4 shared that by measuring how much material they save from landfills, they can also report on the impact on carbon, water, and land (OEM4).

Costing and comparison of figures

Calculating the costs that clients have saved by preventing the product from going to the incineration plant is a popular measurement. Being able to gain weight measurements of potential waste and comparing those figures over the years is considered very helpful. Public1, for instance, explained that they have started to measure the waste created in the new CBM and compared those figures against old numbers from their LBM.

Criticisms regarding the measurements were given by SMEs or start-up organisations. They are eager to apply measurements; however, they struggle to apply all these methods so far due to financial, time or resource issues.

With regards to the effectiveness of these reporting measurements, NGO1 explained to make use of other European country's guidelines to compare the figures against each other. In contrast, NGO4 stated that they are supporting and monitoring the performance about value creation of their clients, particularly when they have received funding. They are happy to help, should problems occur. However, in political circles, technical reporting still appears to be difficult (Gov1). Table 7.13 functions as an overview.

Measurement #4: *Technical reporting*		
Includes:	***Industry Sector:***	***Wishes***
- Estimate of amount/bags collected with - Internal usage of recycled material - Amount of disposed material - Percentage of alternative material / substitute material used - Water retention - Material prevented from landfills	- Manufacturing - Public sector - Waste management - Food and Drinks - Paper and Plastics - Construction and Steel - Textile*	- To have monetary, time, and resource back up to perform adequate measurements
Tools: - LCA, annual reports ***Example(s):*** - Measuring the amount of material that is prevented from landfills (OEM4) - Calculations on carbon, water, and land (OEM4) - Counting the number of bags with material for reuse collected (WSP1) - Monitoring the potential value created (NGO4) - Annual reports containing all relevant data (e.g., substitutes used, etc.) (NGO1) - Comparing the new waste figures against old waste figures (Public1) ***Effectiveness:*** - Aided in estimating how much of the ‘waste’ material can be collected (WSP1) - Comparisons with other countries to compare the number of substitutes used (NGO1)		

Table 7.13 Overview Measurement No. 4 (Source: Author)

7.4.5 Measurement #5: Specified indicators

The fifth measurement discovered can be summarised under a wide spectrum of *specific indicators*. The range of these *specific indicators* varied from organisation to organisation. Political bodies preferred to apply indicators announced by the World Economic Forum, EU, UN, or their own policy regulations (Gov1). NGO4 confirmed this statement, stating that the Well-being Future Generations Act has a huge influence on their measuring of value created.

CBM-aligned personal indicators have been named by NGO1. In that case, for their valorisation model, they used over 77 measurement indicators. OEM4 explained that in their sector, often the *Groceries Code Adjudicator* is applied. Predominantly, to ensure that everyone in the food supply chain is treated fairly and equally and that food products, not fitting the norm, can also be sold.

An entirely different viewpoint on indicators was given by Public1, stating that well-being indicators, such as sickness level, maintained a solid measurement metric. According to their recording, sickness levels have dropped by over 50 percent since applying the CBM. Another method applied is the monitoring the office utilisation by tracking and monitoring devices – *"looking over a six-month period the trend is you're only 40 per cent occupied, so, your ratio desk is too high, we're going to move another team to this area to better utilise that space "*(Public1). As in this specific case, office usage was already monitored before going into an agile office environment. The indicators stated that the new layout made people walk around more or invited them to use stand-up desks.

Table 7.14 summarises the findings. However, it was surprising that not too many organisations referred to specified indicators. And neither of the ones that did made references to know how effective their indicators are.

Measurement #5: *Specified indicators*		
Includes: - Circular transition indicators - UN SD Goal Indicators - Industry-specific indicators - Policy-specific indicators - European Commission CE indicators - Office utilisation	***Industry sector:*** - Manufacturing - Policy - Construction and Steel	***Wishes*** - Follow the indicators through rather than dropping the case after a while
Tools: - Office utilisation - Sickness levels of employees ***Example(s):*** - Local governments see their policy indicators or other public organisation's indicators as an important way of measuring value (Gov1) - Office utilisation and sickness level measurement (Public1) ***Effectiveness:*** - 50% reductions in sickness rate (Public1) - Word-of-mouth feedback from employees (Public1)		

Table 7.14 Overview Measurement No. 5 (Source: Author)

7.4.6 Measurement #6: Tracking methods

Interestingly monitoring or tracking methods maintain a big part in being a metric. OEM1 shared that they measure the material intake, as well as how much of said material is leaving the shop floor as a refurbished product. They are aware of any material that goes to landfills during the refurbishment process. In essence, they can replicate the figures of refurbishment based on simple methods, such as Excel spreadsheets. In addition, they are offering a five-year warranty. There is also the idea of offering a tracking system that allows the product to enter a new cycle of refurbishment after a specific amount of time.

Difficulties in material flow tracking were stated by political institutions – *"Trying to monitor material flows in Wales is virtually impossible. Trying to monitor the weight of materials procured every year in Wales will be a bit of a challenge "*(Gov1). Hence, the wish was expressed for more dematerialisation in procurement. Table 7.15 shows a summary of Measurement #6, Tracking Methods.

Measurement #6: *Tracking methods*		
Includes: - Tracking tools - Warranties - Material Flows - Tracking of material refurbished	***Industry Sector:*** - Manufacturing - Textiles	***Wishes*** - To be able to monitor material flows - Measuring the dematerialisation of procurement
Tools: - Excel spreadsheet ***Example(s):*** - Measuring the efficiency of technology (Tech1) - Awareness of the numbers of materials that have been received and refurbished (OEM1) ***Effectiveness:*** - Monitoring material flows is almost impossible (Gov1)		

Table 7.15 Overview Measurement No. 6 (Source: Author)

7.4.7 Measurement #7: Internal reporting systems

Measurement #7 refers to internal or external reporting and measuring systems. This includes CSR agendas, external and internal certifications, and audits. Certificates have been considered by many organisations as measurements. The common belief results in the thinking that if an external certificate has been issued, predefined control variables have been matched successfully (Tech1). Despite official certificates, organisations also provide their clients with separately issued certificates or notes stating the amount of material saved from landfills or other metrics (SE1).

Other internal reporting systems included general **internal reporting measurements** (NGO1) or external reporting systems, where organisations must report back their achievements (NGO4). **Lessons learnt** and looking at ways to improve have helped to measure the circular value (Public1). In that regard, OEM1 explained that incorporating CBMs in the **CSR agenda** is the way forward, as well as doing **vendor rating**. Having circular or sustainable vendors, respectively, partners, aid a lot (OEM1). Additionally, **social media** usage was indicated as a helpful measurement tool, even though it is sometimes restricted due to data protection issues (OEM1, OEM4).

Measurement #7: *Internal reporting systems*		
Includes:	***Industry Sector:***	***Wishes***
- CSR agenda - Vendor ratings - Audits - Lesson learnt - Certifications	- Manufacturing - Public	- N/A
Tools: - (Official) External certificates ***Example(s):*** - Vendor ratings to see what benefits are achieved from suppliers (OEM1) - Certificates are often used to state that a measurement or some sort of comparable control variable is applied (Tech1, SE1) ***Effectiveness:*** - Stating the benefits on social media or homepage (OEM1)		

Table 7.16 Overview Measurement # 7 (Source: Author)

7.4.8 No measurements

Despite the above-identified measurements, there are still many organisations, part of a CBM, that do not apply any measurements. These organisations leave the impression that they are not against measurements. They are open to measure CO2 savings and other environmental savings and benefits to convince customers and clients about their environmental impact. The biggest hurdle, however, appears to be time, resources and guidance in terms of which measurement to use (OEM6, SE3).

OEM5 explained that they are not yet in the stage of applying any measurements. However, their plan was to look at different parameters. They are planning to look at carbon savings and compare those other regions and organisations active in that sector. An interesting comment was shared about the collaboration regarding the measurements. In an ideal world, best practice about measurements and savings is shared in the form of 'collaborative solutions' (NGO3, OEM5).

Some organisations addressed a moral dilemma, in terms of not having started to measure the impact – *"For us as a healthcare provider, we feel that we have a duty to make sure that we're not damaging the environment and damaging the health service, the community, because that's what we should be doing as a healthcare organisation, we should be protecting their health not damaging it."* (Public1).

7.5 Discussion

The purpose of this chapter was to explore **Research Question 3: How is value conceptualised and measured in Circular Business Models?**

This chapter has so far identified the value proposed, created, delivered, and captured based on the value perspective and the TBL values. Furthermore, the chapter gained a greater understanding of the value measurements currently applied in CBMs. Current scientific research still notes a gap in connecting value perspectives with TBL values, including a lack of unified value measurements (Manninen et al., 2018; Kristensen and Remmen, 2019; Ranta et al., 2021). Hence, the following objectives were introduced:

- to identify value perspective in Circular Business Models and their connection to TBL values
- to gain a greater understanding of the value measurements in Circular Business models

To answer the RQ, this section discusses findings around the value perspectives, with the aim of connecting these with the TBL values, followed by the circular measurements that have been identified in the findings.

To answer the first objective—to identify value perspectives in CBMsircular Business Models and their connection to TBL values—the analysis looked at each value perspective and its components individually (see Section 7.2).

Although the literature states that environmental and societal values are often neglected (Charter and McLanaghan, 2019; Guldmann et al., 2019; Kristensen and Remmen, 2019, Velenturf and Jopson, 2019), the first value perspective, *value proposition*, indicated a wide range of values (see Table 7.1). Looking at the three characteristics of *people, planet, profit* in this value perspective, created the impression that this category already replicates the TBL values in a nutshell, with *people* being the equivalent to social value, *planet* matching environmental value, and *profit* replicating the economic value of the TBL.

Nonetheless, Table 7.1 shows that the values listed in the value proposition are predominantly of a social nature (communal, educative support, society change, etc.) This development is very gratifying, as previous criticism in the broader field of CE and sustainability research indicated that social value is often neglected (Bocken et al., 2015, Charter and McLanaghan, 2019; Velenturf and Jopson, 2019). Surprisingly, the findings provided a more detailed view, indicating that social value proposition towards local communities and schools is more often done than proposing social value to own employees.

As argued in the literature by Preston (2012) and Heath (2016), circular collaborations are vital in any CBM. Sections 2.6.2 and 6.2 identify collaborative networks as contextual factors setting the scene for a circular environment. Hence, an interesting finding referred to bonding relationships with customers/clients and their perceptions of value-adding circular products. In the CBM of refurbishment, customers differentiated between the product life cycles and the value proposed for the same circular product. The example shared explained the different value perceptions, based on the equipping of, for example, construction sites with refurbished furniture, compared to local councils or schools. Therefore, the findings indicated the length of the new product life cycle as an important value conceptualisation in the model of product life extension. In the value proposition perspective, this aspect should be considered at the managerial level.

As Bocken (2019) addressed, the key is to apply the holistic value creation logic with circular principles. Hence, the second value perspective—*value creation*—has been foreseeably the biggest cluster. *Key partners*, *activities*, and *resources* appear to be major components in the value creation process. A variety of literature addressed value creation in the individual context of waste systems (Iacovidou et al., 2017a), retail industry (Mishra et al., 2018), or resource reduction strategy 3R (Ranta et al., 2018). Despite recent literature starting to merge the identified contextual factor of collaborative networks and investigating shareholder value creation (Ranta et al., 2021), none of the literature addressed *value creation* by intangible resources such as patents, accreditation, and certificates. In particular, certificates, either being achieved by the organisations or issued to customers, are a valuable source of value creation. Hence, a greater focus on possible releases and changes in current standards or consultations needs to be considered.

Findings from value perspective No.3 – *value delivery*—also emphasised the importance of the contextual factor of collaboration. Therefore, trust and mutual understanding have been confirmed as attributes of the value delivery process, which is especially needed in bonding collaboration, where collaborative actions can be more sensitive and confidential.

Unanticipated findings resulted from the channels used to deliver value. To a greater extent, well-known channels, such as exhibitions and fairs, are used in combination with newer technologies, such as social media. This indicates the influence that contextual factors of technology (see Section 2.6.4) have on the value conceptualisation of CBMs. The most interesting finding, which has not been named in previous literature, refers to the contextual factor of linking collaborative networks, following the value delivery process via joint marketing strategies.

As economic values have been said to be foregrounded in sustainability and CE research (Evans et al. 2017; Guldmann et al. 2019; Kristensen and Remmen 2019), initial expectations, the perspective of *value capture* would list a variety of economic values, were contradicted. In fact, the results in the category of *cost structure* were surprisingly small. Costs emerging when running a CBM were rarely shared and extremely sensitive. Solely organisations receiving circular material reduced or free of charge shared insights towards cost structures. The second characteristic *revenue stream* implicated a similar picture. Surprisingly, the focus of this perspective appears to be on cost savings rather than the actual revenue created.

As this research aims to connect the value perspectives with TBL, a closer look was taken. An increase in social value in individual value perspectives (see Section 7.2.2) was noted. Table 7.7 and the list of identified social values indicate the rise of social value via, for example, the creation of job positions (i.e., social value lead). However, the findings also confirmed the predominance of economic value (Bocken et al., 2015; Heath, 2016). When rating the TBL values, the findings are in alignment with the literature (Bocken et al., 2015). Organisations still prioritise economic value, while only a small number of organisations refer to purely environmental or social value as a driver. As social enterprises mainly ranked environmental and/or social value higher, this leaves the assumption that there is a strong connection between the set-up of an organisation and the value conceptualisation. However, this is an emerging pathway for further research, as it needs to be more strongly distinguished between industry sectors and CBM.

To see the value conceptualisation in CBMs, this research aims to link value perspectives with TBL values. Therefore, the overall findings of the value perspectives

(Section 7.2) have been merged with the overall findings of the TBL (Section 7.3). Table 7.17 shows the merger and discusses the details in the following section.

Table 7.17 reveals that the value perspectives can be seen with the lens of the TBL values. The table replicates the current research situation, as most research puts an emphasis on the aspects of *value proposition* and *value creation*, while *value delivery* and *value capture* are less present (Mishra et al., 2018; Ranta et al., 2018). It appears that *value delivery* and *value capture* are processes that come at a later stage in the CBM. First, it is important to propose value to the customers and linking and bridging partners. The second phase was used to create it. While the delivery, capturing and value assessment completes the last phase.

Unexpected was the greater occurrence of *not applicable (N/A)* in the environmental column in Table 7.17. As scholars often criticised an emphasis on economic and environmental values (Bocken et al., 2015) neglecting the social side of values, this occurrence is another indicator of an organisation starting to think about social value creation. In contrast, it was surprising that environmental value is almost restricted to CO_2 emission reduction. Only a few interviewees clearly transmitted the message that a CBM needs to offer more environmental value rather than CO_2 emissions (OEM11, OEM12). This opens a new pathway to explore whether organisations might already create significant value; however, they are incapable of conveying the message to clients and the wider public.

In this context, another finding revealed that environmental value is less present in the value perspective of *value capture*. As cost structure and revenue streams are generally more strongly connected to economic values, this finding was interesting, but not entirely unexpected.

Value Perspectives via the Lens of Triple Bottom Line Values			
Value Perspectives	**Economic Value**	**Social Value**	**Environmental Value**
		Value Proposition	
People *(positive impact for the common interest of society)*	• Better economical usage of office spaces and shop floor • Reduction in illness rate	• Positive impact on well-being of (local) community • Social enhancement of the work environment	• Cleaner work environment
Planet *(positive impact on the environment)*	• Cost-effective procurement of circular material • Reduction of material costs through multiple cycles • Reduction of transport costs	• Positive change in societal behaviour • Growing interest in sustainable approaches such as circularity	• Considerate material selection • Multiple material cycles • Sustainable office approaches, including reduction of paper usage • By-product material usage or processing on site
Profit *(superior value that is offered to customers compared to competitors)*	• Free of charge material procurement (where possible) • Material & product usage in different markets • Cost-effectiveness of circular products	• Social benefits from using existent networks	• Sharing of circular material expertise
		Value Creation	
Key Partner *(the network of partners needed to make a business model work)*	• Opportunities for business development • Availability & open-mindedness of circular partners to learn from each other and collaborate	• Usage of local networks & associations • Sharing & promoting social aspects with partners • Employees understand the idea of CE • Circular hubs & workspaces	• Easier circular material procurement

Table 7.17 Value Conceptualisation via the lens of TBL values (Source: Author)

Value Perspectives via the Lens of Triple Bottom Line Values			
		Value Creation	
Key Activities *(the activities needed to make a business model work)*	• Gaining CE certifications & accreditations • Funding • Offering /Receiving tailored advice • Smart usage of circular data	• Support of local businesses & institutions via the CBM • Receiving support of local businesses	• Procurement & usage of circular material
Key Resources *(assets needed to make a business model work)*	• Monetary aspects to develop and strengthen an economic circular business model	• Individual employees investing time and effort in CBMs • Strong local networks willing to work together	• Availability of (non-contaminated) Circular material
		Value Delivery	
Customer Relationship *(the relationships that are established with specific customer segments)*	• economic feasibility of purchased circular product	• To be in the position of aiding in creating (local) employment	• CSR & SDGs influence building of business relationships
Channels *(the communication of an organisation to reach its customer segment to deliver the value proposed)*	• Cooperative strategic marketing	• Events, fairs & markets • Charity work	• N/A
Customer Segment *(the group of people & organisations to reach and aim for)*	• N/A	• Poorer communities or financially weaker households	• N/A

Table 7.17 continued Value Conceptualisation via the lens of TBL values (Source: Author)

Value Perspectives via the Lens of Triple Bottom Line Values			
Value Capture			
Cost Structure *(the costs incurred to run a model)*	• Costs of Circular Material • Scalability of the CBM	• N/A	• N/A
Revenue Stream *(the cash an organisation has created)*	• Costs savings, including but not exclusively based on savings of disposal costs, acquisition costs, material costs, transportation costs	• Creation of communal assets	• N/A

Table 7.17 continued Value Conceptualisation via the lens of TBL values (Source: Author)

The second objective of RQ3 aimed to gain a greater understanding for value measurements. Value measurements have rarely been described in the literature and, if at all, only addressed as indicators (Manninen et al. 2018). This study aims to close this gap. It identified seven different groups of value measurements, which included:

- customer engagement,
- CO2 emissions,
- social value reporting,
- technical reporting,
- internal reporting systems,
- tracking tools and;
- industry specified indicators.

The range of measurement shows that organisations, even if unintentionally, measure the value created in their CBM. Besides more traditional and established measurements, which include customer engagement via surveys or CO2 emission measurements, organisations appear to foreground social value measurements. Despite a noticed uncertainty in how to measure social value, as this value is less tangible than its number-based counterparts of economic and environmental value, organisations emphasise this topic. In doing so, job creation has been identified as a priority measurement method. The observed uncertainty indicates a need for further research looking closer at the social value measurements in CBMs.

An interesting finding resulted from the group *technical reporting*, as this measurement appears directly connected to the impact of a CBM. Participants stated that they had already measured the number of cycles of circular material, including weight of raw material saved, weight of material prevented from landfills and water retention. Such measurements appear innovative compared to the classic reporting figures, such as revenue and cash flow.

Based on the findings of RQ3, the conceptual framework was modified to its final version, which is displayed in Figure 7.2. The final version sees policy and technology as contextual factors outlining the baseline of a positive circular environment, nourishing the ground for CBMs. Contrary to previous assumptions, these contextual factors not only influence collaborative networks (see Figures 3.2 and 6.2) but contribute towards influencing factors as well as directly to the value conceptualisation (value proposition, creation, delivery, capture). In addition, collaborative networks create value-adding linking activities for CBMs. Influencing factors have an impact on the value conceptualisation of CBMs and their linking of collaborative networks. Furthermore, the model sees CBM collaboration based on SCT theory; this means value conceptualisation takes place in bonding and bridging activities, while collaborative networks with partners, such as industry associations, NGOs, and policy bodies, follow linking relationships.

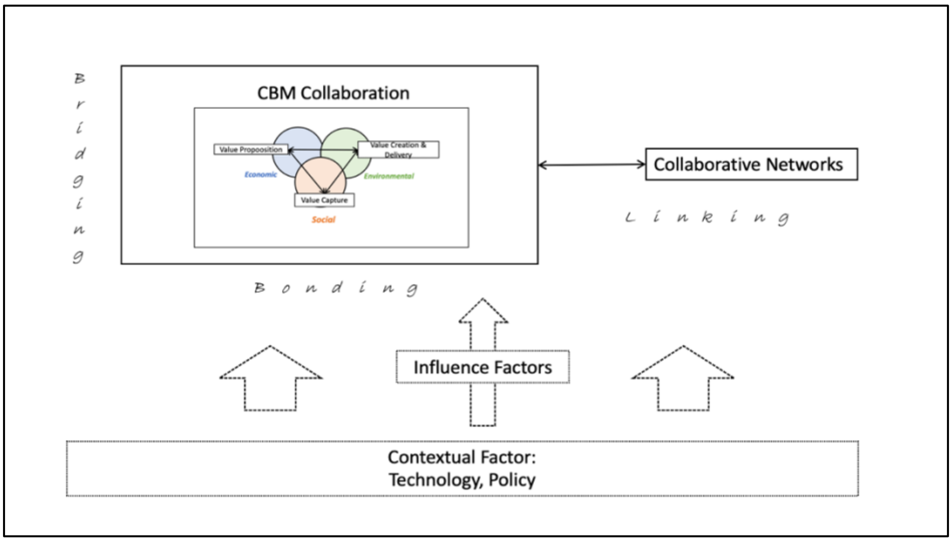

Figure 7.2 Final Framework (Source: Author)

7.6 Chapter summary

This chapter investigated RQ3 by exploring how value is conceptualised and measured in CBMs. It investigated the two value approaches of value perspectives and TBL values individually before connecting their viewpoints. Furthermore, a range of value measurements that are applied in CBMs were identified. In doing so, the chapter contributes to the conceptualisation of value in different CBMs and leads to the final conceptual framework.

8 Conclusion

Chapter aims:
a) To review the main findings of the research b) To identify the contribution made by this research c) To summarise identified limitations of the research and highlight future research options

8.1 Chapter overview

The final chapter serves as a review of the entire study. To begin with, a research summary of each chapter is given, before key findings are summarised, based on the three research questions. In Section 8.3, theoretical and managerial contributions are shared. In Section 8.4, limitations are discussed, and the way for future research is signposted by the provision of research recommendations.

8.2 Summary of research and key findings

8.2.1 Research summary

The overall aim of the study is to understand value conceptualisation in CBMs via collaborative networks and the use of technology in circular supply chain networks.

Chapter 1 introduces the research by providing the background to the study and the researcher's motivation, as well as posing the three accompanying research questions. **Chapter 2** is the first of three theoretical chapters. It conducts a literature review, which allowed the research to be shaped. To fully understand the comprehensive topic of circularity and CBMs, the literature review followed the approach from the general to the specific, beginning with the historical development of the circular economy movement, before highlighting the diversity of CBMs and the value perspectives that surround a circular movement. Splitting the literature review into two parts aided in identifying contextual factors that accompany the circular movement and CBMs. The chapter ended by identifying the research gap and posing the research questions. Subsequent **Chapter 3**, the second theoretical chapter, provided detailed insights into the accompanying framework and its initial development. The framework's departing version was developed over three phases: industry expert encounter, focus group discussions, and complementing site and event visits. Evidence of the development of the original version of the framework and the findings was summarised in a separate publication emerging from this research.

As an abductive approach foregrounds the interplay between theory and knowledge, this research investigates the theories applied in CE research. With further progression of the research, Social Capital Theory was selected as the theoretical lens. With an adequate theory on hand, the research framework's first version was posed. In **Chapter 4**, which is the last theoretical chapter, details about the methodological background were shared. Chapters 2 and 3 identified gaps in empirical research exploring the value conceptualisation of CBMs, as well as the impact of contextual factors in such collaborative CBMs. Recent research from Aloini et al. (2021) and Urbinati et al. (2020) emphasised a still-existing gap in this area. This research contributed to this area by interviewing participants from 25 organisations about their value conceptualisation in CBM. In contrast to the existing research, a range of four CBMs, based on the classification of Lacy and Rutqvist (2019), were covered.

Chapter 5 examined the facilitation of circular actions in CBMs by identifying the influencing factors in joining CBMs. Section 2.4.4 of the literature review identified the influencing factors for a general level of circularity that have been investigated. Nonetheless, scholars lack an investigation of the impact of these on specific CBMs (Aloini et al., 2019; Urbinati et al., 2020). Therefore, and as displayed in Table 5.2, this chapter contributed to this gap by identifying influencing factors for organisations in joining CBMs.

Chapter 6 examines the collaborative actions in CBMs. The literature review (Chapter 2) and the focus group discussion, as well as the expert encounters (Chapter 3), identified the following contextual factors as underlying factors when developing circularity. Collaborative partnerships, which can take place at linking, bridging, or bonding levels, contribute toward value creation in CBMs. Section 6.2 identifies the variety of different collaborations and sets it in the context of the different CBMs. Furthermore, the role of technology in CBMs was identified as a supporting tool in the transition phase from LBMs to CBMs and beyond, as well as the value-adding influence of (political-) guidelines on different levels.

Chapter 7, the last empirical research chapter, examined the value conceptualisation and measurement in CBMs. As revealed in Section 2.5.5, research is focusing in a selective way on circular value. Limitations often refer to a specific

CBM or industry sector. Furthermore, the research neglects to connect the value characteristics with the TBL values. Hence, this research identified the detailed values emerging from the value perspectives (Section 7.2), as well as the TBL values (Section 7.3), and connected both of said value views in the discussion part (Section 7.5) and Table 7.17. Furthermore, it investigated and demonstrated the ranking of TBL values in CBMs, of which four predominant scenarios emerged (Section 7.3.4). As the last step in depicting the value conceptualisation, a variety of seven different value measurement opportunities were identified (Section 7.4).

Chapter 8 is the current chapter and provides a summary of the research and its key findings. Furthermore, the theoretical and managerial contributions are shared, and future research recommendations are given based on the findings and pathways emerging throughout the study.

8.2.2 Key findings

This research provided insights into collaborative CBMs, especially via the value characteristics. In the following paragraphs, the key findings for each RQ are shared.

RQ1: How do influencing factors facilitate the implementation of Circular Business Models?

The first section focused on the facilitation of circular actions and the implementation of CBMs in supply chains by identifying the influencing factors of joining CBMs. In doing so, it was first important to gain an understanding of how circularity is considered and defined in a CBM. Before, identifying the influencing factors of diverse CBMs.

Key findings revealed that defining the meaning of circular actions appears to have a strong influence on the role taken in the CBM (see Section 5.4). Additionally, the findings indicate a strong connection between the interpretation of circularity and the circular product produced. Rather than following a popular public definition, organisations begin to define circularity based on their own needs and the circular product. This indicates the importance of the role of circular levels (micro, meso, and macro). Findings suggest that from a macro-level perspective, circularity is more broadly interpreted than on a micro level. Hence, the research revealed two main findings: (1) the level of intervention and its influence on the interpretation of circularity in general and (2) a connection between the role maintained by individual organisations in a CBM and their actual interpretation of circularity.

Unlike recent studies, which classified influencing factors for circularity based on five categories (economic, environmental, social, organisational, institutional and technological influencing factors) (Aloini et al., 2020; Urbinati et al., 2021), this research identified more in-depth categories (TBL, material, customer demands, business and political standards, individual perception and communication) as categories for CBMs. Furthermore, this research makes a novel contribution in setting the identified factors in relation to individual CBMs (see Table 5.2). The main findings in that regard include a noticed tendency Resource and Recover models, such as valorisation, are more driven by the idea of identifying own waste streams and developing creative ideas in niche markets. Contrasting to Product Life Extension Models (i.e., Repair, Refill, Reuse), which follow a different nature of creating waste stream. In addition, linking collaborations with waste service providers are conducted with hesitation due to the stigma that resources might be dropped out of the loop. The main findings recommend that influencing factors (customer demand, business standards, individual perceptions, and communication skills) are shared amongst the variety of CBMs, while TBL and material influencing factors have a more targeted influence on CBMs.

RQ2: How do contextual factors contribute to the implementation of Circular Business Models?

The second RQ looked at the underlying contextual factors of technology, collaboration, and policy by investigating their role in the grand scheme of CBMs. The main findings identified different business partners on different theoretical levels (see Section 6.2 and Figure 6.1), including the challenges that come with such holistic collaborations. Novel in this approach is to highlight it from the theoretical lens of SCT and in conjunction with individual CBMs. The main findings include the strong linking collaboration in the resource recovery model of refurbishment, as well as the openness for linking collaborations with competitors. Technology can aid in establishing these collaborations. A key finding identified the role of technology as a supporting tool in the transition phase from linearity to circularity and beyond. The following three main categories emerged: technology as a communication tool, tracking tool, and digital platforms.

The findings for contextual factor policy were in alignment with the findings of the literature review in Section 2.6.2. Key findings agreed that policy is established in the three-fold international, national, and local policy guidelines. Although the general approach of political guidelines is seen as a top-down approach, local policy appears to have the biggest impact on action taken in CBMs. Furthermore, apparent inconspicuous tools, such as BS standards, local recycling statutory rules, or accreditations, have a stronger impact than expected. In comparison, international guidelines, such as the SDGs, are acknowledged, but maintain a lower, direct impact on circular organisations.

RQ3 How is value conceptualised and measured in Circular Business Models?

The third RQ looked at the conceptualisation of value and its measurements. Therefore, Osterwalder and Pigneur's (2010) business model canvas was used as a baseline to investigate the value characteristics of CBMs. Key findings identified the different values based on the perspectives of value proposition, creation, delivery, and capture, and in the light of the diverse CBMs. In addition, values based on the TBL were identified. The key findings of the ranking revealed the following three scenarios:

- prioritisation of only one value
- two values are rated the same importance
- all values are equally important.

Furthermore, the reasons that influence organisations in prioritising economic value were identified. Despite the still strong presence of economic value prioritisation, the research revealed a growing interest in social value creation. To complete the value conceptualisation, this study further investigated value measurements, which have rarely been investigated in empirical research studies. The study was able to identify seven different forms of value measurement, including currently used examples and tools.

8.3 Research contributions

This research contributed to the theory and practice of the circular movement. In the following section, the theoretical and managerial contributions are described in further detail.

The following theoretical contributions are made:

- **Contribution to the definition of circularity in the context of CBMs**

  Research is still looking for a unified definition of CBMs (see Table 2.10). This research contributed to this gap by further developing a definition that unifies circularity and CBMs in the context of their different application levels (micro, meso, macro). Therefore, the established definition is as follows: *Circular Economy describes a restorative economic system, operating on different levels (macro, meso, micro), based on different Circular Business Models, to provide circular networks via circular actions (valorisation, recovery, refurbishment, etc.), the opportunity to keep materials, components, products at their highest utility, and as long as possible in the circle.*

- **Development of a framework looking at the value conceptualisation of CBMs**

  The research was accompanied by the development of a theoretical framework, aiding in understanding in depth the value conceptualisation in the diversity of CBMs. Furthermore, the framework highlighted that influencing factors do not only have an impact on CBMs, but equally on the networks and the value creation conceptualisation. The framework can be further developed when investigating the pathways emerging from the research (see Section 8.4.2).

- **Merging value characteristics with TBL values**

  As a novel contribution, the value characteristics were merged with the TBL values. To date, this merger has only been done by Joyce and Paquin (2016). However, their focus was more on the triple bottom layers of sustainable business models, while this research looked at the topic from a circular perspective, considering its managerial application. Therefore, the developed Table 7.17 could also be applied as a template for organisations in identifying their value contribution.

- **Theoretical application of Social Capital Theory**

  Research has very restrictedly applied SCT. This research identified the relationship and their impact on CBMs based on bonding, bridging, and linking activities.

- **Empirical research in the field of CBMs**

  As earlier research stated, there is a lack of empirical research in the topic of circularity; this research contributed by applying a qualitative data collection approach.

The following managerial recommendations are made:

- **Identification of influencing factors based on CBMs**

  A variety of influencing factors was identified. Novelty emerges as these influencing factors were allocated based on specific CBMs. Therefore, managers can now see which influencing factors are of greater importance in their applied CBM (RQ1).

- **Identification of collaborative partners based on CBMs**

  A variety of new circular partners have been identified. This has been done in light of the respective CBMs. These can be considered for organisations in their search for adequate circular partners (RQ1).

- **Role of technology in CBMs**

  The role of technology has been identified. First, it is recommended to use technology as a twin approach to combining new CBMs with technology. In addition, technology has been identified as a supporting tool. Specific areas in which technology can be extremely supportive have been identified and named. Furthermore, findings identified the application of technology in CBMs in three major areas: communication, tracking, and platforms. This could help organisations in the identification of available technology, as well as in the guidance of application according to the CBMs (RQ2).

- **Consideration of policy at all circular levels**

  Policy has been identified as a contextual factor, aiding in setting the scene for circularity. It has been confirmed to follow a three-fold approach of international, national, and local policy guidelines. However, organisations mainly follow micro-level policy, which is particularly interesting for policymakers. Policy seems to be cascaded from macro to micro level (RQ2).

- **Rating of TBL values**

  The research identified scenarios in the rating of TBL values. Organisations can use this information to reflect on their value prioritisation and eventual changes. This is particularly useful when looking at the growing interest in developing and defining social value in organisations (RQ3).

- **Business model value canvas in light of TBL values**

  The value characteristics in the context of the TBL values have been identified. In doing so, organisations can define their value conceptualisation processes (RQ3).

- **Value conceptualisation of social value**

  The research contributed to the value conceptualisation of CBMs. In doing so, it identified a stronger focus on social value, which indicates a change in industry (RQ3).

- **Considerations of circular accreditations**

  The study established that inconspicuous tools, such as BS standards, local recycling statutory rules, or accreditations, have a strong impact on circularity and CBMs. This is particularly interesting for policymakers when identifying strategies for circularity, but equally for organisations when establishing their CBMs, as both should incorporate these standards more (RQ3).

- **Value measurements identified**

  The key managerial contribution of this research is the identification of value measurements when conceptualising value. Therefore, seven measurements have been identified and discussed. Based on the CBM, managers could now adapt these (RQ3).

8.4 Research limitations and future research opportunities

8.4.1 Research limitations

The researcher acknowledges the limitations that come with this research. Therefore, a variety of methodological and execution limitations applied to this research have been identified.

As stated by diverse authors, it is more difficult to generalise from qualitative data (Miles and Huberman, 2002; Polit and Beck, 2010). *"The goal of most qualitative studies is not to generalize, but rather to provide a rich, contextualized understanding of some aspect human experience through the intensive study of particular cases"* (Polit and Beck, 2010, p. 1451). The author agrees with this statement and therefore follows Firstone's (1993) approach of analytical generalisation. In analytical generalisation, *"researchers strive to generalize from particulars to broader constructs or theory"* (Polit and Beck, 2010, p. 1453). However, there are some obvious constraints in this research, referring to the ratio of case organisations replicating specific CBMs. This research demonstrated a broader viewpoint, including a variety of CBMs. It is noted that for some CBMs, for instance upcycling, the number of case organisations is limited in comparison to, for example, remanufacturing models.

Replicability and scalability were identified as another constraint to the study. Theoretical Chapter 3 (Conceptual Framework) and Chapter 4 (Methodology) provided detailed insights into the research design, including philosophical viewpoints, methodological tools, and the case study layout. Nonetheless, the researcher acknowledges that there may be difficulties in replication and/or scaling up the number of case organisations, especially when incorporating a huge variety of CBMs in the scope of the research. Furthermore, sample size contributed to the limitations in scalability and provided limitations in the data analysis. To eliminate this research constraint, future studies are encouraged to focus solely on one or two CBMs; see Section 8.5.2 for details regarding future research suggestions.

As this research is based on qualitative research and interviews (semi-structured one-to-one interviews and focus group interviews), it is important to acknowledge the constraints coming with this data collection method. As the interviews followed a semi-structured approach, bias can occur, as the researcher might only follow the themes and questions that are relevant to the interviewee (Saunders et al., 2009). To minimise this bias, a standardised research protocol was used (see Appendix C). This has been sent to interviewees in advance to provide them with the opportunity to prepare for the interview. However, the research is not free from the above-stated bias. For instance, organisations that are not applying a technology were to some extent not able to answer any technology-related questions.

The researcher is very grateful for the participating case organisations and their interviewees, investing their personal time and effort and providing the opportunity for site visits. Nonetheless, the researcher acknowledges that there are limitations emerging from the nature of the participating case organisations. As already outlined in the case study layout (Section 4.4.2), on occasion, it was impossible to interview all main partners of the CBMs due to internal data protection schemes and other internal confidentiality regulations.

A strong effort was made by the research to build a network of circular organisations by attending numerous industry and policy events. However, despite all efforts, it was only possible to attract organisations based in the UK (with one exemption). Despite some of those organisations being active in the European market of CE, there is a bias that puts a strong emphasis on the UK and specifically Wales.

8.4.2 Future research recommendations

Future studies can consider a variety of pathways and opportunities that opened with further progression of this research. Some of these opportunities are new and emerged as the research went along; others have already been touched up on but could benefit from closer and more in-depth investigations. Some examples of topics and ideas are listed below, but are not exclusive.

Identifying the factors of policy, collaboration, and technology as contextual factors allows future research to further investigate these. Due to the nature of the case organisations, this research predominantly highlighted Welsh policy. However, future research can further investigate the policy impact in other regions or highlight deeper insight into one precise political regulation (e.g., SDGs, Built-back-better, Net-Zero).

Without a doubt, technology is a wide research field. This research began to narrow the terminology of technology by being able to define the meaning of technology in CBMs. Future research can progress on this and is encouraged to investigate the impact that digital technology has on the variety of CBMs.

As this research aimed to foreground collaborative actions in CBMs, this topic can be further investigated in a variety of ways. First, as competitors have been identified as a source for circular collaboration, future research can take a deeper dive into this. The case organisations of this study did not have an actively ongoing collaboration with a competitor. Hence, future research could investigate, based on a case organisation actively collaborating with competitors, the impact, benefits, and challenges of such a special collaboration.

Second, as this research looked at a variety of CBMs, future research could further investigate the collaborative parts of one specific CBM and take a deeper dive. This would also aid in limiting the generalisation bias mentioned in Section 8.4.1.

As this research investigated the value conceptualisation and demonstrated the connection between the value perspectives and the TBL values, future research can further investigate this topic by solely focusing on one specific industry sector, respectively CBM, and investigating the value merger further. In doing so, the created framework can be further developed to define value in individual CBMs.

A last path emerging refers to the value measurements. This research identified various value measurements that aid organisations in measuring their value contribution. Future research can expand on this topic, investigate, and deepen one value measurement further, or identify more value measurements in specific industry sectors or CBMs. In addition, future research could focus on how the value measurements could be adopted in different CBMs and organisations.

8.5 Chapter summary

This chapter provided a review of the entire study. In the first step, the study was summarised based on each chapter, and key findings were listed according to the respective research question. Subsequently, the theoretical and managerial contributions of this study were introduced. As each research is accompanied by research limitations, the following section acknowledged the research limitations and constraints and revealed, in a second step, further research pathways and recommendations that emerged from this study.

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Appendices

Appendix A Example Expert Encounter Notes

Roundtable 5: Embedding the SDG's across Supply Chains

Event: The Power of The Crowd: Harnessing collective intelligence to accelerate the SDG's
Date: Monday 25th February 2019
Prepared for: [redacted]
Prepared by: Nadine Leder

Executive Summary:

Participants thoughts and ideas were inspired by the following two questions, posed at the beginning of the roundtable discussion:

1. How do business gather and share data with suppliers to make more informed decisions, and measure long-term based business benefits of sustainable sourcing?
2. How can collective intelligence in the supply chains be used to both mitigate risk and maintain a competitive advantage?

The discussion unfolded in two main themes. Firstly, *'data collection and data sharing within supply chains'* were discussed; followed by '*the greater meaning and impact of SDG's within organisations and their supply chains*'. Participants named a variety of challenges and best-practice approaches before remarking that transparency, mind-set change, collaboration and commitment are the indicators that need to be focused on, when embedding SDG's across supply chains.

First theme:

Data collection & data sharing within supply chains:

To begin with, participants shared a variety of challenges occurring when collecting or trying to share data with their suppliers, respectively customers. The following *CHALLENGES* & BARRIERS were addressed:

1. **Confidentiality protection**: Collected data can not be shared with other business entities due to existing data protection schemes. Since, these data protection schemes differ from country to country, international supply chains find the process of collecting and/or sharing data even more challenging.
2. **Communication purposes**: Attempts to share collected data for communication purposes with the wider public appears challenging. There is the tendency of only sharing data that fulfils all environmental regulations.
3. **Dealing with 'underperforming data'**: Data which does not meet the environmental requirements, in other words data that is underperforming, is less likely to be shared. Achieving a mind-set change, in which underperforming

Appendix A Interview protocol cont'd (2/4)

data is considered as a transparency tool and as a possibility of (cross-) industrial learning, is currently difficult.

In the following participants shared BEST-PRACTICE AND SOLUTION approaches. These approaches covered:

1. **The use of scorecards / pre-determined indicators**, which enable the ranking of suppliers.
2. **Pre-determine criteria** regarding relevant content which the collected data should ideally cover.
3. **The power of being a member of an association:** Collected data is only shared with members of an association in which the organisation itself is a member of.
4. **The usage of online platforms:** Collected data is shared at online platforms, to which even competitors have access. In doing so, transparency and the required shift from profit-thinking towards a stronger sustainability focus is achieved. Data published on these platforms should contain both, performing and underperforming, data.

Second theme:
The greater meaning and impact of SDG's within organisations and their supply chains

During the second part of the discussion, participants addressed a variety of different CHALLENGES that come along with the implementation of the SDG's in their organisation.

1. **Application of SDG's:** Business entities are still profit-driven. The fulfilment of the SDG's is not prioritised in daily business operations.
   Furthermore, it appears to be unclear how some of the SDG's should be applied within the organisation. The question arose, if it is necessary to tick all goals, or rather go small and only tick a few?
2. **Public engagement:** SDG's and their relation to the public is difficult. The public is not informed enough about what SDG's are, and how organisations apply them.
3. **Organisational issues**: The SDG's might be used internally, but not to communicate externally. In other words, companies already applying some of

Appendix A Interview protocol cont'd (3/4)

those goals, but do not use it as a communication tool to ultimately convince costumers and end-consumers of their necessity.

4. **Industry sector related difficulties**: Some industry sectors might struggle in applying the SDG's, since their purpose, respectively initial task, differ from some of the SDG's purposes.
5. **Communication difficulties:** Under 'CSR aspects' an organisation is willing to share information; under 'SDG's aspect' information sharing is less likely.

The following SOLUTIONS were discussed:

1. **Public Information**: Public needs to get more involved i.e. by including the SDG'S on an organisation's homepage. Other options to make the public aware of SDG's include the promotion of mobile applications, such as 'SDG's in action'.
   No matter which channel of communication is used, information for the public needs to be in an easy and understandable language. This could be achieved by providing easy and imaginable examples to the public.
2. **Collaboration:** Stronger involvement of suppliers could help to share the necessary data.
3. **Governmental support** A stronger support from the government's side, by setting stricter rule and regulations or issuing certificates, could convince more suppliers in following the SDG's.

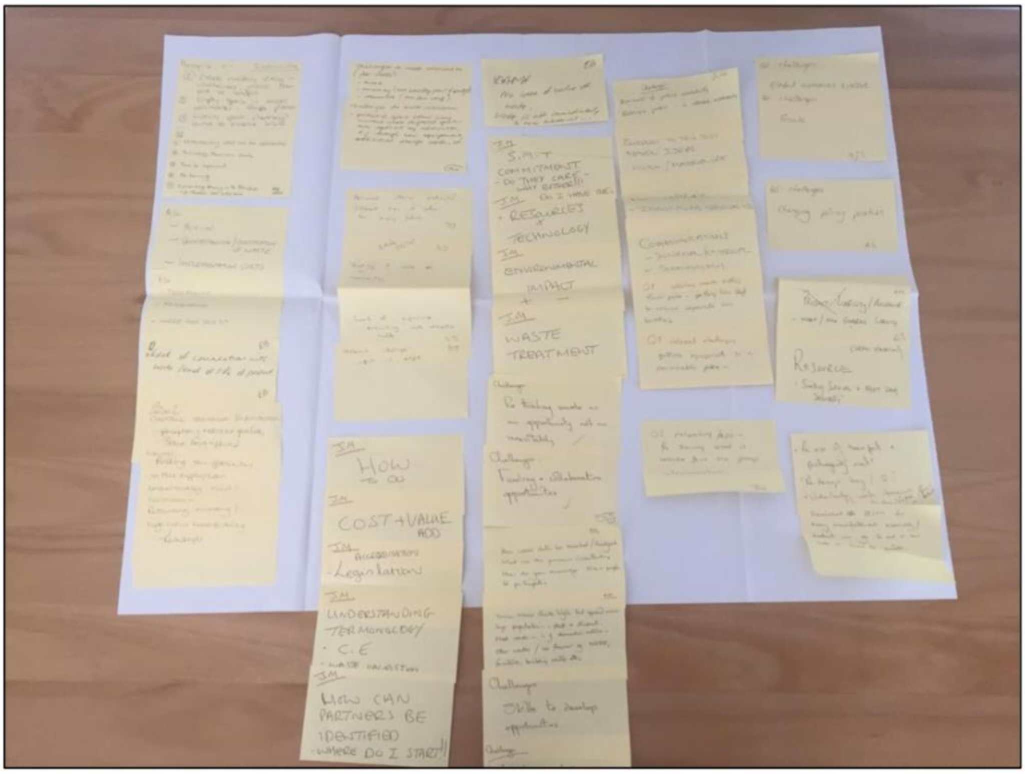
The participants concluded the roundtable discussion with the following **REMARKS.**

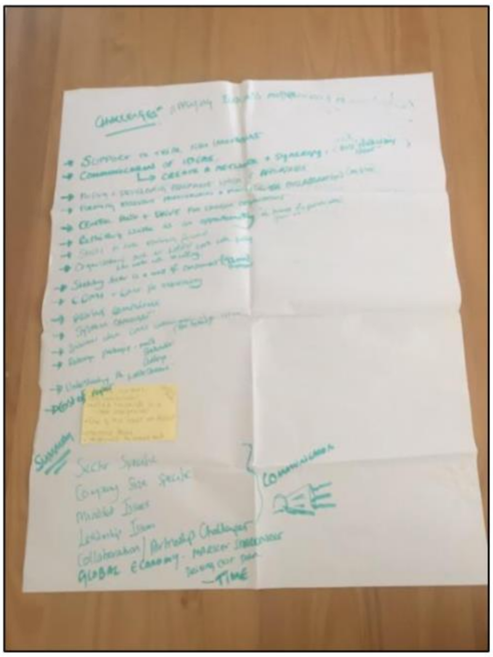
1. **Data transparency;** is needed and could be achieved by using open access platforms. Customers will value this transparency approach in the long-term.
2. **Mind-set change:** Moving away from a purely profit-driven approach towards a more open and sustainable thinking approach is necessary.
3. **Collaboration:** Stronger collaboration is needed, especially towards the supplier's side. Creating learning opportunities for suppliers by offering meetings with other suppliers in which best practices are shared, would be a first step to foster such collaboration. Secondly, stronger collaboration with local projects, respectively associations, in particular when dealing with waste reduction, is considered as an opportunity.

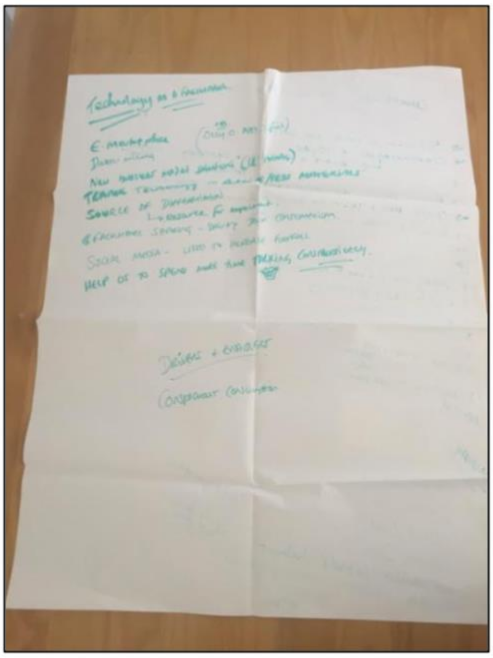
Appendix A Interview protocol cont'd (4/4)

4. **Commitment:** All new ideas and approaches need to gain the commitment of top management level.

Appendix B Summary Post-it notes Focus Group Discussion







Appendix C Interview protocol

INTERVIEW PROTOCOL – *Name of Case organisation*

A. Background
A.1 Can you please introduce me to your organisation, your position / job title and responsibilities

B. Circular Economy & Circular Model of Waste Valorisation
B.1 Can you tell me more about the **history** of the circular business model which your organisation applies? B.1.1 When did you start to implement this circular model? B.1.2 Who was leading the change towards a more circular environment in your organisation?
B.2 What was your **motivation** to realise a circular model in the first place? (i.e. environmental advantages, niche market, costs, CSR; SDGs, …)
B.3 Were there any **influencing factors** whilst implementing your circular model? (i.e. internal standards, policy regulations, customer wishes, etc) B.3.1 If so, which role did these influencing factors have?
B.4 To what extent does **policy/political regulations influence** your circular model? B.4.1 To what extent are you driven by local policy guidelines? (i.e. Future Generations Act)
B.5 To what extent is **Circular Economy** known and applied in your industry sector?
B.6 What **motivates organisations** to be part of your model (social, economic, environmental reasons)? B.6.1 To what extent is one of the three **values** (social, economic, environmental) **prioritised** by either you or your partners?
B.7 What sector specific **challenges** do you face when implementing Circular Economy?
B.8 Which **support (if any)** do you get when realising your circular model? (NGO, government, co-working, etc.)
B.9 To what extent do you **measure the effectiveness** of your circular model. In other words, how do you measure the value you created with your circular actions? (key figures, reports, social value, …)

Appendix C Interview protocol (cont'd)

C. Collaboration
C.1 How does **collaboration currently** take place in your circular model? C.1.1 Which are the parties you are collaborating with?
C.2 How do you feel when trying to **manage** your current **collaborations**? C.2.1 How do you deal with **difficulties** (i.e. uncertainties) that come along such collaborative relationships? C.2.2 What **works well** in these collaborative relationships? Why (i.e. what are you doing to make it work well)?
C.3 Are there any **parties** you wish to collaborate with, but collaboration is currently impossible? C.3.1 Why would you like to collaborate with – *party named by participant* –?
C.4 How do you think about **cross-industrial collaboration?**
C.5 Would it be an option to collaborate with **competitors** in a circular environment? C.5.1 Why (not), please elaborate?
C.6 How do you know your **collaborative relationships** are **effective**?

D. Technology & Collaboration
D.1 How would you describe the **role of technology** in Circular Economy?
D.2 How do **you apply technology** in your business model?
D.3 How do you deal with **uncertainties / difficulties** regarding technological issues in your circular model? D.3.1 Are there specific uncertainties/ difficulties occurring when collaborating with customers / suppliers?
D.4 Is there anything that **works very well** when using technology? Why?
D.5 Regarding the **financial side** of technologies, do you feel you have got the necessary **support**? (i.e. via funding opportunities, collaboration with suppliers or customers) Please elaborate.
D.6 What do you think about the usage of **digital platforms** (i.e. for waste exchange)? D.6.1 Would you have the incentive to use such a platform? Why (not)?
D.7. Would you **collaborate with competitors** when using technologies? D.7.1 Why (not), please elaborate

Appendix D Research Ethics

Appendix D1 Ethics Application

SURNAME: LEDER
Student Number: C1419200

ETHICS 2

FULL ETHICAL APPROVAL FORM
(STAFF/PHD STUDENTS) or students referring their form for a full ethical review

(For guidance on how to complete this form, please see Learning Central – CARBS RESEARCH ETHICS)

If your research will involve patients or patient data in the NHS then you should secure approval from the NHS Health Research Authority. Online applications are available on http://www.hra.nhs.uk/resources/applying-for-reviews/

NB: Safety Guidelines for researchers working alone on projects – please go to this University's web link to learn about safety policies - http://www.cf.ac.uk/osheu/index.html

Name of Lead Researcher : **NADINE LEDER**

School: CARDIFF BUSINESS SCHOOL

Email: LEDERN@CARDIFF.AC.UK

Names of other Researchers: PROF MANEESH KUMAR (1ST SUPERVISOR)
DR VASCO SANCHEZ RODRIGUES (2ND SUPERVISOR)

Email addresses of other Researchers : KUMARM8@CARDIFF.AC.UK
SANCHEZRODRIGUESVA1@CARDIFF.AC.UK

Title of Project:

WORKING TITLE: –THE IMPACT OF LEAN, GREEN AND INNOVATIVE INCENTIVES ON GLOBAL SUPPLY CHAIN MANAGEMENT–

Start and Estimated End Date of Project: OCTOBER'17 – SEPTEMBER'20

Aims and Objectives of the Research Project:

- TO COMPREHEND THE TWO FACILIATORS OF TECHNOLOGY & COLLABORATION IN THE CIRCULAR BUSINESS MODEL OF WASTE VALORISATION
- TO INVESTIGATE THE BOUNDARIES OF TECHNOLOGY & COLLABORATION IN WASTE VALORISATION
- TO INVESTIGATE CURRENT MEASUREMENT APPLIED IN WASTE VALORISATION MODELS & THEIR CONNECTON TO THE SUSTAINABILITY PILLARS

Please indicate any sources of funding for this project:
- ECONOMIC AND SOCIAL RESEARCH COUNCIL (ESRC)

SURNAME: LEDER
Student Number: C1419200

1. *Describe the methodology to be applied in the project*
This research will investigate how the two contextual factors of collaboration & technology facilitate the realisation of Circular Economy in the specific context of Waste Valorisation Models. In doing so, a framework is developed, focusing specifically on the two contextual factors of ‘collaboration’ and ‘technology’. Collaboration and technology have been identified in the literature as two major influence factor for Waste Valorisation. However, literature is not referring at all towards the point of ‘how’ those two factors can be applied in practice and ‘how’ those factors improve Waste Valorisation models. Furthermore, value creation has been identified as an essential component in the circular movement. Since appropriate value measurement are lacking, the framework aims to identify ways of measurement in a waste valorisation environment, which ideally could be linked towards the sustainability pillars. Within latest research a stronger call towards the sharing of more best-practice examples and case studies has been made. This research will the case study approach to verify and further develop the framework. Since Waste Valorisation is part of the fast-developing area of Circular economy, it is from greater importance to include viewpoints from industrial experts and academia alike. Hence, the framework has been developed based on current research literature and a variety of fieldwork visits of Circular Economy and Waste Valorisation events. To confirm the framework an assessment will be made based on the outcome of a pilot case study and up to date published secondary data. This secondary data search includes research publication, industrial- as well as policy reports. Following this, a number of organisations will take part in the case study research. These organisations will be ideally manufacturing or retailer organisations already applying the model of Waste Valorisation. The case studies themselves will be of qualitative nature, utilising semi-structured interviews as the main method for data collection, but with an option to expand to mixed methods. The framework is will be first tested by conducting pilot case study and interviews with experts in the field of circular economy (e.g. WRAP, Ellen MacArthur Foundation members, Welsh Government Circular Economy Lead). Based on the findings from pilot study and interviews with experts, framework will be revised. Thereafter, I plan to conduct main case studies with another 2 selected organisation that are considered mature in CE applications. Given the theoretical framework focuses beyond organisational boundaries, so range of external stakeholders influencing a company operations will also be part of the study, i.e. suppliers, customers, and any other company using the by-product of the selected case company.

2. ***Describe the participant sample who will be contacted for this Research Project. You need to consider the number of participants, their age, gender, recruitment methods and exclusion/inclusion criteria.***
The case study will require the involvement of several manufacturing-, respectively retail-, organisations, which already apply to some extent the circular model of waste valorisation. The number of case companies, including the pilot case company, will be no more than three (in details: one pilot case company and a maximum of two other case companies). The companies would be selected based on the level of their waste valorisation to allow a range of sector specific and cross-industrial comparisons and to elaborate on the characteristics defined in the framework. For examples, only companies applying a waste valorisation model in a B2B environment with some years of experience would be selected. Participant of the organisation will be chosen according to their job description, position in the organisation, and involvement in the waste valorisation model itself. Ideally this will be sustainability- environmental- and operations managers (or if applicable circular economy experts of the company). To gain the big picture of the entire supply chain, it is planned to interview as well Supply Chain Manager from Tier 1 Supplier Level and Managers from the organisations Business customer side that are actively involved in the waste valorisation model. The case is likely to be low (i.e. less than 6 ; including the organisation’s supplier and customers), assuming the participants possess an adequate working experience and knowledge towards the topic of Circular Economy. This study will not select participants on other measures (including age, gender, race, religious beliefs, etc). Organisations will be invited to join the research activity in writing. The researcher will send a letter, respectively email, together with the project brief. The researcher has designed an informative Poster to explain the participating organisation about the research and how it can benefit the participating organisation (see the attached poster). In doings so, the organisation will be informed about project itself and its key objectives. Prior to be involved in the research, interested organisations will be able to achieve further detailed information from the researcher by telephone, letter or email. It will be made clear that participation in the research project will be entirely voluntarily and that the organisation may withdraw their support / involvement at any point in time.

ETHICS 2

SURNAME: LEDER Student Number: C1419200

3. Describe the method by which you intend to gain consent from participants.

Following the invitation letter, any organisation which indicated their interest in the research project will be visited by the researcher herself. A short presentation, outlining the aims and objectives of the project, the research methods to be employed, plus the outputs which will results, will be delivered. It is the responsibility of the researcher to ensure informed consent is achieved; meaning, all participants are aware of the nature of the research and the reason of the study, any funding bodies involved in the project, and how the results will be disseminated. In doing so, attention will be drawn to rights and responsibilities of the researcher, Cardiff University & Cardiff Business School, as well as the collaborating organisation itself and any issues such as confidentiality. It will be ensured that such significant information is conveyed in appropriate detail and by using terms which are accessible to the participant. Opportunities for the organisation to ask questions, seek clarification, plus contact details of, both of, the researcher's superior (i.e. 1st or 2nd supervisor) will be provided.
Agreement to participate will be achieved by using the signed consent form attached, which will fully be explained to each participant. If necessary, a confidentiality agreement could be provided for organisations involved in the project.

If wished by the participating organisation, debriefing will be achieved through the provision of a case study report. The report will provide the synthesis of the research output, together with copies of any publication that might result from this research.

4. Please make a clear and concise statement of the ethical considerations raised by the project and how you intend to deal with them throughout the duration of the project. (Please use additional sheets where necessary.)

This research activity's ethical considerations focus primarily on the achievement of informed consent for the organisation, plus the need to maintain confidentiality and secure storage of data achieved. All research undertaken shall be in accordance with English and Welsh law and administrative regulations. Such regulations include, but are not limited to, Data Protection Act 1998, Copyright, Designs and Patens Act 1988, and the Copyright Regulations 1992. Furthermore, the ethics code of Cardiff University and the ESRC's ethics code will be obliged. From May 2018, the EU enforced the EU General Data Protection Regulation (GDPR). Hence this research will be conducted in accordance to this regulation as well.

Informed consent will be achieved both at the initiation of the research with an organisation, but will be subject to a continual basis. Research aims, objectives and methods will be reiterated throughout the project, with opportunities for involved to ask their questions any time. Contact details of the researcher (email, telephone), as well as the supervisors contact details (email, telephone) will be made available for all participating parties of the project.

Data and interview coding will be held in such a way that it is impossible to trace back any participant within the research project, or identify any participating organisation. Data achieved will not be published or made public in any other way which would be incompatible with the confidentiality agreements made in the research project. Data held electronically will be secured by using password systems and shall not be held on unencrypted on other media (e.g. backup tapes/discs).

The research will be conducted in accordance to CARBS ethical guidelines as well as ESRC Ethics Framework

SURNAME: LEDER
Student Number: C1419200

5. ***Please complete the following in relation to your research project:***

		Yes	No	n/a
(a)	Will you describe the main details of the research process to participants in advance, so that they are informed about what to expect?	☒	☐	☐
(b)	Will you tell participants that their participation is voluntary?	☒	☐	☐
(c)	Will you obtain written consent for participation?	☒	☐	☐
(d)	Will you tell participants that they may withdraw from the research at any time and for any reason?	☒	☐	☐
(e)	If you are using a questionnaire, will you give participants the option of omitting questions they do not want to answer?	☐	☐	☒
(f)	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☒	☐	☐
(g)	Will you offer to send participants findings from the research (e.g. copies of publications arising from the research)?	☒	☐	☐
(h)	If working with children and young people please confirm that you have visited this website : Working with children and young people and vulnerable adults please go to web link - http://www.cardiff.ac.uk/racdv/ethics/guidelines/index.html	☐	☐	☒
(i)	**DATA PROTECTION:** (A) Will any non-anonymised and/or personalised data be generated? (B) If "YES" will it be stored beyond the end of the project/archived? http://www.cardiff.ac.uk/socsi/research/researchethics/destructionofdata/index.html	☐	☒	☐

PLEASE NOTE:
If you have ticked **No** to any of 5(a) to 5(g), please give an explanation on a separate sheet.
(Note: N/A = not applicable)

If there are any other potential ethical issues that you think SREC should consider please explain them on a separate sheet. It is your obligation to bring to the attention of the Committee any ethical issues not covered on this form and checklist.

Signed: N Leder

Print Name:
NADINE LEDER

Date: 15/04/2019

SUPERVISOR'S DECLARATION (Student researchers only): As the supervisor for this student project I confirm that I believe that all research ethical issues have been dealt with in accordance with University policy and the research ethics guidelines of the relevant professional organisation.

Signed: Maneesh Kumar

Print Name:
MANEESH KUMAR

Date: 15/04/2019

TWO copies of this form (and attachments) MUST BE OFFICIALLY STAMPED

ETHICS 2

Appendix D2 Approval Letter

Cardiff Business School
Ysgol Busnes Caerdydd

Nadine, Leder
Cardiff Business School
Cardiff University

20 May 2019

Dear Nadine

Ethics Approval Reference: 1819036
Project Title: THE IMPACT OF LEAN, GREEN AND INNOVATIVE INCENTIVES ON GLOBAL supply chain management

I would like to confirm that your project has been granted ethics approval as it has met the review conditions.

Should there be a material change in the methods or circumstances of your project, you would in the first instance need to get in touch with us for re-consideration and further advice on the validity of the approval.

I wish you the best of luck on the completion of your research project.

Yours sincerely,

Electronic signature via email

Dr. Debbie Foster
Chair of the School Research Ethics Committee
Email: CARBSResearchEthics@cardiff.ac.uk

Appendix D3 Ethics for Focus Group Research

SURNAME: LEDER
Student Number: c1419200

ETHICS 1

Cardiff Business School | Ysgol Fusnes Caerdydd

STANDARD ETHICAL APPROVAL FORM

This form should be completed for every research project that involves human participants. It can also be used to identify whether a full application for ethics approval needs to be submitted. The researcher or, where the researcher is a student, the supervisor, is responsible for exercising appropriate professional judgement in this review. This checklist must be completed **before** potential participants are approached to take part in any research.

SECTION 1 - RESEARCH CHECKLIST

1.1	**Does the study involve holding personal information (names, attributable information or personal identifiers of any form) on a database?**	NO
1.2	**Does the study involve participants who are particularly vulnerable or unable to give free and informed consent (children, people with learning disabilities, students in academically dependent relationships)?**	NO
1.3	**Will it be necessary for participants to take part in the study without their full knowledge and explicit consent (perhaps through covert observation)?**	NO
1.4	**Will the study involve discussion of sensitive topics (political or religious views, illegal activities, sexual activity, drug use and so forth) that could be uncomfortable to participants or harmful if divulged to others?**	NO
1.5	**Will the study involve potentially harmful procedures of any kind or be conducted in a hazardous environment that could expose the researchers or participants to higher risk than is encountered in normal life?**	NO
1.6	**Will financial inducements (cash, vouchers or a prize draws) be offered to participants?**	NO
1.7	**Will the study involve patients or patient data in the NHS?**	NO

If you have answered 'NO' to all questions 1.1 to 1.7 above, please complete this form and submit TWO copies to Postgraduate Teaching Centre in PTC Building .Both forms will be stamped as evidence of submission. One copy will be retained by the School for audit/office purposes and the other by the researcher/s. Undergraduate and postgraduate students should include/bind their copy of the form with their research report or dissertation.

If you have answered 'YES' to any of the questions above, you will need to complete a full ethical review form (ETHICS 2, available on Learning Central – CARBS RESEARCH ETHICS)

ETHICS 1

SURNAME: LEDER
Student Number: c1419200

SECTION 2 PROJECT DETAILS

Title of Project:	**Qualitative Research Methods Assignment #2**
Name of Lead Researcher:	**Nadine Leder**
Status (please circle) :	**MSc /Post Graduate Researcher**
Names of other Researchers:	-
School: **Section:**	**Business School**
Email:	**LederN@cardiff.ac.uk**
Contact Address:	**56 Colum Road** **Flat 1** **CF103EH** **Cardiff**
Telephone number:	**07391030155**
Start and Estimated End Date of Project:	**30th March 2017**

SECTION 3 STUDENTS ONLY

Module name and number	**BST214**
Supervisor's or Module Leader's name	**Maneesh Kumar / Vasco Sanchez Rodrigues**
Email address	KumarM8@cardiff.ac.uk / sanchezrodriguesva1@cardiff.ac.uk

SECTION 4 TO BE COMPLETED BY SUPERVISOR AS VERIFICATION

• **Have you seen the students Questionnaire?** • **A copy to be attached to application**	Yes
• **Has the student prepared a consent form to leave with participants** • **A copy to be attached to application**	Yes
• **Has the student given a brief list of interview questions** • **A copy to be attached to this application**	Yes

SECTION 4 TO BE COMPLETED BY STUDENT

ETHICS 1

SURNAME: LEDER
Student Number: c1419200

Briefly describe the study design to be applied in the project including methods of data collection and data analysis **The focus group takes place within the iLEGO 2017 Workshop hosted by Cardiff Business School on Thursday 30th March 2017. The aim is to explore the role of sustainability and innovation within supply chain networks. Data analysis will be done based on a 'cluster of post-it notes' and a frequency analysis.**

SECTION 5 DECLARATION

I/we hereby agree that I/we have read the Cardiff Business School's Ethics Code of Practice and taken reasonable steps to ensure the independence and transparency of this research project. There are no significant conflicts of interest or partiality that may impact on the findings and outputs of my/our research activities. **I/we confirm that all participants will be recruited on the basis of informed consent.**	
SIGNED: N Leder **PRINCIPAL RESEARCH INVESTIGATOR**	**DATE:** 29/03/2017
SIGNED: Manesh Kumar **SUPERVISOR (WHERE APPROPRIATE)**	**DATE:** 29/03/2017

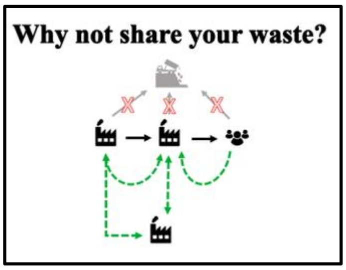
NB: Safety Guidelines for researchers working alone on projects – please go to this University's web link to learn about safety policies - http://www.cf.ac.uk/osheu/index.html

APPLICATION APPROVED
Research Ethics Committee
Cardiff Business School
Cardiff University

ETHICS 1

Appendix D4 Project Brief for Research Participants

PhD Research on the Circular Economy Business Model of Waste Valorisation



This research activity is sponsored by the Economic and Social Research Council (ESRC) in the UK, and and serves the purpose to contribute towards the Circular Economy Movement.

The focus of this research is to learn more about the Circular Business Model of Waste Valorisation, particularly in terms of value creation via collaborative business relationships and the use of technology within supply chains.

Waste Valorisation Model – What is that?

In your production process, do you generate scrap material or residue? Do you make it available to other organisations, rather than disposing in landfills or bins?
Do your customers return used products to you, so that you can refurbish or recycle them?
Do you receive recycled material from your supplier, rather than virgin material?
Do you cooperate with other organisations in order to reduce waste?
- If you can answer one of the above questions with 'yes', you are one step ahead - you do apply the model of Waste Valorisation! -

What are we looking for?
Interested case-organisations, applying the model of Waste Valorisation and which are willing to provide their time for a short series of interviews.

Who will be interviewed?
- Ideally *Sustainability-, Environmental, Circular Economy-, Procurement*, and/or *Operations Managers*, as well as your Suppliers and Customers who are involved in the model.
- Interviews will last between 30 and 60min, and are planned to take place from May from September 2019 (subject to your availability).
- Interviews can be organised on-site, via skype or via telecom; during or outside working hours, depending upon the interviewees' availability

Your Benefits:
- ❑ Access to best-in-class examples from different industries
- ❑ Access to the overall results at the end of the study
- ❑ Feedback & suggestions regarding your Waste Valorisation Model
- ❑ Network Options with the Circular Economy Club
- ❑ Option to credit you for your contribution in upcoming publications and reports

For more information…
If you are interested, please feel free to contact:

Nadine Leder	LederN@cardiff.ac.uk / (Mobile: 0739 1030 155)
Prof Maneesh Kumar	KumarM8@cardiff.ac.uk
Dr Vasco Sanchez Rordigues	SanchezrodrgiuesVA1@cardiff.ac.uk

Cardiff Business School
Ysgol Busnes Caerdydd

Appendix D5 Informed Consent

CARDIFF BUSINESS SCHOOL
RESEARCH ETHICS

Cardiff Business School
Ysgol Busnes Caerdydd

INFORMED CONSENT DECLARATION FOR PARTICIPANTS

This study is being conducted by Nadine Leder, who is a PhD Student at Cardiff University based at Cardiff Business School. She is supervised by Professor Maneesh Kumar and Dr Vasco Sanchez Rodrigues, who both can be contacted via the following email addresses:
Professor Maneesh Kumar: KumarM8@cardiff.ac.uk
Dr Vasco Sanchez Rodrigues: SanchezrodriguesVA1@cardiff.ac.uk

Participation in the research project will involve expert interviews to identify the value created in Waste Valorisation Model with the help of collaboration and technology. The interview can take place on-site, via Skype or via telecom, during or outside working hours.

Participation in the study is entirely voluntary and participants can withdraw from the study at any time without giving a reason. Participants may also ask questions at any time and discuss any concerns with either the researcher (LederN@cardiff.ac.uk) or the supervisor as listed above.

The findings of the study will form part of the PhD research project.

All information provided during the interview will be held anonymously so that it will not be possible to trace information or comments back to individual contributors. Information will be stored in accordance with the current Data Protection Act.

Participants can request information and feedback about the purpose and results of the study by applying directly to the researcher LederN@cardiff.ac.uk.

15th of April 2019

Nadine Leder
Cardiff Business School
Cardiff University

Appendix D6 Consent Form

CARDIFF BUSINESS SCHOOL
RESEARCH ETHICS

Cardiff Business School
Ysgol Busnes Caerdydd

CONSENT FORM
FOR PARTICIPANTS

Project Description:
This research activity is sponsored by the Economic and Social Research Council (ESRC) in the UK, and serves the purpose to contribute towards the Circular Economy Movement.
The focus of this research is to learn more about the Circular Business Model of Waste Valorisation, particularly in terms of value creation via collaborative business relationships and the use of technology within supply chains.

I understand that my participation in this project will involve:

- participation in one or more interviews about Waste Valorisation in the Circular Economy Movement, which will require approximately 60-90minutes of my time

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason. In that regard, provided information will be deleted or destroyed in accordance to the Data Protection Act 1998.

I understand that I am free to ask any questions at any time. The researcher conducting the research can be contacted at any time:
Email: LederN@cardiff.ac.uk
Telephone: 0739 1030155
Post: Nadine Leder, Cardiff Business School, Colum Drive, Cardiff CF10 3EU

If for any reason I experience discomfort during participation in this research project, I am free to withdraw or discuss my concerns with the researcher's supervisors listed below:

⇒ Prof Maneesh Kumar (KumarM8@cardiff.ac.uk)
⇒ Dr Vasco Sanchez Rodrigues (SanchezrodriguesVa1@cardiff.ac.uk).

I understand that the information provided by me will be held confidentially and securely, such that it is impossible to trace this information back to me individually. I understand that with that in accordance with the Data Protection Act, this information may be retained indefinitely.

I understand that at the end of the study I may request some additional information and feedback about the purpose and results of the study by applying to the University.

Name of researcher conducting the research: Nadine Leder
Name of researcher's supervisors: Prof Maneesh Kumar, Dr Vasco Sanchez Rodrigues

I, ______________________________ (*please insert in name in capital letters*) consent to participate in the research conducted by Nadine Leder, PhD student of Cardiff Business School, and supervised by Prof Maneesh Kumar and Dr Vasco Sanchez Rodrigues.

________________________________ ________________________________
(Location, Date) (Signature)