Circular Economy, Circular Communities?

Examining the role of community in circular economy organisations

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Abstract

Circular economy (CE) research has previously focused on product development or its implementation in regions or industry; very little research has been conducted into how communities can be used to advance this sustainability model. The work in this thesis investigates how organisations in North West England approach the CE and utilise their communities to further their CE ambitions. It uses stakeholder maps to visualise the community connections and the Community Capitals Framework (CCF) to reveal which capital flows are the most important. This shows how these organisations engage with and use their communities.

The research followed a Mixed Methods Case Study approach, using data drawn from interviews and secondary sources. The case studies examined organisations from a range of industries and included multinationals and SMEs. The analysis showed that despite the differences, the organisations approached the CE in many of the same ways. The CCF was applied to stakeholder maps and used for social network analyses of each case study. This revealed that Human Capital was most used by the organisations, but Social and Political Capital played a large role among their connections too. As a result of this research the Knowledge exchange, Experimentation through collaboration, Power, and Influence (KEPI) framework was developed, this can be applied to organisations working towards a CE in order to reveal whether their stakeholder connections are knowledge-based or power-based. By placing their stakeholder connections into this dichotomy, organisations can see which of their connections can be used to further their ambitions and in what ways. The knowledge-based connections are focused on learning opportunities: knowledge exchanges, and relationships that enable experimentation. The power-based relationships provide access to power structures through governance or industry or present the opportunity to influence policy and practice at different levels. This research contributes to an emerging field that is placing human interactions at the centre of the CE.

Declaration of Authorship

I, Jessica Clare Robins, can declare that this thesis has not been submitted in support of an application for another degree at this or any other university. I have written and produced the text and images and any resources I have consulted have been clearly indicated in this thesis.

Signed:

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Much of Chapter 2.3 was published in the conference manuscript:

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Chapter 1
Introduction

1.1 Positioning the PhD

This PhD was funded by the AHRC as part of a cohort, Transformation North West (TNW), who were brought together to investigate ways that the 2017 UK Government's Industrial Strategy could be applied to the Creative Industries. The PhD followed an unconventional pathway, requiring us to develop projects with stakeholders outside of academia rather than start with a research question. The projects were meant to create new products and services for the North West and our PhDs would develop out of these projects. As a first group activity, the TNW cohort was tasked with writing a response to the Industrial Strategy from the point of view of the creative industries. This task gave us an intimate knowledge of the Industrial Strategy and a context for where to focus our research. We were told to consider creating our PhD research projects around themes raised in the document that interested us. Through this activity, I became interested in situating my research within community, which fell under one of the five foundations for productivity and growth as listed in the Industrial Strategy white paper, *Place*. This also tied in with the North West focus of the PhDs. For the UK government, 'place' is intrinsically linked with 'community':

> *This is a critical moment for our cities and regions. As we make choices for our economy in the coming years, our Industrial Strategy will create new opportunities for communities throughout the UK to shape their dynamic, prosperous futures.*

(BEIS, 2017, p. 237)

Through collaborative activities conducted at the beginning of the response writing exercise, I became aware of the government's attempts to mitigate the impact of climate change, described in the Industrial Strategy through technological and business innovation. In a small part of the Industrial Strategy, the circular economy was discussed as a means of tackling climate change while also ensuring the country's prosperity.

> *We are committed to moving towards a more circular economy – to raising productivity by using resources more efficiently, to increasing resilience by contributing to a healthier environment, and to supporting long-term growth by regenerating our Natural Capital.*

(BEIS, 2017, p. 148)

Motivated by this statement, a research direction became clear: to develop projects that would investigate the intersection between community and circular economy. Through conducting a review of community-based literature, section 2.3, an understanding of the broad nature of the term *community* was arrived at, and a taxonomy was created to specify which parts of community would be explored. Through my academic background in Media and Cultural Studies I also have an interest

in networks and how individuals and organisations use these networks. Positioning circular economy research through a community and network lens would give the investigation an interesting focus.

Knowledge and uptake around the circular economy among organisations in 2017 was not at the level that it is now in 2022, so when the research initially started, there was a challenge around finding industry partners in the North West who understood the circular economy and had the capacity to develop a project around it. As design researchers, TNW were encouraged to develop action research projects that could create change within an organisation. To develop our skills, a practice project was co-designed with a TNW colleague and libraries in Cheshire East. This project encouraged the uptake, among staff, of digital technologies (laser cutters, 3D printers, programmable circuit boards, etc) provided to the libraries through Arts Council England. This project used action research methodologies, explored further in section 3.4, engaging staff through workshops and focus groups to understand the needs of the librarians and fill any skills gaps. A new programme of activities was co-designed with the librarians to take advantage of the technology they had been given and their level of confidence with this technology.

For the main thesis research, the plan was to develop action research projects with organisations exploring barriers to circular economy uptake and ways to overcome these barriers. However, due to the challenges faced in finding collaborators, a different approach to the project and data collection was needed. The research developed around more traditional data collection methods (detailed in Chapter 4 Research Design), to minimise the amount of disruption or commitment that an organisation had to give. The research also had to adapt the language used when engaging potential collaborators. As the term circular economy was relatively unknown, it was much easier to use language around *sustainability* when approaching organisations. However, once a relationship was established, the term circular economy was explained and used. During the process of finding organisations to work with, it was necessary to develop my professional networks, identifying the key stakeholders that would provide access to potential collaborators. Through student membership of IEMA (Institute of Environmental Management and Assessment) and attendance of their meetings, two collaborations were developed. Attendance at the Manchester Circular Economy Club meetings introduced two further collaborators to the project and the final collaboration was introduced through Lancaster University networks.

1.2 The Wider World During the PhD

This PhD has taken place during a period of social and political turmoil and uncertainty. Shortly before commencement of this PhD there was the Brexit vote, which took the UK out of the EU in 2020; the

global coronavirus pandemic, which halted almost all in-person interactions for a year and has caused large shifts in various industries, the effects of which are still being felt and examined. There have also been six British governments since the start of the PhD all with differing agenda and policies.

Finding different avenues to tackle the wicked problem of climate change has taken on more of an imperative in recent years, not least personally, since becoming a parent in 2021. Much of the rhetoric around climate change has focused on individual actions, changing light bulbs, recycling more, flying less; actions that often feel like toying at the edges when large polluters continue unchallenged. However, this PhD has not been designed to take down big petroleum. This thesis acknowledges that, although individual action is important, there needs to be a bigger emphasis on the responsibility of government and business, to change their practices in order to have a significant and meaningful impact. There is a paradigm, the circular economy, that is being promoted as a way that businesses, organisations, and governments can be persuaded to take bigger steps towards the mitigation and reversal of climate change while still remaining prosperous.

There has been a visible acceleration of climate change in the last few years, to which the public and organisations have been responding, through well-publicised protests in the UK and beyond, and the development of strategies such as the OECD's "Building Back Better"[1] for sustainable recovery post-pandemic. These factors are pushing sustainability initiatives into public consciousness. Successive global and national crises have started to bring elements of circularity into public and political consciousness, reflected in the huge growth in research around certain areas of circular economy. There has been a renewed interest in reshoring in manufacturing circles since Brexit and the pandemic, bringing production of parts back to the UK or countries that are closer than the Far East where most production is situated (Theyel and Hofmann, 2020; Choudhary *et al.*, 2022; Gupta *et al.*, 2021; Moradlou *et al.*, 2020; Harris *et al.*, 2020). There has also been a large increase in the number of small start-ups offering additive manufacturing, or 3D printing, services within the UK due to the cost of the technologies coming down (Liu *et al.*, 2022; Allwood *et al.*, 2019; Turner *et al.*, 2019; Rimmer, 2021). Due to economic pressures, there is more interest in repairing goods at a consumer level, with over 2,000 "Repair Cafés" registered globally in the decade since its inception in 2010 (van der Velden, 2021; Spekkink *et al.*, 2022) and there has been a wide uptake of second-hand clothing resale applications since the pandemic. These all represent different elements of CE, which is explored in more detail in section 2.2.

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[1]   https://oecd.org/coronavirus/policy-responses/building-back-better-a-sustainable-resilient-recovery-after-covid-19-52b869f5/

When this thesis started, the landscape of circular economy research was considerably less than it is now. Since 2019/2020 there's been a relative explosion of articles exploring circular economy. Searching Scopus for articles that contain the term "circular economy" published in 2017 returns 763 results. Searching for articles published in 2022 returns 5,622 articles, an increase of over 1000 articles per year. Combining the circular economy with community and networks gives this research scope to be impactful and stand out in a busy field, as the intersection of these two areas is currently under-researched. Just 83 articles were returned on Scopus when "circular economy" was searched for with "community" and "networks", 57 of which have been published since 2020. This research builds on these areas to show that there are huge benefits for organisations to connect with active communities in their local or industry areas. The circular economy will create change in many aspects of our lives, not just within organisations, so it is important to study its impact beyond the usual business lens.

1.3 Research Overview

The research explored in this thesis brings together elements of community and network studies with the circular economy. It takes two very different areas of research and explores the intersections between them. Working with organisations who were working towards a circular economy, the research explored the communities they operated within and interacted with, and examined whether these communities made any contribution to the organisation's circular ambitions. The primary aim of the research was to understand the roles of different types of community in a circular economy transition. Figure 1-1 shows how the different elements of the research come together in the thesis.

The research aimed to examine the different ways in which the organisations engaged with their communities to enhance their circular economy ambitions. It did this through an examination of their networks using the Community Capitals Framework to identify and demonstrate the capitals that exist within each relationship that the case study organisation has. The framework allowed for an examination of capital required by a community to develop resilience and to prosper. By framing the analysis this way, the research positions the case study organisations as communities themselves, which enables the research to reframe each organisation as a small part of a much wider whole, entities that are embedded within their networks rather than externally. It positions the case study organisations within a much greater CE community that must utilise all of its resources to continue to develop.

The research also aimed to understand how these organisations interpreted and implemented the circular economy within their business operations and outside of them. It was not the aim of this thesis
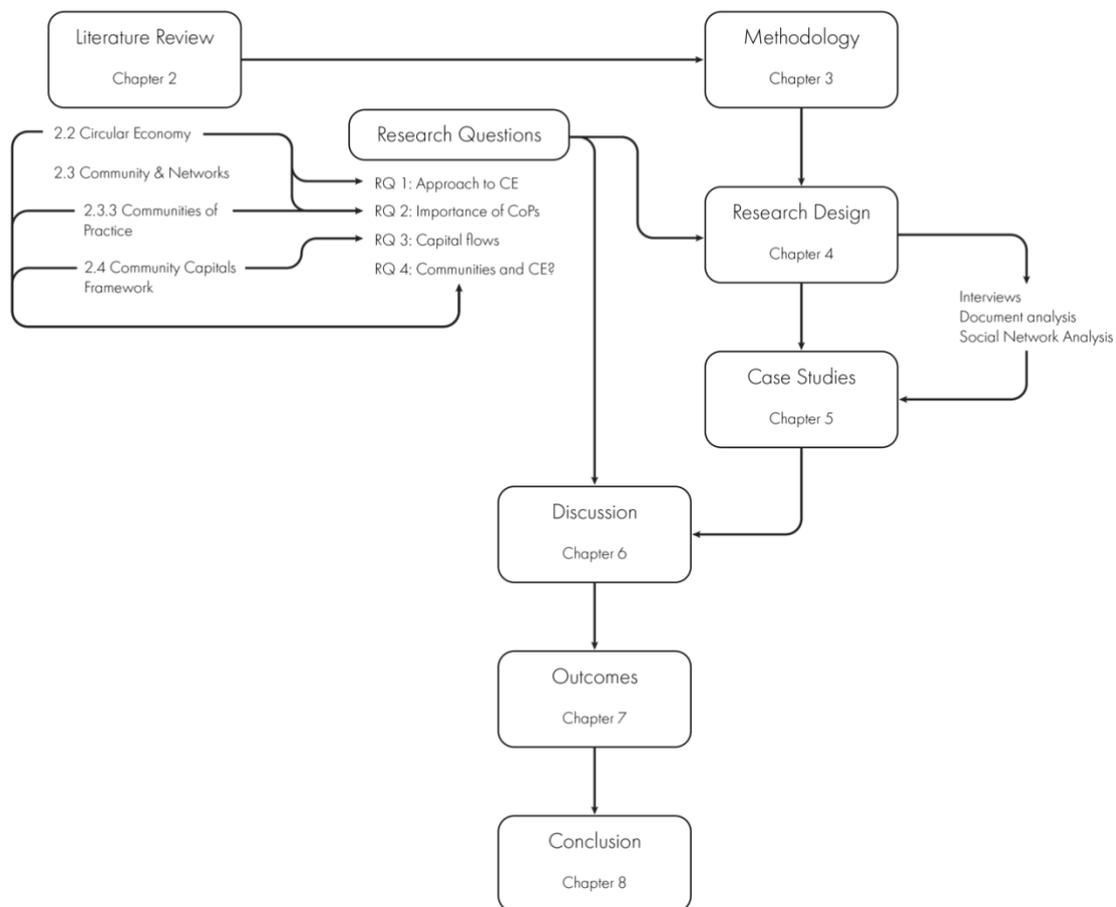
Figure 1-1: Flow chart of the thesis.

to evaluate the case study's ecological impact, and where there are comments on their efforts, these should be understood as open to interpretation.

Within this thesis, the *circular economy* refers to the economic model that advocates a move away from the current economic model of take – make – dispose to one of cycles of reuse of materials already in circulation, ensuring that products and materials are designed to be reused as many times as possible. *Community* is used to describe a network of business and local communities, Communities of Practice, and other groups, that utilise capital flows to function. The research examines these communities as individual entities that make up part of a whole.

Through the literature review in Chapter 2, the following four research questions were developed:

> *RQ 1: How do organisations approach the circular economy?*

> *RQ 2: How important are Communities of Practice to an organisation's circular journey?*

> *RQ 3: Which capital flows are the most important to an organisation's network?*

> *RQ 4: How do organisations engage with and use their communities to further their circular economy ambitions?*

To answer the research questions case studies were developed with five organisations working towards the circular economy. The case studies were made up of interviews, a stakeholder mapping exercise, and secondary document analysis, the documents examined were publicly available at the time of the analysis.

The circular economy analysis used frameworks developed from the literature to explore the interpretation and implementation of the circular economy. The community analysis used social network analysis in combination with the Community Capitals Framework to explore the networks and relationships of the organisations studied. This part of the analysis also looked at the CoPs each organisation was involved with, analysing their make-up and relevance to the organisation.

1.4 Chapter Outlines

The following section outlines each of the chapters in this thesis. The first half situates the research fields within the current literature, offers a review of the different research approaches, and discusses the design of the research. The second half describes the case studies undertaken, providing analysis of the data gathered, followed by a discussion and conclusion of the results.

Chapter 2 Circular Economy and Communities: Framing the Discussion Through the Literature

This chapter reviews and describes the concepts around the different fields of research being explored in the thesis. It starts with the circular economy, reviewing the approaches to the model and defining where the thesis research is positioned in terms of this sustainability model. Through this review, a comprehensive understanding of circular economy is developed that is used as a lens to examine how organisations understand and implement circularity within their organisations. Gaps in the circular economy literature are also identified concerning community, which is explored in the second section. Community is defined in this section and its relevance to the research is reviewed alongside network theory, introducing ideas around these concepts, and stating how they are used to frame the research regarding these areas. This section also introduces the Community Capitals Framework, developing a deeper understanding of the types of connections the case studies have. Through the exploration of these areas, gaps in the research are identified to bring together the different fields studied.

Chapter 3 Methodology

This section reviews the different approaches that are used to underpin academic research and inform the study undertaken through this thesis. It firstly explores the different philosophical positions that could be considered for this research; going into detail about the epistemological positions that underpin most research, before exploring a number of theoretical frameworks that were considered

and discussing some of the methodologies and methods that could be used to create a rich selection of data for analysis.

Chapter 4 Research Design

The Research Design chapter selects the philosophical position that this research takes and describes the rationale for these decisions. It describes the choices made for the research based on the theoretical framework, going into detail about the methodologies selected to answer the research questions. The final section details the case study analysis methods used to gather and analyse the data.

Chapter 5 Case Studies

The sections in this chapter detail each of the case studies undertaken in the research; following the research design described in Chapter 4, the case studies explore the organisations' attitudes to circular economy principles, and then look at their communities and networks. The chapter covers five case studies that include two large corporations and three SMEs working in different industries but all with a strong sustainability ethos and towards a circular economy. The case studies used interviews, stakeholder mapping exercises, and document analysis to develop the data that is detailed in this chapter.

Chapter 6 Responding to the Research Questions

This chapter responds to the research questions posed in the Research Design Chapter. It starts with an analysis that crosses the case studies and considers in detail the data synthesised in the previous chapter to find patterns and commonalities across the case study organisations. It follows the research design frameworks developed and explores in detail each of the research questions, using the individual case study data and cross-case data to answer them.

Chapter 7 Research Outcomes and Contribution to Knowledge

This chapter explores the outcomes of the research and describes this thesis' contribution to knowledge. It details the development of a framework that has arisen out of the cross-case analysis for use with organisations wishing to develop circularity beyond their business remit and asks them to consider their place in the circular economy through scrutinising their stakeholders. This section also includes the first stages of feedback on the framework, which has been provided by some of the case study organisations.

Chapter 8 Discussion and Conclusion

This chapter situates the research within the wider circular economy debate, starting with a brief examination of the changing landscape of circular economy research over the duration of the PhD, and discusses issues raised by the interviews that did not fit within the research framework. The

second half of the chapter returns the focus to the research and answers the research questions. There follows a reflection on the study itself, a discussion of the limitations and further avenues of study that this research could lead to.

Chapter 2
Circular Economy and Communities: Framing the Discussion Through the Literature

This section describes the concepts around the circular economy, exploring where the thesis research is positioned in terms of this sustainability model. Through this research, gaps in the circular economy literature are identified in relation to communities, which are then explored in the second section. Community theory and its relevance to the research is examined alongside network theory, introducing ideas around these concepts, and stating how the research is framed regarding these areas. This section also introduces the Community Capitals Framework, which is applied to the case study analysis to develop a deeper understanding of the types of connections the case studies have. Through the exploration of these areas, gaps in the research are identified and the research questions are formed.

2.1 Climate Emergency

It is no longer possible to deny that the world is living through a radical change in climate. In the last decade, countries across the globe have consistently experienced record-breaking temperatures in both summer and winter; instability in arid regions; and dire warnings from the scientific community, all pointing to a need to act quickly in a thoughtful, long-term, and sustainable way (Berners-Lee and Clark, 2013; Cook *et al.*, 2016). Recently, there has become greater public awareness of the damage caused by consumerism and unchecked growth (Raworth, 2014; Newman *et al.*, 2012; von Weizsäcker and Wijkman, 2018). Documentary series such as the BBC's Blue Planet II (2017) are affecting national policy (Rawlinson, 2017); school children around the world are striking for stronger actions (Aronoff, 2019); and a well-publicised report by the Intergovernmental Panel on Climate Change has issued a stark warning that *"that global net human-caused emissions will need to fall by about 45% from 2010 levels by 2030, reaching 'net zero' by 2050"* (Norton, 2018, p. 1) to avert ecological disaster. Despite the recommendations in the report not being ratified by all countries in the UN, global citizens are taking notice and demanding more from corporations and policy makers (Gallaud and Laperche, 2016; Aronoff, 2019).

The climate emergency can be viewed as a set of wicked problems, too complex to be seen as one problem with one solution (Buchanan, 1992). Attempts to create neat descriptions of the problems are not possible without understanding the framing through which the problems are described (White and van Koten, 2016). John Dryzek (2013) developed four discourses through which to discuss approaches to environmentalism in contrast to industrialisation. He discussed dimensions that are either *reformist*, focusing on small changes or ones that require large, *radical*, changes, these dimensions sit alongside either *prosaic* ideas, that requires action but not a new society, or *imaginative* ideas, that see environmental problems as opportunities for change, *"the environment is brought into the heart of society and its cultural, moral, and economic systems, rather than being seen as a source of difficulties standing outside these systems."* (2013, p. 15). The combination of these four dimensions creates four areas of environmental discourse, discussed in Table 2-1.

	Reformist	*Radical*
Prosaic	**Environmental problem solving** Adjusting the political and economic status quo to manage environmental problems. Using market incentives or policy updates to control climate change.	**Limits & survival or survivalism** Staying within 'planetary boundaries' by redistributing power and moving away from continuous growth, through better control of existing systems.
Imaginative	**Sustainability** A stance that is compatible with both environmental and economic values, rather than a conflict, as described in the prosaic discourses.	**Green radicalism** Rejecting industrialised models for society and embracing alternative positionings of the environment within society.

Table 2-1: Four environmental discourses to discuss responses to climate change.

Source: John Dryzek (2013, pp. 15-16)

The CE proposes a model designed to disrupt the status quo, challenging companies, and countries, to alter how they think about resources and do business, while allowing for the possibility of growth. It is poised to bring about the change consumers are demanding and is an idea gaining traction with businesses, governments, and academics (Kirchherr *et al.*, 2018; Geissdoerfer *et al.*, 2017; Mathews and Tan, 2016; Ellen MacArthur Foundation, 2013a). It can be seen as contradictory, however, on the one hand demanding disruption to current practices, but on the other, continuing normative practices that encourage growth within a capitalist framework. Further limitations are discussed in section 2.2.8.

This chapter explores the need for a CE, the theories behind it and prominent models that have been developed. It focuses on the influence of key texts from academia and business and situates the CE within the context of the rest of this thesis. It also examines some of the critiques of the CE, discussing where problems and contradictions lie within the model.

2.2 Circular Economy

The environmental movement has waxed and waned over the decades of the 20th and 21st Centuries (Gray *et al.*, 2014; Piccioni *et al.*, 2014; von Weizsäcker and Wijkman, 2018). In the last 25-30 years, since the 1992 Kyoto Protocol, various international agreements have been passed by the UN. However, they have not made a huge impact in the decades since, as the countries that generate the highest amount of greenhouse gasses have failed to implement strong enough measures to curb greenhouse gas emissions (Gallaud and Laperche, 2016; von Weizsäcker and Wijkman, 2018; Berners-Lee, 2019). There is a pervading idea that prosperity and growth do not fit with environmental protection, which has led to short-termism and weak policy on climate change in favour of the market (Raworth, 2014; von Weizsäcker and Wijkman, 2018).

> *Consequently, governments impose fewer regulations on the activities of corporations, preferring to rely on approaches involving voluntary commitment and on the pressure brought to be borne by consumers against the polluting activities. Consumers, for their part, remained relatively unconcerned by these issues.*

(Gallaud and Laperche, 2016, p. ix)

Advocates of CE aim to address this short termism by demonstrating that through the decoupling of growth from resources and long-term planning, businesses and governments can tap into an economy worth billions (Ellen MacArthur Foundation, 2013). With the rise in consumer awareness of the impact of pollution on the environment, governments and corporations are being pushed to adopt radical shifts in policy (Wiese *et al.*, 2015; Unilever, 2017; PriceWaterhouseCoopers, 2008). The CE is bringing a new dimension to business. Previously, for many organisations, sustainability and "green causes" were side-lined as corporate social responsibility efforts, rather than being an integral part of business models. The CE demonstrates that sustainable practices can be an integral part of how a business operates; helping to fight against the notion that environmental protection is at odds with profitability (Veleva *et al.*, 2017; Kirchherr *et al.*, 2018).

2.2.1 Background to the Circular Economy

Although the CE ideas are becoming more widespread, the idea of intelligently designed systems that ensure resource longevity is not a new one. This section examines the key figures in the arguments for a CE; exploring their influence on the movement and how the current definition, as used in this thesis, has come about.

A key text that focuses on the design of products for a sustainable future is Cradle to Cradle (2009), by architect William McDonough and chemist Michael Braungart. It is an optimistic manifesto that proposed a radical shakeup of the way things are designed. Based around closed-loop systems that mitigate the negative effects of production processes but feedback to create a better environment overall. Looking towards the natural world as inspiration, they argue that new products should be designed with material reuse in mind and each stage of the product life-cycle considered. Some of the concepts they champion include design for disassembly and local manufacture. They argue for 'Recovery' to be added to the '3Rs' of "Reduce Reuse and Recycle", to create processes that can extract resources out of waste streams, rather than mining 'virgin' sources of that resource. Since 2002, their manifesto has developed into a design framework and certification of the same name, with 8,000 products currently registered (see www.c2ccertified.organisation).

Prior to McDonough and Braungart publishing their manifesto, cradle to cradle systems were explored through ideas of a closed loop economy by Walter Stahel in a number of seminal papers and books. Founder of the Product-Life Institute, Europe's oldest sustainability-based consulting firm

(http://product-life.organisation/), Stahel, is credited with initially developing the ideas around the CE. Firstly, in the 1976 research report to the European Commission 'The Potential for Substituting Manpower for Energy' with Genevieve Reday-Mulvay, which "*sketched the vision of circular economy and its impact on job creation, economic competitiveness, resource savings, and waste prevention.*" (Kopnina, 2014). The ideas laid out in this paper and his prize winning 1982 paper, 'Product-Life Factor' are expanded upon in his 2006 book, *The Performance Economy*, in which he develops a framework around a 'loop' or CE. He mandates for the new economy to take a holistic view, "*from an emphasis on periodically replacing existing goods by new ones to efficiently managing existing material assets*" (Stahel, 2010, p. 181). This includes a shakeup of economic accounting in order to measure Human Capital alongside Natural and Financial Capital (discussed further in section 2.5). "*The quality of Human Capital can be greatly improved through education and training – and it is the only type of capital that will deteriorate over time if left unused.*" (Stahel, 2010, p. 181). The loop economy would provide new types of jobs and require new types of skills and training. Items kept in use for longer will need skilled repairers and crafters, creating a growing demand for the renewable resource 'labour'. The energy and resources used to create items must slowly be replaced by the labour used to keep them in the loop. He argues for a move away from large-scale material production towards locally integrated, small-scale, independent units; keeping products and materials in the loop for as long as possible requires keeping those products close to sites of production. To counter the economic argument from industry where designed obsolescence is often a factor, Stahel advocates for an increase in 'goods-as-services'.

> *Manufacturers become fleet managers […] when they retain control of their goods, selling results, system utilisation and customer satisfaction instead of selling the goods. Managing performance over time – for instance by extending the service-life of components and goods – then becomes an integral part of a highly profitable business model.*

(2010, pp. 184–185)

The ideas and models proposed by Stahel have been very influential on the development of ideas around the CE, especially those put out by the Ellen MacArthur Foundation, the UK's leading advocate of CE adoption. Stahel works closely with the foundation to develop frameworks for moving to a CE. Their work is explored later in this chapter.

2.2.2 Defining the Circular Economy

A lot of research has been dedicated to stabilising the meaning of CE across academia and business since 2016. This section explores some of the work done in different areas to provide clarity of the various definitions and terms used in CE research.

> *There are multiple approaches and activities that use circular economy, and these vary according to the definitions and countries being considered. These include reuse, repair, recycling, functional economy, eco-design, industrial ecology, sustainable supply and responsible consumption, in other words a profusion of concepts which demonstrate that the definition of circular economy has not yet stabilized completely.*

(Gallaud and Laperche, 2016, p. x)

Kirchher, Reike and Hekkert (2017) analyse 144 definitions of the CE in order to consolidate and create transparency around current understandings. Their research concludes to define CE as "*an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes.*" (2017, p. 229). They describe the operational levels as *micro* (at the product, company or consumer level) (See also Kalmykova, Sadagopan and Rosado, 2018; Lewandowski, 2016; Laubscher and Marinelli, 2014), *meso* (a specific resource or sector, such as water, or location-based, such as eco-industrial parks being developed across China) (Mathews, Tan and Hu, 2018; Yuan, Bi and Moriguichi, 2006) and *macro* (national, regional or city level implementation) (Elia, Gnoni and Tornese, 2017; Kirchherr, Reike and Hekkert, 2017; Blomsma, 2018; Saidani et al., 2018; Ellen MacArthur Foundation and Arup, 2019). Current trends in research tend to focus on macro-level implementation in Europe (Veleva, Bodkin and Todorova, 2017; Blomsma, 2018; Kirchherr et al., 2018; Milios, 2018; Petit-Boix and Leipold, 2018; Velte, Scheller and Steinhilper, 2018; Vuță et al., 2018), or the meso-level that focuses on localised implementation. For example, China's eco-industrial parks where industries that can make use of each other's waste are built within close proximity to one another (Geng et al., 2012; Ma et al., 2014; Mathews and Tan, 2016; Mathews, Tan and Hu, 2018). Since 2018, there has been a rise in CE research focused on the link between CE and Industry 4.0, using digital technologies to apply CE to materials (Liu et al., 2022). This is discussed further in section 2.2.6.

Within business, the CE is seen as a set of principles that advocate a new way for looking at the economy "*that decouples revenues from material input*" (Ellen MacArthur Foundation, 2013a). Promoting the reduction of waste creation through championing the reuse of waste to become new products within a 'closed-loop' system. The CE is promoted as a sustainable way for businesses and organisations to ensure prolonged resource productivity and for governments to legislate in favour of both the environment and business while facing an uncertain future (Blomsma and Brennan, 2017; Kalmykova *et al.*, 2018; Ghisellini *et al.*, 2016; Lewandowski, 2016). It celebrates innovation in areas that find new purposes for waste products, with the ultimate aim to make a zero-waste future possible. It challenges consumers to see the products they use as a service rather than a precious artefact while asking organisations to reassess their relationship with the materials they use and create ways to ensure they maintain control of their resources. Not only does it cover the design and

creation of consumable products, but it pushes for an accelerated adoption of renewable energy sources.

The CE advocates a whole system rethink of how we live and work; moving away from the current linear economic model of 'take-make-use-dispose', and towards a more sustainable, circular model, where waste is seen as a resource (Ellen MacArthur Foundation, 2013). It champions a move to totally renewable energy, draws from localist ideas of repair cultures and sharing economies, to big data, AI and globally connected technologies.

2.2.3 Ellen MacArthur Foundation and the Circular Economy

Since 2010, the Ellen MacArthur Foundation (EMF) has become the leading voice advocating for a move to the CE (Nobre and Tavares, 2021); this section focuses on their influence. The EMF have brought together ideas from Cradle to Cradle and the Performance Economy, explored above, as well as the sharing economy, repair communities, bio-mimicry, and industrial symbiosis. They have combined these ideas to promote an economic model that moves away from the take-make-dispose tryptic of the linear economy, the current basis for the global economy, to an economy that is regenerative and restorative by design and intention (Ellen MacArthur Foundation *et al.*, 2014). The EMF has engaged a lot of high-profile multinationals to represent their industries as knowledge partners. These partners investigate the possibility of CE and promote it within their industries (Ellen MacArthur Foundation, 2017). Some of these partners are known to be high polluters so whether their collaborations amount to concrete change remains to be seen (Kopnina, 2018, 2019).

Between 2013 and 2014 the EMF published three reports under the heading "Towards the Circular Economy". These reports explore the potential opportunities and impact of CE on businesses (2013a), the consumer goods sector (2013b) and global supply chains (2014). Since 2015, the EMF reports have focused on predominantly macro and meso-level CE implementation. Macro-level: looking at case studies involving individual countries and CE; implementation in cities; broad systems such as Industrial Revolution 4.0; and connected devices. Meso-level focus on one CE aspect within a city, such as the reuse of waste, for example (Ellen MacArthur Foundation, 2019b).

The first report has arguably been the most influential, bringing together essential parts of the previous writing around circularity and closed loop systems. Summarising their influence are the five underlying principles behind the CE:

> *Design out waste.* Waste does not exist when the biological and technical components (or 'nutrients') of a product are designed by intention to fit within a biological or technical materials cycle, designed for disassembly and refurbishment.
>
> *Build resilience through diversity.* Modularity, versatility, and adaptivity are prized features that need to be prioritised in an uncertain and fast-evolving world.
>
> *Rely on energy from renewable sources.*
>
> [Including Stahel's addition of human labour, as a renewable, adaptable, energy source.]
>
> *Think in 'systems'.* Systems thinking emphasises flow and connection over time and has the potential to encompass regenerative conditions rather than needing to limit its focus to one or more parts and the short term.
>
> *Waste is food.* On the biological nutrient side, the ability to reintroduce products and materials back into the biosphere through non-toxic, restorative loops is at the heart of the idea. On the technical nutrient side, improvements in quality are also possible; this is called upcycling.

(Ellen MacArthur Foundation, 2013a)

These five points are illustrated by a detailed "butterfly" diagram (Figure 2-1); exploring how biological and technical nutrients should be used within a regenerative cycle. This diagram has been frequently cited when explaining the CE as it very clearly shows the different aspects of the looped systems (Gallaud and Laperche, 2016; Lewandowski, 2016; Olakanmi, 2016; BEIS, 2017; Hopkinson et al., 2018).

The right-hand, technical, side, focuses on the reuse and redistribution of resources with a long lifespan, such as petroleum-based materials (i.e., plastics) and metals. It stresses the importance of ensuring materials remain within the cycle of use for as long as the product lifespan, without degrading the quality of the resource. The nutrients side of the butterfly looks at materials that are suitable for returning to the biosphere once their lifespan has ended, materials that are plant-based or food waste, for example.

Figure 2-1: Circular economy butterfly diagram.

Source: Ellen MacArthur Foundation (2013a).

2.2.4 How Many Rs?

CE research can be viewed in two camps, transformationist and reformist. Reformist *"takes a weak sustainability perspective and sees no need for the reduction of absolute resource input"* (Lazarevic and Brandão, 2020, p. 17). The transformationist view of the CE is something that needs to be implemented across the supply chain and considers the balance of people, planet and profit – discussed in this research as social equity, environmental quality, and economic prosperity (Elkington, 1999). "*A CE understanding only entailing one or two of the three dimensions of sustainable development can result in CE implementation that is not sustainable*" (Kirchherr, Reike and Hekkert, 2017, p. 227). From this understanding, Reike *et al* (2018) establish as "*one of decisive elements of a more transformative view of CE, nuanced material hierarchies as operationalization principle of CE"* (Reike, Vermeulen and Witjes, 2018, p. 247) also known as the R framework. Originating from Reduce – Reuse – Recycle (Ghisellini, Cialani and Ulgiati, 2016), these principles have been built on so now

there are up to 11Rs, from R0 – R10, although R10 – Rot is often missed out of literature focused on technical circularity. The R framework also reflects the butterfly diagram in Figure 2-1 above. Within a reformist view of the CE attention is only focused on the lower end of the R framework, i.e., recycling, rather than engaging with the R's further up the hierarchy (Reike, Vermeulen and Witjes, 2018). Transformationist views of the CE consider each aspect of the R hierarchy and as ideas around the CE and keeping materials in use have developed and grown so have the number of "Rs" in the R hierarchy or framework. This framework is often seen as making up the core principles of the CE (Kirchherr, Reike and Hekkert, 2017). Table 2-2 shows one interpretation of the 10R framework, however the number and meaning of the different Rs is not universally agreed upon (Reike, Vermeulen and Witjes, 2018). Within this research, the 4Rs of Reduce, Reuse, Recycle and Recover are used as they broadly cover the 11 categories, and align with the European Waste Hierarchy which was the most commonly used reference point at the time of data collection.

Smart product use and manufacturing	R0 – Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1 – Rethink	Make product use more intensive (e.g., by sharing product)
	R2 – Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
Extended lifespan of product and its parts	R3 – Reuse	Reuse by another customer of discarded product which is still in good condition and fulfils its original function
	R4 – Repair	Repair and maintenance of defective product so it can be used with its original function
	R5 – Refurbish	Restore an old product and bring it up to date
	R6 – Remanufacture	Use parts of discarded product in a new product with the same function
	R7 – Repurpose	Use discarded product or its parts in a new product with a different function
Useful application of materials	R8 – Recycle	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9 – Recover	Incineration of material with energy recovery
	R10 – Rot	Decomposition of organic material to feed new organic material growth

Table 2-2: The 10R framework.

Adapted from Kirchherr, Reike and Hekkert, 2017.

2.2.5 Design and the Circular Economy

Design has a huge role to play in the CE. From product designers ensuring that design for disassembly is built into every new product; to re-thinking and planning our towns and cities to make them easier to move around without the need for individual fossil fuel driven cars. As Ezio Manzini argues "*we are all designers*" (2015, p.1) not just as individuals but as groups, businesses, and organisations too. People-led design is at the forefront of moving to a circular economy, collaborations are needed between expert designers and other fields to come up with the materials, products, and habitats of the future. We need designers to help with "*sense making*" in the new circular world, to make the new

systems and processes "*visible and tangible*" (Manzini, 2015, p. 121). Much of the work on design and the circular economy is currently focused on production (McDonough and Braungart, 2009; Ellen MacArthur Foundation, 2013a; Yang, 2016; Blomsma and Brennan, 2017; Ellen MacArthur Foundation and IDEO, 2017; Lofthouse and Prendeville, 2018). Design can add so much more to the circular future. The move to circular systems needs a transformation of not only the production system but of how we consume (De Los Rios and Charnley, 2017). As society becomes more conscious of the impact of late capitalist levels of consumption, we are moving from being passive consumers to engaged users. Designers are the experts to ease society through this transition.

Currently, the areas explored in CE design research focus predominately on designing out waste and removing product obsolescence (McDonough and Braungart, 2009). However, a growing number of research now argues that design research needs to focus on other areas. As explored by Kirchherr *et. al.* (2018) previously, consumer uptake is the biggest issue facing the adoption of the CE across Europe. Change needs to happen across design thinking, including education (Andrews, 2015), the application of design roles in organisations (De Los Rios and Charnley, 2017), an alignment with research in design for behaviour change (Daae, Chamberlin and Boks, 2018), and people-centred design (Rossetti di Valdalbero and Birnbaum, 2017; Lofthouse and Prendeville, 2018). Andrews argues that a change in design thinking and education needs to happen to reduce the proliferation of designed obsolescence and ensure a thriving CE. She argues that designers must start designing for the CE now, rather than waiting for legislation to change.

> *Designers now have the opportunity to lead the paradigm shift and in addition to designing for the 'closed loop' they have the potential to influence business and consumer behaviour and consumption by extending actual product life and increasing perceived value of products.*

(Andrews, 2015, p. 312)

The work by De Los Rios and Charnley (2017) argues for a greater variety of designers and engineers in business to provide insight along the value chain. Adding that the consumer is "*a depleting entity,*" within a system that needs to see a shift to conscious 'users', "*as a pillar for restorative systems*" (De Los Rios and Charnley, 2017). There are different views on how this can be achieved. The work by Daae *et. al.* (2018) develops methods to examine the crossover between CE principles of maintenance, reuse, refurbish, and recycling and Design for Behaviour Change strategies.

> *For a circular economy to function successfully, it is not only necessary to have systems in place to enable the various circular goals (reuse, refurbishment, recycling, etc.) but*

> *also to increase the likelihood of consumers (or users) to behave in accordance with the goals.*

(2018, p. 522)

This strategy focuses on how the manufacturer can develop positive CE habits in their users. Design is becoming a key part of the sharing economy, particularly human-centred design (Lofthouse and Prendeville, 2018) or co-creation (Rossetti di Valdalbero and Birnbaum, 2017), developing the idea of the "passive" consumer becoming the conscious user. Design is an important part of moving our economy from one that is focused on ownership to one that is focused on access. Lofthouse and Prendeville (2018) argue that users as partners rather than subjects in product design *"has the potential to broaden the remit of issues and design artefacts under consideration.*" (2018, p. 463), allowing for a greater understanding of how users can become involved in developing circular solutions through active engagement with the design process. Rossetti di Valdalbero and Birnbaum (2017) argue that design practices such as co-design and open innovation develop trust between users, producers, and governments.

> *Trust is at the core of our European values. It is at the basis of all human relations. […] Trust is also at the roots of the economic system. In the emerging sharing economy "C2C" - Consumer to Consumer, trustful relationships are a pre-requisite.*

(2017, p. 25)

Ensuring that trust is at the centre of design practices helps us to develop and implement the new economic models that are essential for environmental wellbeing and a resilient sustainable future.

2.2.6 Digitalisation

Digitalisation and the use of new technologies is an important part of CE adoption. Many of the industrial models for CE around product service systems, continued material usage, etc. rely on the uptake and advancement of digital technologies by industry, including big data and Internet of Things (IoT), the backbone of what is being called the fourth industrial revolution or Industry 4.0 (Pagoropoulos, Pigosso and Mcaloone, 2017; Antikainen, Uusitalo and Kivikytö-Reponen, 2018; Bressanelli et al., 2018; Burkett, 2018; Neligan, 2018). Digitalisation offers the potential to "*use fewer resources more efficiently. Smart solutions enable reduction of energy consumption, logistics routes and capacity can be utilised more efficiently.*" (Antikainen, Uusitalo and Kivikytö-Reponen, 2018, p. 46). These are key components of the circular systems promoted by the CE, but digital technology can go much further in helping with the implementation of CE principles. Since 2020, there has been an explosion of research into CE and Industry 4.0 (Liu et al., 2022), especially in the areas of manufacturing (Kerin and Pham, 2019; Rusch, Schoeggl and Baumgartner, 2022; Liu et al., 2022), built

environment (Cetin, De Wolf and Bocken, 2021; Elghaish et al., 2022), and agriculture-food systems (Bigliardi and Filippelli, 2022; De Bernardi, Paola; Bertello, Alberto; Forliano, 2022).

The key areas of Industry 4.0 that are affected by the implementation of CE are grouped into *automation*, *data analysis,* and *data collection and integration* (Pagoropoulos, Pigosso and Mcaloone, 2017; Liu et al., 2022). Within data collection, Pagoropoulos *et. al.* highlight methods to track materials through supply systems. By tracking these materials organisations can implement three of the Rs - reuse, repair, and remanufacture. IoT is used to monitor a physical product while it is being used, feeding back usage results to manufacturers. Data integration involves the use of systems to bring together and manage all of the data being generated "*across multiple life cycles and across various stakeholders in the value chain.*" (2017, p. 22). The third area of data analysis employs machine learning, AI, and Big Data analytics. AI is employed to improve algorithms that respond to data, and support system optimisation and processes. Liu *et. al.* (2022) cross-references the applications of digital technologies as discussed above with the 9R framework, identifying where the current digital technology research trends are. They identify that reduction through data analysis and automation are the biggest areas of research in CE and digitalisation.

The potential of AI and machine learning to enhance the CE can be summed up in three areas:

> 1. **Design circular products, components, and materials.** *[…] through iterative machine-learning-assisted design processes that allow for rapid prototyping and testing.*
>
> 2. **Operate circular business models***. AI can magnify the competitive strength of circular economy business models, […] increase product circulation and asset utilisation through pricing and demand prediction, predictive maintenance, and smart inventory management.*
>
> 3. **Optimise circular infrastructure.** *AI can help build and improve the reverse logistics infrastructure required to 'close the loop' on products and materials by improving the processes to sort and disassemble products, remanufacture components, and recycle materials.*

(Ellen MacArthur Foundation, 2019a, pp. 4–5)

The combination of these "*two emerging megatrends*" (2019a, p. 4) can be demonstrated within the agricultural sector and consumer electronics. Describing the use of AI as a tool for farmers to understand the condition of soils and crops in real-time to optimise crop rotations and to plant according to changing weather patterns. It has the potential to reduce waste at the picking and storage stage and is being developed to assist in the sorting and composting of organic waste within cities to optimise distribution to farmers (Cîmpeanu, Dragomir and Zota, 2022).

Within consumer electronics AI can be used to aid design for longevity rather than obsolescence, creating products that are easy to disassemble for parts reuse. It can be used to optimise materials to prevent wastage at the manufacturing stage and can also be used to create an optimised circular infrastructure for the recovery of e-waste (Ellen MacArthur Foundation, 2019a). The application of AI is not a panacea to CE challenges; using deep learning technologies is very energy intensive, with a high carbon footprint (Ligozat *et al.*, 2022). These tools can add complexity and contradiction to ecological decision-making (Prendeville *et al.*, 2017) by focusing on a weak sustainability approach that relies on technology to make efficiency improvements, rather than tackling unrestricted growth (Hobson, 2013).

2.2.7 The Sharing Economy

This section examines the middle two loops on the butterfly diagram, maintenance, and reuse. The emphasis of these areas is on the consumer to change their habits; and avoid buying new products either by fixing what they already have, reusing a more durable item, buying second-hand, or borrowing. These could be the most difficult parts of the CE to instigate as research done by Kirchherr *et. al.* (2018) shows. In their study of 208 businesses and policymakers, they explore barriers to CE adoption in the EU and find that *'lacking consumer interest and awareness'* is the most pressing issue preventing wide-scale adoption of CE (2018, p. 268). This section looks at examples of where ideas of maintenance and reuse have been successfully adopted and how these ideas could be used by organisations looking to move to CE principles.

 The EMF and Cradle to Cradle mandate that products should be designed without premature obsolescence and new products last for as long as possible. The second loop of the butterfly diagram, *maintain/prolong*, puts the emphasis on products yet to be designed, and looks at high-tech solutions to monitor the degradation of a product, this is explored in the next section of this chapter. However, many products already in circulation could also be repaired for a longer life. There are movements dedicated to the repair of items already in use, with local initiatives that provide individuals with the skills to maintain and repair. The movement can be demonstrated by community maker spaces, tool libraries, and repair cafes; skills are taught cheaply or for free, often by volunteers, and equipment is loaned out. These groups are complemented by online communities of fixer and makers who share videos and write instructions for repair, maintenance and making (Gauntlett, 2011).

The third loop on the butterfly diagram focuses on reuse. This can be seen through small scale initiatives like charity shops, second hand market places in cities and online or much larger tech-platforms that connect people to services or products through lower cost than traditional avenues (Rossetti di Valdalbero and Birnbaum, 2017; Lofthouse and Prendeville, 2018). These two loops can

be seen as being part of the umbrella movement of the 'sharing economy' (Lessig, 2008; Sundararajan, 2016). Economist and author of *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist* (2014), Kate Raworth, describes the sharing economy as one "*in which the culture of ownership […] is giving way to a culture of access*" (2014, p. 26). This access is increasingly provided through online platforms where tangible items can be rented, swapped, or sold second-hand, and intangibles such as entertainment, music, software, and education can be shared for little or no cost to the user.

The sharing economy model is an example to organisations wishing to move into the CE. It provides companies and organisations with ways to earn money through rental services that use big data or IoT systems to gather usage information (Ellen MacArthur Foundation, 2019) while reducing the amount they sell (Kopnina, 2014; Raworth, 2014). Plus, they can make use of repairer networks that already exist to ensure retention and control over the raw materials within their products. Bressanelli *et. al.* (2018) describe this as *servitised business models*, where "*the use or the function of a product is sold instead of the product itself*" (2018, p. 639). This is a key model to enable organisations to align their business with CE principles. An example of a servitised business model is Philips, who rent lighting systems as opposed to selling bulbs, controlling the maintenance of the lighting systems within an office (Ellen MacArthur Foundation, 2014). At the other end of the sharing economy spectrum, there are for-profit peer-to-peer platforms. These are marketed as a utopian vision of self-employment where workers can control their hours and work independently of bosses and large companies. However, in reality, this has led to massive exploitation and is often referred to as the gig economy where the onus of ownership (of vehicles, for example) is placed on the worker and their income is greatly reduced due to maintenance costs (Cagle, 2019). This human exploitation not only applies to the workers engaged in the delivery end of the sharing economy, but all through the global supply chain, in order to provide the technology that these platforms exist on (Hobson and Lynch, 2016).

> *Consequently, we cannot have a conversation about labor platforms without first conceding that they depend on exploited human lives all along their global supply chains, starting with the hardware without which this entire "weightless" economy would sink to the bottom of the ocean.*

(Scholz, 2017, p. 166)

This type of economy links back to Stahel's arguments for human labour to be counted as a renewable energy source (Stahel, 2010), however, the exploitation of workers has led to a loss of dignity for those who engage in these industries (Scholz, 2017).

2.2.8 Limitations of the Circular Economy

The discussion, so far, has framed the CE in positive terms, however, there are several critiques of the CE that should be considered. This section will discuss some of these areas that are relevant to the thesis: focusing on the practical issues raised in the literature, but also asking whether the CE, in its current implementation, can be as systemically transformative as its advocates' promise (Zwiers, Jaeger-Erben and Hofmann, 2020; Corvellec, Stowell and Johansson, 2022).

 The difficulties organisations have when implementing CE are explored in a small number of papers, namely (Rizos et al., 2016; Kirchherr et al., 2018; Tura et al., 2019). Of these, Rizos *et. al.* identify barriers faced by start-ups and SMEs, listing them as:

> *Lack of support in the supply and demand network; lack of capital; lack of government support; administrative burden; lack of technical know-how; lack of information; and company environmental culture.*

(Rizos *et al.*, 2016, p. 11)

These barriers are examined alongside differing drivers, namely: *"company environment culture; networking; support from the demand network; financially attractive; recognition; personal knowledge; and government support"* (ibid). Kirchherr *et. al.* (2018) examine only barriers in the context of interviews with EU organisations, creating a framework of four broad categories: *cultural*, *regulatory*, *market* and *technological*. Tura *et. al.* developed seven overall themes from the literature: *"environmental; economic; social; institutional; technological and informational; supply"* (Tura et al., 2019, p. 92), covering both barriers and drivers.

Within CE research and discussion, there is an emphasis on pairing CE with digitalisation and Industry 4.0 technology advancements, in areas such as the Internet of Things, big data, and analytics (Bressanelli, 2018; Liu et al., 2022). Many advances in technology will make aspects of the CE easier to implement and manage, such as material tracking and monitoring (Cetin, De Wolf and Bocken, 2021), on-demand manufacturing (Despeisse *et al.*, 2017), and engagement with the sharing economy as discussed earlier in the chapter. However, there is little consideration of the overall ecological impact of these technologies, for example, transportation around global supply chains, and the energy needed to run these technologies. To achieve net zero ambitions by 2050, the UK needs to reduce its energy consumption to around 80% of current usage at the current (Allwood *et al.*, 2019). The focus on technological advancements as a means to enable circularity could also lead to increased competitiveness, emphasising growth over the health of ecosystems and human well-being (Calisto Friant, Vermeulen and Salomone, 2021; Corvellec, Stowell and Johansson, 2022). The focus on

technology to drive CE can also cause biodiversity to be overlooked, there is a risk that a technology-focused CE could cause further damage to the environment (Buchmann-Duck and Beazley, 2020).

The consumer with a CE is often overlooked (Kirchherr, Reike and Hekkert, 2017), but their role is important as *"within a circular economy, consumers would be expected to perform a series of behaviours that enable circular consumption."* (Camacho-Otero *et al.*, 2020, p. 75). Many factors need to be considered to encourage consumers to enthusiastically engage with every area of the CE, including repairing their current products, recycling following the correct labels, and be willing to lease rather than own (Hobson and Lynch, 201; Hobson, 2020). Hobson asks:

> *Can the usual mechanisms for directing consumer behaviour (prices, labels, and so on) serve as the main tools of social change, given how they inevitably reinforce the norms of consumerism, which of late have tended more and more towards hyper-consumerism?*

(2020, p. 480)

This starts to show the contradictions that lie within the CE model of continuous consumption but with better waste management. A recent study by Vogel and Hickel (2023) examined the reality of "green growth" alongside aims to reduce carbon emissions in high-income countries.

> *Our analysis thus suggests that green growth approaches, understood here as pursuing climate mitigation alongside continued economic growth, are inadequate for high-income countries to deliver on their Paris obligations. Further economic growth in high-income countries is at odds with the climate and equity commitments of the Paris Agreement.*

(2023, p. e764)

This study has been released since the data in this thesis was gathered and analysed but provides a sobering point of reflection on CE efforts discussed throughout this thesis and exposes the safe changes that the CE allows businesses to make that continue to allow for business as usual, as not enough to mitigate the effects of climate change.

There are concerns that the enthusiasm for CE from policymakers and businesses is glossing over the complex and difficult challenges that would be faced by leaving the embedded, capitalist, linear economy and transitioning to a circular one (Corvellec, Stowell and Johansson, 2022), favouring a weak sustainability perspective of technology-based efficiency improvements, instead of a strong perspective that favours radical change based degrowth (Hobson, 2013). The current framing of the CE positions it firmly within the capitalist structures that have benefited the powerful for so long, promising 'radical' change that is *"far from radical as it fails to address the roots and origins of the issues it claims to remedy* [… without disrupting] *the status quo in terms of power, norms and politics"*

(Hobson and Lynch, 2016, p. 17). For the CE to work and be effective within the current framework, discourse needs to move away from the supposed radical utopian vision and focus on a more modest approach that is based on a fair distribution of resources. One that *"balances tensions among ecological, economic and social priorities"* (Johansson and Henriksson, 2020, p. 155), and develops in a way that moves away from unfettered growth. There needs to be a focus on CE that provides clear solutions to actual problems, one that is transparent about what is achievable, taking a global mindset to people, energy and waste (Corvellec, Stowell and Johansson, 2022).

2.2.9 Summary and Circular Economy Research Question

The literature explored in this chapter demonstrates that there are many aspects to the CE. The principles can be applied on a range of scales, to many aspects of life: the type of work we undertake; how we consume; or the way our cities are designed. There are many aspects of the CE and as it requires a massive shift in perception and consumption patterns, it is important to be flexible when finding organisations that are working in this area. Based on the literature discussed in this section, the first research question developed aims to understand how organisations are engaging with the CE:

RQ1: How do organisations approach the circular economy?

This question allows the research to identify which parts of the CE are currently being focused on by North West organisations and reveals what gaps exist. This question is developed further in the Research Design Chapter. As this is such a large and, at the time of data gathering, a relatively new area, it is necessary to identify where the focus of the research in this thesis lies. The organisations the research engages with are different sizes, so it is important to identify where there are similarities between the case studies and develop a consistent framework to examine their CE engagement.

The following section explores at the community side of the research, focusing on Communities of Practice and other aspects of community that are useful to consider, as well as exploring networks, and introducing the Community Capitals Framework.

2.3 Community and Networks

2.3.1 Introduction

This section explores the concepts of "community" and "network", it investigates each term, developing a clear definition of how they are to be used in the thesis, and establishes the differences between them. The literature used has explored a wide selection of sources to develop an understanding of these two terms as separate entities. The chapter starts with an overview of each term before introducing theories that make up the definition of community as referred to in this thesis: systems thinking, CoPs, Community Capitals Framework, and Social Network Analysis. These are concepts that have been built out of community and network studies. The final section demonstrates how community and networks can be linked with the CE detailing the gaps that have been revealed through the literature review and situating the thesis research within these gaps. The chapter concludes by detailing the research questions that have come out of the literature review and proposing where this thesis could make its unique contribution to research.

2.3.2 A Brief History of Community

To define community for this thesis the term must be contextualised within its past and current usage. Throughout most of the 20th Century, community was discussed as either a nostalgia for a 'lost' ideal that has been destroyed by modernity (Tonnies and Hollis, 2001); a loss that could be recovered and realised through an individual making conscious connections (Durkheim and Giddens, 1972); or an achievable future utopia (Marx in Delanty, 2010). Linking these ideas was the foundation that community provided a sense of belonging.

During the 20th Century, ideas around community became more focused on communication and social networking to create, often city-based, communities as *"a mosaic of little worlds"* (Park, 1915, p. 608). Individuals could express different sides of their personality and background connected through 'communities of interest' rather than traditional, familial communities (for further research into city-based communities see Abu-Lughod and King, 1997; Hemphill and Leskowitz, 2013; Warren and Jones, 2015). With mass communication "community" began to suggest an imagined concept, developed through a shared, imagined connection, such as the nation or region (Anderson, 2006). These large, imagined communities exist through self-identification and are reinforced through symbols and signs adopted by the community and used to signify its boundaries (Cohen, 1985). Ideas of community as imagined and bound by symbols become more significant as society moves online. Ideas of networks become significant, as individuals link to different communities forming bridges between them and providing access to these communities for others (Castells, 2000; Raine and Wellman, 2012). In this

sense, communities can be seen as nodes in a wider network, and digitalisation makes communication within and between communities faster and easier.

From this literature, four key properties make up the basic structure of a community:

Social: community contains more than one person.

Belonging: there is something shared that connects members.

Communicative: members are conscious actors within the community.

Networked: members are active in maintaining the cohesion of the community.

2.3.3 Deliberately Formed Communities

Within an individual's many communities, there are often deliberately formed groups developed around a shared desire to learn about something specific, known as a Community of Practice (CoP). This is a term used to describe a group that arises based on a shared expertise or practice. These communities *"are not defined by place or by personal characteristics, but by people's potential to learn together"* (Wenger, White and Smith, 2009, p. 11). These communities often come together organically through a shared desire to improve knowledge of a certain subject. CoPs can be seen as a space for an individual to build upon skills and knowledge by connecting to a group with similar goals and practices. There is a strong element of reciprocity in CoPs, people contribute to the pool of knowledge *"while trusting that at some point, in some form, they will benefit. This kind of reciprocity is neither selflessness not simple tit for tat, but a deeper understanding of mutual value that extends over time."* (Wenger, McDermott and Snyder, 2002, p. 37).

The theory of CoPs was developed by Jean Lave and Etienne Wenger to give a name to informal shared learning that develops around a specific interest or activity (Lave and Wenger, 1991; Wenger, 1998b). However, the practice of learning socially is not a new one,

> *they were our first knowledge based social structures, back when we lived in caves and gathered around the fire to discuss strategies for cornering prey, the shape of arrowheads, or which roots were edible.*

(Wenger, McDermott and Snyder, 2002, p. 5).

CoPs are not planned groups with a definite timeline but come together organically to work on a shared problem or interest. As time goes on and new people join and others leave, the bank of knowledge grows and the practice changes to respond to new challenges and developments (Wenger, White and Smith, 2009).

There are several strata to CoP formation and analysis. They can be found within a business, where colleagues from the same department, for example, come together to develop professional skills; across a business, involving people from different departments or locations, for example, to implement a new business-wide strategy; and across organisational boundaries, e.g. responding to sector changes (Wenger, 1998a; Wenger, McDermott and Snyder, 2002). Each CoP is developed around three key aspects: reciprocal communication across multiple channels, referred to as *mutual engagement* (Barton and Tusting, 2005); a shared goal or *joint enterprise* (Li *et al.*, 2009) and thirdly "*they develop a **shared repertoire** of common resources* " (Barton and Tusting, 2005, p. 2) that are built upon and shared with members. This knowledge exchange is known as *situated learning*, which takes place through participation in the CoP (Lave and Wenger, 1991; Barton and Tusting, 2005).

CoPs tend to be formed by a core group of interested actors, usually with a key co-ordinator. They develop by drawing in new members with different levels of interest and participation. As Figure 2-2 shows, the structure of CoPs and how an individual's participation changes over time, becoming more or less involved. As the make-up of a CoP changes, so too does the dynamic, as shown in Figure 2-3. CoPs are not static entities, but they evolve as the membership changes and the shared repertoire develops and expands.

This section touches briefly on some of the literature around the sharing of information between CoPs. This is viewed as an understudied and difficult phenomenon (Hislop, 2004; Sytch and Tatarynowicz,
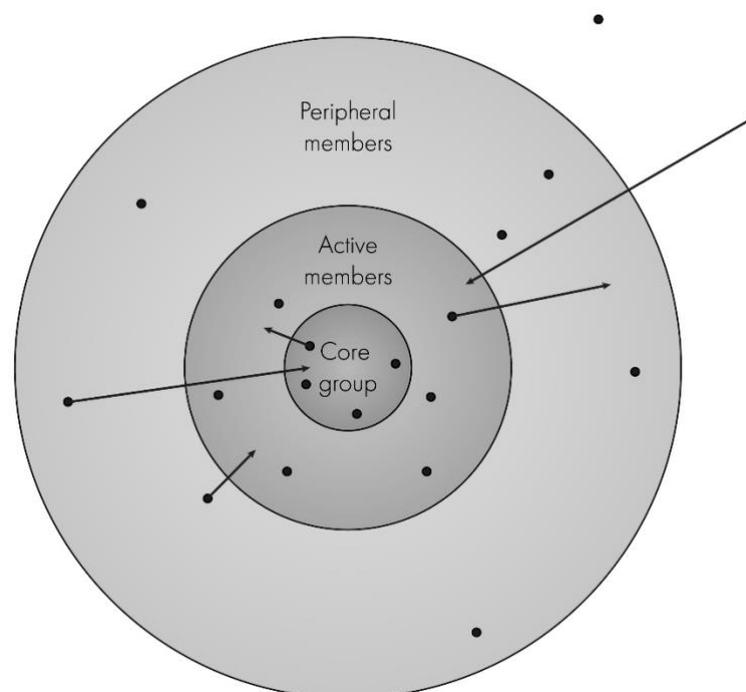
Figure 2-2: Participation in a community of practice.

Adapted from Wenger et. al.., 2002, p. 57.

2014). Sytch and Tatarynowicz identify the sparse connectivity between groups as a problem "*information, knowledge, and other critical resources are likely to be more homogeneous **within** rather than **across** network communities.*" (2014, p. 250). Hislop states that

> *the lack of consensual knowledge and diverging senses of identity that exist between communities represent two of the most important reasons why such processes are difficult and complex. […] the character of inter-community social relations crucially shapes efforts to share knowledge between communities.*

(2004, p. 43)

Despite the difficulties, Hislop argues that it is important that CoPs share information with one another to develop trust and prevent knowledge silos. He posits that it is the role of management in organisations to encourage collaboration and communication between CoPs. While moving to a CE communication between CoPs will be important as without it, organisations could miss out on crucial knowledge, tools, skills, and resource exchanges.

Stages of development
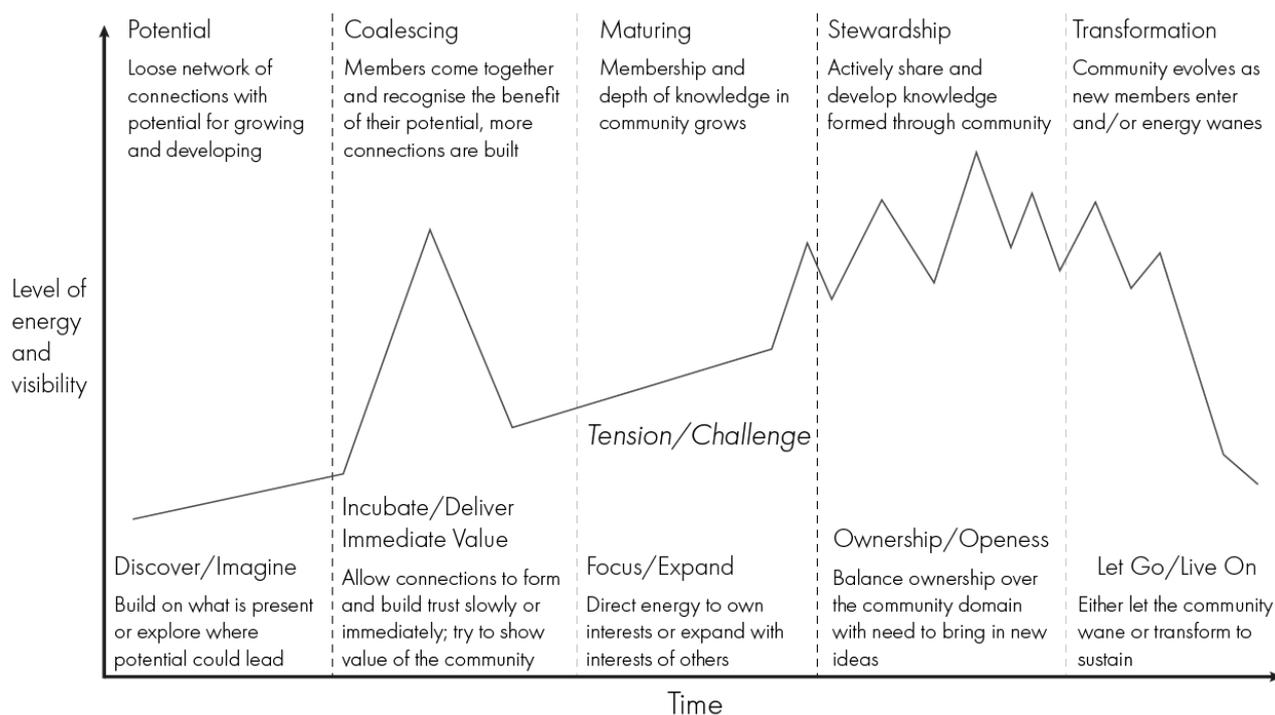
Figure 2-3: Stages of development in a community of practice.

Source: Wenger et. al.., 2002, p.69

Within this thesis community and CoP remain as separate phenomena. CoPs are used to refer to the kinds of knowledge exchange groups that have been described above, ensuring they are created around *mutual engagement*, working towards a *joint enterprise* while building a *shared repertoire*. CoPs are a useful part of the network of communities referred to, and their purpose and expertise can

benefit beyond their community boundary. Specific CoPs are identified through the case studies and highlighted, as are non-CoP communities.

The term "community" is used expansively in this thesis to refer to groups with a common interest or feature: they may have one or two of the features of a CoP but not all. There is a need for many different sorts of communities to engage with and advocate for a CE and more sustainable ways of living. The linking of CoPs with other communities shows that their real benefit is as an intrinsic part of the network whole.

2.3.4 Communities of Practice and the Circular Economy

CoPs could be critical for the move to a CE and the development of a more resilient and sustainable future. They are a key source of collaboration, and research conducted by Mies and Gold (2021) finds that *"collaboration is emphasised as main facilitator of a circular economy."* (2021, p. 11). As their primary focus is to share knowledge and expertise, they are the ideal places for the development of skills for circularity and resilience. For example, within business, as employees develop knowledge around a new way of working and thinking, across organisations collaborations will increase between design, manufacture, procurement, distribution, and the maintenance and return of goods and materials; in the early stages of moving to CE, the sharing of best practice between organisations is crucial to ensuring a CE that works for all. The knowledge and skills developed through a CoP could potentially be disseminated to other communities that the members of the CoP are part of, passing these skills on throughout a network that is wider than the initial CoP.

One of the key gaps highlighted by the literature review is the role of CoPs in the implementation of the CE. Searching through Scopus, a dearth of articles are returned that contain both "circular economy" and "community of practice". These articles focus on two areas, the education of engineers in using circular technologies and systems (Wilco *et al.*, 2018), and the barriers to CE adoption by SMEs. Rizos et al. (2016)identify *"that participation in communities of practice can support the successful implementation of circular business solutions"* (2016, p. 14). However, they identify a gap in the design of these CoPs where the specific needs and requirements of SMEs are not being provided for.

Presently two main sources of CoPs focus specifically on CE in business. The CE100 network run by the Ellen MacArthur Foundation, and Circular Economy Club, an international not-for-profit network of organisations based in more than 100 cities globally. The CE100, represents *"a pre-competitive space to advance individual agendas through collective approaches"* (Ellen MacArthur Foundation, no date). The network is made up of large multinationals, universities, 'innovative SMEs' and local governments. The literature on the CE100 website states that they work on collaborative projects together that can

take any form but must lead to tangible outcomes. The EMF also host in-person events such as 'acceleration workshops', and an annual summit. The CE Club was founded by Anna Tari in 2012, it is now an "*international network of over 3,100 circular economy professionals and organizations from over 100 countries*" (Circular Economy Club, 2019). Groups are run by volunteers on a regional basis with cities as a focal point. They meet a few times a year and often use social media sites to continue conversations outside of the meetings. The CE Club has not been the subject of any academic inquiry, although work has featured in a few papers (Jones and Comfort, 2018; Repo *et al.*, 2023). Some of the case studies chosen for this thesis research have links with the CE100 and the Circular Economy Clubs. Their relevance to the case study organisations is discussed further on in the thesis.

2.3.5 Degrees of Separation

Before an examination of networks can be made, it is important to examine the theory of *weak ties* as put forward by Granovetter (1973). This theory explores the overlap between community and networks by exploring intrapersonal ties. An individual's social world is made up of many relationships based on either strong or weak ties. Strong ties are formed between people who know each other well and develop over a long period of time, such as family and close friends; weak ties, on the other hand, are connections established quickly and more superficially with people such as work colleagues or sports club members. Weak ties can be used to create 'bridges' to other communities (Putnam, 2000), links which can enable networks to be formed. Weak ties alone cannot make a community, however, the potential bridges created through weak ties can be essential for the survival of said communities by bringing in new members with diverse ideas and enthusiasm. Strong and weak ties together can be seen as the basis for the formation of a community, although a community does not form randomly, *"the relevant aspects of the social environment can be seen as a foci around which individuals organize their social relations"* (Feld, 1981, p. 1060). These foci can be any number of things that draw people together, and weak bridging ties allow for a wide diversity of people to be brought in.

2.3.6 Networks

Network theory has become a useful tool for researchers to discuss community. This is especially true since the widespread adoption of the internet and the change in community from one based in just a physical space to one that includes virtual space as well (Castells, 2000). Network theory shows the connections between different phenomena, individuals or agents are represented by nodes that can be connected by ties which represent some form of social interaction (Granovetter, 1973). Prior to digitalisation, individualism was viewed as replacing traditional community groups based on a shared sense of place (Durkheim and Giddens, 1972), however, networked individualism could be seen to be replacing this idea. Individuals, instead of groups, are now nodes in the network, connecting many

different communities based on shared interests or ideals, whether these interests have a positive or negative effect on society (Chen, Chen and Xia, 2022; Musetti et al., 2022).

One of the methods used to study these networks is known as Social Network Analysis (SNA). It is used to examine the structure of social relationships and understand interactions between nodes and how these relationships are formed (Prell, 2012). Through SNA a detailed picture of a network of interactions can be created. SNA is covered in more detail in the Research Design chapter.

2.4 Communities, Networks, and the Circular Economy

To understand the relevance of networked communities to the CE, it is important to explore and understand the entire CE system. This way of looking at phenomena holistically is known as systems thinking. Systems thinking considers the whole system and the environment in which it is situated to identify the optimal point to create an intervention to address a challenge or situation. It "*sees the whole as different from the sum of its parts, because of the interactions between the parts.*" (Packham, 2014, p. 752). For the CE to be implemented fully, understood, and embraced by businesses and consumers alike, the separate parts need to be identified and examined together. An understanding of how these parts interact with one another must be developed (Mendoza *et al.*, 2017). Only by looking at the system as a whole can the points of intervention be identified.

> [T]he CE perspective seeks to tackle problems by looking holistically at complex systems and their interaction—and strives to conceptualize the economic system within the context of the natural system that binds all life, air, water, and matter on Earth.

(Whalen and Whalen, 2018, p. 609)

By viewing CE as a whole system, the importance of the networks that connect that system together becomes clear. According to Webster, "[t]*he circular economy is an expression of systems thinking revealed through an economy comprised of materials, energy and information stocks and flows.*" (Webster, 2013). The British Standards Institute identify systems thinking as a defining principle of the CE. *"Organisations take a holistic approach to understand how individual decisions and activities interact within the wider systems they are part of"* (BSI, 2017, p. 34). Understanding a systems thinking approach to the CE requires a detailed exploration of the networks an organisation is involved in, looking beyond the supply chain and out to places where business models could cross over or work symbiotically with one another.

Networks exist throughout the CE. The research explored in the previous chapters shows that there are focuses on: material exchange networks (Rossetti di Valdalbero and Birnbaum, 2016; Spring and Araujo, 2017; Moreno et al., 2018), collaborative knowledge exchange networks (Aminoff, Valkokari

and Kettunen, 2016; De Los Rios and Charnley, 2017), technology and industry 4.0 such as IoT and blockchain (Pagoropoulos, Pigosso and Mcaloone, 2017; Ellen MacArthur Foundation, 2019a), and supply chain networks (Gallaud and Laperche, 2016; Burkett, 2018). By exploring networks and how they differ from communities this chapter narrows the focus for the research undertaken in this thesis. Networks are made up of individuals linked through a complex series of interactions. The importance of networks beyond the supply chain has so far been overlooked in terms of the CE, the research undertaken in this thesis hopes to address this knowledge gap by building comprehensive examples of the role of networks in CE through the projects undertaken. By including networks in the research, the author hopes to provide a link between communities and the CE.

The following section explores the framework that was selected to be applied to the ties made evident through the examination of the organisations' networks. Through the application of the framework a picture of values of each of the nodes on the network is created, allowing for a detailed analysis of the nodes within each network.

2.5 Community Capitals Framework

2.5.1 Outline of Framework

Changing to a CE does not just require products and materials to become circular in their production and use but also requires a rethinking of how our economy works. One of the ideas proposed (Raworth, 2014; Stahel and Clift, 2016) is to see progress as measured through what we already have of value, rather than constant growth. These resources of value are commonly known as capital; Stahel and Clift (2016) refer to different capitals through the idea of stocks, seeing goods as something to be gathered, in opposition to common economic measurement of flows where goods move through systems. They place a greater value on stocks as that is what is usually used to demonstrate wealth rather than resource flows, "*arguably, the quality of life in a developed society depends more on the quantity and quality of its stock than on the flows through the economy*" (Ibid 2016). Traditionally, capital refers to finance and resources. Emery and Flora (2006) developed a system to discuss the wealth held within a community and where it could be built upon. This includes other sources of capital that move beyond tangible, monetary resources, adding value to individual lives and society as a whole (Flora et al., 2004; Emery and Flora, 2006; Callaghan and Colton, 2008). The Community Capitals that Emery and Flora proposed for use within their framework are 'natural', 'cultural', 'human', 'social', 'political', 'financial', and 'built'.

> *The Community Capitals Framework (CCF) offers a way to analyze community and economic development efforts from a systems perspective by identifying the assets in*

> *each capital (stock), the types of capital invested (flow), the interaction among the*
> *capitals, and the resulting impacts across capitals.*

(Emery and Flora, 2006, p. 20)

Nogueira *et. al.* (2019) added 'digital' capital to reflect the importance of digital infrastructure to contemporary society.

In a previous iteration of the research, just Social Capital was used to examine the ties evident in the networks. However, by just focusing on one capital it was felt that the examination of the connections lacked nuance and their full potential and role within the network was underappreciated. By using the CCF to explore the connections, a fuller picture of the networks was able to be developed.

2.5.2 Community Capitals Framework, Community, Networks, and the Circular Economy

The Community Capitals Framework brings together multiple parts and examines how each part fits and relates to the whole. It can be described as a systems thinking method, a discipline that has moved away from reductionist principles of research, that breaks something down into small pieces to understand it, and examines the whole system as a complex and interacting set of components (Meadows, 2017).

> *Systems thinking methods have allowed researchers to map the structure of*
> *relationships among components of a complex system, explore the dynamics of*
> *relationships among them, including causal relations and feedback loops, and explore*
> *how changes in components or their relationships with other parts affect the whole.*

(Nogueira, Ashton and Teixeira, 2019, p. 567)

The individual elements of the CCF work together to create resilient communities. Improvements in one area of capital have a knock-on effect among the other capitals and the benefits can be seen as 'spiralling up' through the community. This also makes the case for not neglecting any aspect of the CCF because of the negative, 'spiralling down', knock-on effect this can have (Emery and Flora, 2006). The CCF cannot be viewed solely as each capital acting alone, it is best viewed as a whole entity made up of equally important parts. However, Pigg *et al.*, (2013) find that there is a lack of an empirical basis for the spiralling up/down theory, and their finding show that the relationships between the capitals are more complex than indicated in the previous literature.

As discussed in section 2.2.3, the CE model has been developed using systems thinking and forces an examination of every part of the production process: identifying where there is waste and how this waste can be designed out or become a new resource; nutrient cycles and where resources can be returned to restore nature; energy systems; and material sources and technology. Beyond the

production process, a systems thinking approach is applied all along the supply chain to ensure CE principles are followed at every step, employing feedback loops to constantly improve and evolve the different sections, to ensure the whole system remains up to date and within the circular system.

> *Yet this transition requires interventions in consumer behavior, market rules and dynamics, cultural heritages and social contracts, as well as both the physical and the digital infrastructures through which individuals and organizations produce and consume things.*

(Nogueira, Ashton and Teixeira, 2019, p. 567)

The key places where these two systems overlap appear through an understanding of the economy side of the CE. By introducing the CCF to the analysis of the case studies, the research ensures that there is a firm link between the *circular* part of the CE, i.e., the manufacturing and waste removal principles, and the *economy* parts, redesigning the economy to work for people and planet. The addition of the CCF uses the capitals as representations of the different parts of this new type of economy, that looks beyond just measuring financial flows. The community capitals demonstrate the systems needed to create a decent and just transition, creating an equitable society that remains within planetary boundaries (Raworth, 2014; Ellen MacArthur Foundation, 2019).

The beginning of this chapter attempted to situate the thesis within the broad area of community. It looked at some of the types of community that the research might come across, for example, CoPs, and described how communities are represented through networks. This section focuses the research onto how communities can thrive through investment in them. The framework is used to examine organisations working towards a CE as a part of their community network, whether industry based, location based, or within the organisation itself. By applying the CCF as an interaction lens, the research can delve into the areas of capital that guide each relationship. Through examining the different capitals, this research refers to Stahel and Clift's criticism that the CE focuses too much on flows, arguing instead that it should focus on maintaining stocks of capital (2016).

> *[T]he circular economy as a strategy could benefit from a capital approach which does not have a weak-sustainability approach that focuses on maintaining the total sum of capital (natural and otherwise) and instead focuses on maintaining sustainable levels of critical natural capital stocks, as well as other forms of capital in a strong sustainability approach.*

(Brandão, Lazarevic and Finnvedan, 2020, p. 507)

The rest of this chapter explores the different capital elements of the framework.

2.5.3 Exploration of Each Element

This section explores each of the individual capitals that make up the Community Capital Framework and how they could be applied to the research undertaken in this thesis. Table 2-3 provides a summary of each element.

Natural	Cultural	Human	Social
Natural resources: renewable and non-renewable Life support systems Flora and fauna	Values and beliefs Social practices Cultural and artistic expression	Individual skills Knowledge Health Motivation	Connections between individuals Professional relationships Family, friendships, acquaintances
Political	Financial	Built	Digital
Power structures and links to them	Assets as a form of currency	Manufactured environment Material goods Machines	Infrastructure Data Online platforms Literacy

Table 2-3: Summary of capitals used in Community Capitals Framework.

Adapted from Emery & Flora (2006).

Natural Capital

Natural Capital represents the "*stock of renewable and non-renewable resources provided by nature*" (Throsby, 1999, p. 3) and the systems that ensure there is life on Earth, including climate, soils and land, water cycles etc. without which there would be no other types of capital. Its value is calculated through stocks: of domesticated animals for consumption or materials; land for arable agriculture; forestry and other plant-based resources; mineral resources for technology; or many other quantifiable resources. These are the stocks that provide the basic functions for life. Within community capital research there is recognition of the value of Natural Capital and the impact that its degradation has on the other forms of capital (Emery and Flora, 2006; Callaghan and Colton, 2008; Stahel and Clift, 2016).

The relationship between Natural Capital and the other types of capital can be seen through the four basic functions of Natural Capital: regulatory, maintaining ecosystems; carrier, the space for human existence; production, of food and resources; and information, what nature "*can teach us about itself and ourselves*" (Callaghan and Colton, 2008, p. 933). The interdependence between the capitals is explored further in the rest of the chapter.

The regeneration of Natural Capital is seen as a vital component of the CE (Ellen MacArthur Foundation, 2013a) although identified by Buchmann-Duck and Beazley (2020) as a neglected area

that can contain contentious strategies, for example, *"[Natural Capital] poses a threat to elements and areas of less "valuable" (or under-valued) bio-diversity that do not compete well in terms of market indicators or measures"* (ibid 2020, p. 4). Analysing Natural Capital connections informs the research of the importance that the CSOs place on this capital, whether it is seen as vital or neglected.

Cultural Capital

Cultural Capital is the value ascribed to culture in a given society or community. Culture can be described:

> *as an expression of group or collective aspects of people's behaviour, as demonstrated in their activities and belief systems. Thus, in broad terms something can be said to be of cultural value if it contributes to these shared elements of human experience.*

(Throsby, 1999, p. 6)

Within the CCF, Cultural Capital is seen to exists as tangible and intangible assets that a community holds and as something that belongs in different forms to all communities (Throsby, 1999; Koos, 2019; Beel and Wallace, 2020). Cultural Capital can be seen as the tangible expression of culture through heritage building, sites of religious importance, and works of art. There are also intangible expressions of culture that contribute to Cultural Capital. These assets include the "*artistic practices undertaken by creative individuals in the context of [...] places and communities which generate meaning [… and] experience*" (Scott, Rowe and Pollock, 2018, p. 2). This can be reflected through the values and beliefs of a community, whether through religion or a shared history, or through the creative expression of a place.

Human Capital

Human Capital is a traditional long-term productivity measure to describe the value of an individual to society in terms of their labour (Becker, 1964). It is developed through investment in that individual: whether by the state (in terms of formal education), their employers, or themselves. "*The acquisition of knowledge, skills and qualifications increases the productive potential of the individual concerned and is a source of future economic benefit.*" (OECD, 2001, p. 46). The investment made in the individual shapes their talent and worth (Goldin, 2014). Human Capital is something that has to be constantly built upon and developed, *"it is the only type of capital that will deteriorate over time if left unused."* (Stahel, 2010, p. 181), this is on an individual, community, and societal level. Over time, investments in Human Capital, in shared education and knowledge, cause advances in technology, which in turn, demand more skills and expertise. This has been the case throughout human history, accelerating since the start of the industrial revolution and the era of modern medicine (Goldin, 2014). These accelerations have enabled populations to live longer and healthier, and be useful members of society for longer, with each generation building on the Human Capital of the last.

Within the CCF, Human Capital moves beyond an individual's value to the labour market and places value on their skills and knowledge as tools to enhance the community. It places value on an individual's ability and motivation to develop the skills they have through access to external resources, adding to the resources of the community through the acquisition of more skills and knowledge.

> *Human Capital addresses the leadership's ability to "lead across differences," to focus on assets, to be inclusive and participatory, and to act proactively in shaping the future of the community or group.*

(Emery and Flora, 2006, p. 21)

By acknowledging the role of Human Capital within a community, leaders place value on the members of that community. There is also value placed on an individual's health and well-being, self-esteem and respect, and the ability to think and react creatively. These attributes all contribute to creating productive and active individuals, who are, in turn, of value to their community (Flora et al., 2004; Emery and Flora, 2006; Duffy et al., 2017).

Social Capital

Social Capital is used to describe an individual's worth to society through their intrapersonal skills, connections, and networks. All individuals have a level of Social Capital, which is formed through connections with other people (Coleman, 1988). There are different types of Social Capital: bonding, bridging, and linking (Putnam, 2000; Halpern, 2005). Bonding Social Capital is formed through strong ties and exists in closely linked groups such as a family or religious congregation. This type of Social Capital is good for mobilising solidarity among a specific community but can be exclusionary towards outsiders (Putnam, 2000). Bridging Social Capital, created through weak ties, is inclusive and outward-facing, it facilitates the interaction of a diverse section of society. This type of Social Capital can be seen in organisations and clubs, it provides "*better linking to external assets and for information diffusion*" (Putnam, 2000, p. 22). This creates bridges between different communities and provides connections to other sections of society. Bonding is better for getting by and bridging is better for getting on. The third type, linking Social Capital, is concerned primarily with power, and who has access to it. It is very similar to Political Capital and is discussed more in that section.

There are three structures for the development of Social Capital: obligation, reciprocity, and trust; knowledge and information; and norms and sanctions (Coleman, 1988). These structures are built through cooperation for the benefit of both actors, while the norms are developed over time, which shows a continuation of interaction that builds the trust needed for Social Capital to be maintained. *"Social Capital can improve the efficiency of other forms of capital – such as financial/manufactured capital, Human Capital, and environmental capital"* (Flora et al., 1997, p. 625) through the building of trust, which in turn reduces transactional difficulties.

Situating Social Capital within the CCF, Emery and Flora (2006) introduce the idea of Entrepreneurial Social Infrastructure as a configuration of Social Capital in relation to community development. *"ESI may be viewed as a particular format for directing or converting Social Capital into organizational forms that encourage collective action"* (Flora et al., 1997, p. 627), actively promoting change within the community. Stronger levels of Social Capital lead to an increase of trust between actors, which allows changes and developments to be embraced more readily.

Political Capital

Within the CCF, Political Capital is the ability to enact community-level change from the bottom up. It gives communities the power to shape their environment rather than having government or outside investors make decisions without local consultation (Turner, 1999). Political Capital works in the same way for communities that exist elsewhere, online for example, it is the value given by those in power to the experts in the area that is to be changed.

> *Political Capital goes beyond voice and financial investment by culminating in self-direction. Community groups use political empowerment to make independent and entrepreneurial decisions or to independently set the terms of negotiation for development. Local government may be uncomfortable giving up control over neighborhood revitalization decisions and releasing funds to community groups. Investors and the public sector can be persuaded to support neighborhood-derived development in low-income and inner-city locations, even if economic risk is high, if a strong community capacity is evident.*

(Turner, 1999, p. 16)

Trust is an essential component in Political Capital, it can allow for more access to power and money through stable communities and good political representation on every level (Rossetti di Valdalbero and Birnbaum, 2017). As discussed in the previous section, certain aspects of Political Capital can be included in Social Capital, described by Halpern (2005) as 'linking Social Capital', this aspect of Political Capital can be viewed as an individual or community's connections to structures of power, which provides the ability to enact social change. It is "*the extent to which an individual's, or community's, networks are characterised by linkage between those with very unequal power and resources*" (Halpern, 2005, p. 25). Communities with low Political Capital can be seen to be very unequal, where money and power are concentrated within a small group that is inaccessible to the rest of the community.

Financial Capital

Financial Capital is the most basic form of capital, and where the use of the term capital originates. It is the way financial resources move around the community, the amount of this resource, and how it is invested to support the creation of "*community capacity-building, to underwrite the development*

of businesses, to support civic and social entrepreneurship, and to accumulate wealth for future community development" (Emery and Flora, 2006, p. 21). There is an important degree of trust needed if Financial Capital is to be invested, as often a contract alone is not enough to mitigate the risk to investors.

> *Trust [is] built up through a learning process. Small risks [are] followed by larger ones, contingent on the success of cooperation. The importance of time and experience in deciding whether or not to cooperate points to the limits of the argument that reputation alone can account for the success of long term-contractual relations.*

(Lorenz, 1999, p. 309)

Trustful relationships must be mutually beneficial for all parties involved and cooperation should be built into these relationships. Lorenz argues the importance of reputation in creating trust, which is shown within the CCF as where Social Capital and Financial Capital cross over, the higher the Social Capital of an individual, the better their reputation, and therefore the more trustworthy they would appear.

Financial Capital is the main form of capital that can act as a catalyst for other forms of capital to function and moves a community forward (Duffy et al., 2017) . We can see Financial Capital, Political Capital, and Natural Capital working together in the recent announcement that farmers in England are to be given government subsidies to rewild parts of their land. The Natural Capital of England will be directly enhanced by these subsidies. Political Capital comes in to play through the conversations held between the relevant government departments and the farming community. If these subsidy plans do not work, then the Political Capital (trust) will be damaged between farmers and government (Harvey, 2022). Another area where Financial Capital can be seen as a catalyst for other capitals is through an organisation such as Arts Council England, who support, through financial investments, arts and culture to thrive in England. From small circus troupes to national museums, Financial Capital investment underpins Cultural Capital's ability to survive in areas where there might be less alternative investment from other sources such as tourism (Arts Council England, 2015).

Built Capital

Built Capital is the final capital within the framework developed by *Flora et. al.* (2004). It refers to the man-made infrastructure around which all the other capitals exist. It can refer to newly built structures or buildings and structures that serve an important role in the community. *"Although new Built Capital is often equated with community development, it is effective only when it contributes to other community capitals."* (Flora, Flora and Gatseyer, 2016, p. 16). Kline *et. al*. (2019) discuss Built Capital projects that have resulted in 'Spiralling up' of other capitals.

> *The forms of capital that were reported […] to be most influenced by the Built Capital projects […] were human, social, and cultural. Analysis of the spiralling up effect also revealed that many impacts contributed to an increase in more than one form of capital.*

(Kline, McGehee and Delconte, 2019, p. 912)

If new structures are built without the support of the community and consideration for the other capitals, then they can be detrimental to the community and cause the degradation of other capitals. This could include railway infrastructure, waste processing plants or wind farms.

Digital Capital

Digital Capital has recently been introduced to the CCF by Nogueira *et. al.* (2019) to reflect the increased importance of digital infrastructure. Previously, digital infrastructure: broadband cables, server centres, etc., was included in Built Capital, but they included it as a separate capital *"due to the contemporary role of digital technology and data in shaping innovation practices within multiple contexts."* (Nogueira, Ashton and Teixeira, 2019, p. 568). Digital Capital exists now as more than just the infrastructure associated with the internet, it also includes access to online information, the different modes of communication and the tools that facilitate this, digital literacy, and skills of adaptability in using current, popular platforms (Roberts and Townsend, 2016). In discussing Digital Capital's importance to rural creative communities Roberts and Townsend found that *"Digital tools are an increasingly important component of all creative practices, [… used] in various ways, from simple research to sophisticated online 'real-time' collaboration"* (Roberts and Townsend, 2016, p. 205). They found that web and computer-based tools served an important role in allowing rural creative communities to thrive. The distinction between web and computer based here is based on those digital tools that require an internet connection to function properly (web-based) and those that do not (computer-based).

Digital Capital is important to include in this thesis' view of the CCF, as there is increasing value placed on digital interactions and the use of digital tools, this has accelerated since the pandemic and the human need to communicate even through isolation. The definition of capital put forward in this chapter is the value contained within something and its ability to produce resources for other capitals. Even very traditional, placed-based communities and events are finding value in utilising Digital Capital resources: academic conferences as a specific example, may have utilised some Digital Capital for attendees pre-COVID for tweeting and sharing videos, however, since the pandemic, many conferences were either cancelled or moved online. This opened up their attendee lists to people who might have been restricted from going in person while keeping their regular contributors safe. A side-effect of this was a dramatic drop in the carbon footprint of academic conferences during the

pandemic. Even as travel restrictions are lifted, organisers are looking at continuing to host blended online and in-person events, as the argument for reducing the carbon footprint gets louder (Geitmann, 2020; Tao et al., 2021).

2.5.4 Community Capitals Overview

The CCF is a useful tool through which to examine community assets and interactions. Including the CCF within this thesis and using it as a lens to explore the case study organisations' relationships, gives the research a means to examine the perceived value of each connection. It shows how each capital relates to the network as a whole and whether certain capitals guide the work done by the case study organisations. It also reveals how the different capitals are engaging with and contributing to a CE.

This section has given some examples of where the different capitals overlap and complement one another. Figure 2-4 shows how all the capitals overlap and link together, each element represents a specific capital, but they interact with one another to create overall value for the community. Ignoring one type of capital can have a detrimental effect on the others, whereas a specific focus on one could have a positive knock-on effect too, for example, built capital improvements in a rural town improve residential relations (social capital), and increase tourism revenue (financial) (Kline, McGehee and Delconte, 2019). Throughout this section, there has been a demonstration of how each capital is used in the analysis, taking elements from the research into each capital and pulling together the parts that might reveal the most about the case study organisations' relationships. The research identifies where the capitals exist for each case study organisation and where there might be a lack of a type of capital that could be influencing the relationships or CE aims for the organisation.

2.6 Bringing the Elements of Community Together

To situate communities within the CE it is important to recognise the role of systems thinking in ensuring that the different aspects of community (network, capital flows, and communities of practice) must all be examined together as separate entities. A key part of the CE is the transformation of one business's waste into another's resource. Networks set up to facilitate connections between CE-focused businesses could provide links between local businesses that require resources from other businesses' waste (Blomsma, 2018). Another key network that is important to the CE is the establishment of servitised business models, as discussed in section 2.2.7. For these networked links to be successful trust needs to be established between different industries. Trust is seen as an important part of a successful network, and as explored, Social Capital plays an important role in the establishment of trust. Another way that networks influence the CE is through communities of practice, both informal and formal. There are online and location-based communities being founded

across the world, for example, Circular Economy Clubs, sharing best practice specific to their town, city or region. CE-based CoPs include formal, membership-based groups for environmental managers across large organisations, for example, or informal online/offline communities of fixers and makers.

2.7 Summary

This section of the literature review has explored the difference between community and networks and introduced the Community Capitals Framework. The first section explored the history of the term community and developed four key areas that make up a community: *social*, contains more than one person; *belonging*, a shared something that connects members; *communicative,* members are conscious actors within the community; and *networked,* members are active in maintaining the cohesion of the community. Communities that are deliberately formed around a shared learning goal are known as communities of practice. CoPs will be crucial to a move to a CE, as some of the literature has suggested through examinations of Circular Economy Clubs etc. To this end, the CoPs the organisations are involved in are identified and discussed in the following research question:
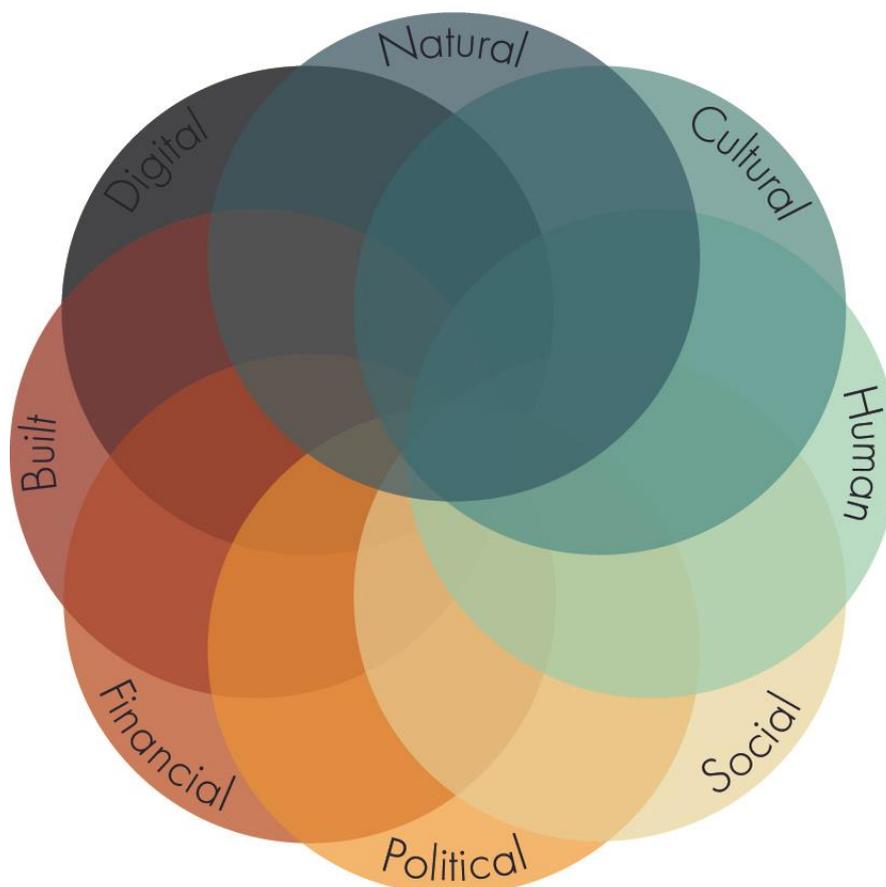
Figure 2-4: How the capitals link together.

RQ 2: How important are Communities of Practice to an organisation's circular journey?

The next section explored networks; identifying them as being made up of *nodes* of individuals or groups that are connected by *ties.* These networked webs are viewed on a small, individual level, but it is important to the research to situate them within the bigger picture of the CE network and develop insights into the whole through the separate parts. To explore the ties between each of the organisations and the nodes in their networks, the Community Capitals Framework is adopted to add an extra layer to the analysis and build insights into the type of relationships the organisation has. Adding the CCF to the network analysis provides answers to the third research question developed out of the literature review:

RQ 3: Which capital flows are the most important to an organisation's network?

The final research question has been developed to bring the two areas of CE and community together:

RQ 4: How do organisations engage with and use their communities to further their circular economy ambitions?

The following chapter describes the methodological choices for the research. Examining several methodologies before detailing the selection of the most appropriate theoretical framework for this thesis.

Chapter 3
Methodology

This chapter details the philosophical position that underpins the research undertaken in this thesis. It firstly explores the different methodologies that were considered for this research; going into detail about the epistemologies that underpin most research, before exploring theoretical frameworks that were considered for the research and discussing some of the methodologies and methods suitable for the research undertaken in this thesis.

3.1 Introduction

This chapter explores the different philosophical underpinnings of the research process. It explores a selection of philosophies that were considered for the research design. There are four elements to consider when conducting research, these are laid out by Crotty (1998) as such:

- *What **methods** do we propose to use?*
- *What **methodology** governs our choice and use of methods?*
- *What **theoretical perspective** lies behind the methodology in question?*
- *What **epistemology** informs this theoretical perspective?*

(1998, p. 2 emphasis in context)

This chapter explores different approaches to these four elements, taking a top-down approach. Firstly, it explores the overarching theories of knowledge that inform epistemological positions, followed by theoretical perspectives related to those epistemologies. The strategies that can be associated with those theoretical perspectives are covered in the 'Methodologies' section, and the final section concludes by exploring some of the methods associated with the different methodologies.

3.2 Epistemology

Epistemology is defined as how we understand what we know and how we come to that knowledge (Crotty, 1998; McNiff and Whitehead, 2005; Gray, 2018). Crotty outlines its importance to research design by stating that "*epistemology bears mightily on the way we go about our research* (1998, p. 9). There are two main epistemologies, *objectivism* and *constructivism*, which are seen as opposing paradigms putting forward very different ways of seeing the world.

> *In the former, the world is seen as composed of objects—physical and conceptual having some form of independent existence— which are amenable to observation and (gradually enhanced) understanding. In the latter, our view of the world is viewed as constructed in the course of our various activities; both at the mundane and routine level, and also as part of more specialized activities, such as research and various professional practices.*

(Bryant, 2017b, p. 340)

This section explores these different epistemological viewpoints, as well as making the case for pragmatism, sometimes seen as sitting between the two.

3.2.1 Objectivism

Traditional or naturalist scientific research, the *scientific method* as developed by Roger Bacon in the 13th Century, was initially based on the paradigms of **empiricism** and **objectivity** and **induction**, explained by Archer (1995)as:

> *The whole process is characterised as being empirical (that is, based upon evidence obtained in the real world), objective (that is, free from the influence of value judgements on the part of the observer), and inductive (that is, moving from the observation of specific instances to the formulation of general laws). Intellectual processes of any sort that fail the tests of empiricism, objectivity and inductive reasoning are dismissed as unscientific and unreliable. So goes the Baconian paradigm.*

(1995, p. 7)

Research situated in this paradigm attempts to develop new knowledge through controlled, methodical approaches, that are carefully observed from an uninvolved, **objectivist** viewpoint (Marczyk *et al.*, 2005). The world is viewed as separate from our lived experience and can be studied objectively, as nature is studied. For objectivist researchers, 'the truth is out there'; true knowledge is something that can be discovered and laws about the nature of existence can be postulated. Research that follows an objective epistemology is often positioned within a **positivist** theoretical framework, "*which argues that reality exists external to the researcher and must be investigated through the rigorous process of scientific inquiry.*" (Gray, 2018, p. 22). Objectivist epistemology is closely associated with the paradigm of deductive reasoning, a general research paradigm that sees research as a means of testing a theory or hypothesis. The research is usually designed with quantitative methods to test a hypothesis to discover new rules for science or society (Crotty, 1998; Marczyk *et al.*, 2005; Tashakkori and Teddlie, 2010; Gray, 2018).

A major criticism of objectivism in social science research is that it does not consider human subjectivity. It claims an objective, distanced stance to the research on behalf of the researcher, assuming that they are unaffected by the social, cultural and historical position they are situated in and how this will affect the research they undertake (Crotty, 1998; Gray, 2018).

> *The emphasis on universal rationality left little room for spirituality and human passions, emotions, imagination, and differences among individuals and cultures. Romantic writers attempted to bring the more human side of people back into focus, rejecting the idea of "man as machine".*

(Tashakkori and Teddlie, 2010, p. 79)

Influenced by the Romantics in the late 19th Century, philosophers and scientists began to argue against objectivism as a paradigm. Out of these arguments developed alternative epistemologies, including constructionism and pragmatism, which the next section shall explore in more detail.

3.2.2 Constructionism

Social science developed out of an interest in studying human behaviours through interactions with the subjects of research. With this came a strong argument for a separate epistemological framework. D'Agostino (2010) lays out three reasons for an alternative to objectivist epistemology:

> *"First there is the **reflexivity** of the social sciences in relation to the objects of their scrutiny. "Human subjects are, usually, aware of their participation in a study and are able to interact with the researcher in a way a non-human subject could not;*
>
> *"Secondly, there is the **complexity** of social phenomena, or perhaps, more correctly, their relative imperviousness to control (and thought-) experimental manipulation;*
>
> *"Thirdly, there is the (essential) **contestability** of many of the theoretical concepts of the social sciences."*

(D'Agostino, 2010, p. 740 empasis added)

The term **constructionism** (also called constructivism) is commonly used to describe an alternative epistemology to objectivism. Mannheim argued "*that knowledge was always produced from a specific social and historical standpoint, reflecting interest and culture of the groups in question. Truth is ultimately a product of its social location.*" (cited in Fuchs *et al.*, 1999, p. 113). Constructionist philosophy argues that the meaning of the world is constructed by human interaction with it, not discovered through distant observation.

> *All knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context.*

(Crotty, 1998, p. 42)

Researchers following a constructionist epistemology use **inductive** reasoning to develop theories about the world. They see knowledge as something to be constructed from the interaction of an object and subject; these interactions are intrinsically tied, and one cannot be studied without acknowledgement of the other. "[M]*eanings are thus at once objective and subjective, their objectivity and subjectivity being indissolubly bound up with each other.*" (Crotty, 1998, p. 48). This is in opposition to objectivists, who view a separation of object and subject as a necessary component of research and use **deductive** reasoning. Constructionist researchers almost always use qualitative methods to develop knowledge, as these methods are conducive to understanding human interactions and responses to situations.

3.2.3 Pragmatism

A third way of thinking about knowledge, **pragmatism**, was described in the mid-20th Century. It developed out of the writings of CS Pierce and was adopted and built upon by William James and later John Dewey (Dalsgaard, 2014).

The pragmatists rejected the quest for knowledge to uncover absolute 'truth' through research and promoted the idea of fallibility. Bryant (2017a) explains fallibility in these terms:

> *For Pragmatists, knowledge exists in the form of statements or theories that are best seen as instruments or tools […] Tools are to be judged in terms of usefulness, and that judgment will be context-specific, although a tool that is useful in one situation may also be useful in others. There are no once-and-for-all-time truths, just as there are no universally useful tools.*

(Bryant, 2017a, pp. 337–338)

Objectivism and constructionism have certain tools and methods ascribed to each epistemology, namely quantitative and qualitative respectively. Pragmatists see theory as tools to be applied to practice; the useful tools and methods are the ones that gather the most relevant data for what is being studied and may not (Dalsgaard, 2014). However, it has faced much criticism due to its proponents' perceived lack of critical rigour when developing new theories. Lewis Mumford and Randolph Bourne accuse the pragmatism of Dewey and James as 'pathetic', lacking in 'struggle' (cited in Crotty, 1998). The philosophy fell out of favour after Dewey's death but has seen a significant revival since the 1980s, particularly through the work of Richard Rorty (Bryant, 2017a). Rorty sees pragmatism as an epistemology that allows truth to evolve with knowledge.

> *For philosophers in the pragmatist tradition, there is no contrast between achieving truth and achieving freedom. For truth is just whatever consensus (ideally) free and open enquiry reaches. For the slogan 'the truth will set us free' we should substitute 'our ability to redescribe things in novel terms will make us richer, more complex, more interesting than we were'.*

(Rorty, 2000, p. 820)

In terms of methods and theoretical perspectives, pragmatists do not see the need to adhere to strict methodological frameworks when conducting research. They believe that the development of knowledge should come from using methods most suited to answering the questions on inquiry.

> *This enables a researcher to develop a holistic analysis to fully incorporate numerous relevant factors into the study. Pragmatic studies are inductive, moving from a complex problem to a general theory of understanding in order to improve a given situation.*

(Duram, 2019, p. 1043)

Pragmatic approaches are often given more credence in real-world situations and applications. It expresses a *"sceptical anti-authoritarian stance towards all claims of knowledge save those that demonstrate the utility of knowledge in advancing 'human happiness'"* (Johnson and Duberley, 2011, pp. 157–158). Pragmatist researchers often seek to engage outside of academia to encourage communication and action (Duram, 2019; Bryant, 2017a). Design is one field that often engages outside of academia to develop interventions that respond to challenges or create change. Dewey believed in

> *the transformative* **potential** *of human action and intelligence, not in its guaranteed success. As such, his vision is offered as a* **hypothetical** *proposition worth pursuing, something to be tested in practice that may yet yield value.*

(Dixon, 2020, p. 108 emphasis in original)

Design theorists argue that Deweyan pragmatism is the appropriate epistemology for design-based practice-lead inquiry (Dixon, 2019; Dalsgaard, 2014). Stating that design, as a multifaceted field, should be viewed outside of the "arts/science" dichotomy and treated as a third paradigm of inquiry (Dalsgaard, 2014). Dalsgaard finds many parallels within design that also occur in Dewey's writing, especially around inquiry being *situation-based* (Dalsgaard, 2014, p. 148).

The epistemological position taken in this thesis is based on pragmatism. The thesis brings together well-established research areas of community and networks, with the emerging research area of circular economy. The frameworks used in the research were chosen for their flexibility and are adapted to suit the research. Another reason to situate the research in the pragmatist tradition is the engagement of stakeholders outside of academia, creating potential knowledge exchanges between the research and organisations working in CE.

3.3 Theoretical Perspective

The theoretical perspective is closely aligned with how the researcher sees the world; and what they believe the world to be. Where epistemology provides the philosophical grounding for research, the theoretical perspective is the stance or angle that the researcher is approaching that philosophy from (Crotty, 1998; Creswell and Creswell, 2018; Gray, 2018). It is the assumptions the researcher brings to their methodology and is embedded in their epistemological position. There are many different types of theoretical position, this section looks at some of the common ones that have arisen out of the epistemologies laid out in the previous section, before discussing critical realism, which is used as the perspective for this research.

3.3.1 Positivist and Postpositivist

Research undertaken using an objectivist paradigm is closely tied to a positivist or post-positivist theoretical perspective. The positivist perspective views the social world as existing externally to the researcher (Gray, 2018). The methods used are usually quantitative: new knowledge is observable through empirical, scientific processes.

> *The 'empirical approach' is an evidence-based approach that relies on direct observation and experimentation in the acquisition of new knowledge. In the empirical approach, scientific decisions are made based on the data derived from direct observations and experimentation.*

(Marczyk *et al.*, 2005, p. 16)

This perspective is viewed by many to be where 'hard' research falls, the discovery of 'truths' that can become 'laws'; as opposed to 'soft' research, which is more interested in knowledge gained through a subject's interaction with the object, or social life-world. For positivists, truth and knowledge are waiting to be discovered through experimentation.

> *[T]he world addressed by a positivist science is not the everyday world we experience […] the scientific world is an abstraction from the lived world; it has been distilled from the world of our everyday experiences.*

(Crotty, 1998, p. 28)

Positivism was first theorised by Comte, who wanted to be able to develop 'laws' that were applicable to society, much like science focused on nature (Crotty, 1998; Tashakkori and Teddlie, 2010). Since then, many types of positivism have been developed, too numerous to discuss here. However, the link between objectivism and positivism remains clear: objects all have a prescribed meaning that is waiting to be discovered (Gray, 2018).

Postpositivism argues against the infallibility of positivism: demonstrated by the precariousness of scientific 'facts' that can change with new knowledge or tools.

> *This philosophy of science has incorporated many of the criticisms of positivism and accepts the following positions: (a) theory-ladenness of facts, (b) fallibility of knowledge, (c) underdetermination of theory by fact, (d) value-ladenness of facts, and (e) social construction of parts of reality.*

(Tashakkori and Teddlie, 2010, p. 82)

Central to postpositivism is the admission that reality can change, even if the same phenomena has been observed a thousand times it doesn't mean that it is a fact, and won't change in the future, or under different circumstances. Objective truth can only be an approximation based on probabilities that the findings are correct.

3.3.2 Interpretivism

Through the rise of social science, theoretical perspectives developed in opposition to positivism and its methods of defining the social world based on value-free, observable rules. There was a move towards understanding the world as it is experienced by the people who live within it, and perspectives started to be developed that reflected this. Around the turn of the 20th Century, philosophers started to argue that social reality was different to the natural world and needed to be studied in different ways (Crotty, 1998; Gray, 2018). It was through this period that **interpretivism** developed as "*a major anti-positivist stance*" (Gray, 2018, p. 24) closely linked to constructivism. Whereas positivism follows a traditional science method where detached objective observation reveals universal truths about society, interpretivism "*looks for culturally derived and historically situated interpretations of the social life-world"* (Crotty, 1998, p. 67). Truths about human social reality can only be revealed through acknowledging the researcher's position within the social world and the influence that the researcher has on it.

Interpretivism has influenced many branches of theory, some quite contradictory. This chapter now briefly explores two of them: symbolic interactionism and phenomenology, demonstrating interpretivist theory developed from pragmatism (symbolic interactionism) and constructivism (phenomenology). These were considered for use in this research but ultimately rejected in favour of critical realism, which is explored further in the chapter.

Symbolic Interactionism

Symbolic Interactionism was developed by pragmatist philosopher and social scientist George Herbert Mead (Gray, 2018), and later described by Herbert Bulmer, who is credited with bringing Mead's symbolic interactionism perspective to the fore (Crotty, 1998). Blumer lays out three, often quoted (Flick and Creswell, 2009; Crotty, 1998; Cohen *et al.*, 2000; Berg, 2001; Charmaz, 2006) basic tenets of Symbolic Interactionism:

> *The first premise is that human beings act towards things on the basis of the meanings that these things have for them. Such things include everything that the human being may note in his world […] and such situations as the individual encounters in his daily life;*
>
> *A second premise is that the meaning of such things is derived from, and arises out of, the social interaction that one has with one's fellows;*
>
> *The third premise is that these meanings are handled in, and modified through, an interpretative process used by the person in dealing with the things he encounters.*

(Blumer, 1969, p. 2)

This perspective demonstrates that humans create meaning through their interactions with the world, but these interactions are interpreted through personal, social, and cultural symbols, such as language, culture, and religion, that are derived from our experiences.

Phenomenology

This perspective is concerned with how the individual reacts to cultural phenomena, and how understanding of reality is grounded within our experiences (Gray, 2018).

> *Symbolic interactionism explores the understandings abroad in culture as the meaningful matrix that guides our lives. Phenomenology, however, treats culture with a good measure of caution and suspicion. Our culture may be enabling but, paradoxically, it is also crippling.*

(Crotty, 1998, p. 71)

Phenomenology was founded by Edmund Husserl, he believed that knowledge-making should move away from abstracts and return to 'the things themselves'.

> *Husserl recognized that a central aspect of 'the things' is their significance to human beings and our lived experience of them. Through reclaiming day-to-day, subjective experience as a means through which knowing is created, phenomenology repositions the knower in his or her own world as central to that which is known.*

(Ladkin, 2014, p. 616)

Subjective experience is how meaning is created about the lifeworld. The individual or knower is central to understanding that meaning. The focus of phenomenology is on the meaning for the individual. Phenomenologists believe that revisiting phenomena immediately after it has happened is crucial to developing new understandings of it (Gray, 2018).

Critical Realism

Critical realism is positioned as an alternative paradigm to the dichotomies of interpretivism and post-positivism. It was built on the ideas of Roy Bhaskar (2014), who developed a three-layered approach to research of human behaviour and society: the real layer, the actual layer, and the empirical layer (Mearns, 2011; Mingers and Standing, 2017). The real layer is external and intransitive, comprised of power, structures and social mechanisms *"that have properties and causal powers leading them to behave in particular ways."* (Mingers and Standing, 2017). The actual layer consists of the interactions of the mechanisms in time and space that create events. The observation and recording of these events make up the final empirical layer (Mingers and Standing, 2017; Mearns, 2011; Maxwell *et al.*, 2010). "*Critical realism is concerned with the nature of causation, agency, structure, and relations, and the implicit or explicit ontologies we are operating with.*" (Archer *et al.*, 2016). It examines the

interactions or events that take place between the layers of reality, or the mechanisms (Archer *et al.*, 2016; Mingers and Standing, 2017).

Critical realism sits a little way outside the epistemology - theoretical perspective - methodology - methods path this chapter has been following.

> *[It] is not an empirical program; it is not a methodology; it is not even truly a theory, because it explains nothing. It is, rather, a meta-theoretical position: a reflexive philosophical stance concerned with providing a philosophically informed account of science and social science which can in turn inform our empirical investigations.*

(Archer *et al.*, 2016, p. 4)

Critical realists maintain a marked distinction between epistemology and ontology, favouring an ontological approach and accusing other approaches of ignoring the ontological in favour of epistemology (Archer *et al.*, 2016; Maxwell *et al.*, 2010). Where epistemology focuses on how we know what we know, ontology tries to explain the nature of what is known. Critical realism is based on a realist ontology: that there is a real world outside of our perspective and that truth does exist but is relatively autonomous to social reality. It "*asserts that much of reality exists and operates independently of our awareness or knowledge of it*" (Archer *et al.*, 2016). Critical realists embrace epistemic relativism to develop knowledge that is mediated through the experiences of the human actor. Knowledge about reality is always bound up in the historical, social, time and space context of the object being experienced (Archer *et al.*, 2016; Bhaskar, 2014; Johnson and Duberley, 2011). "*The goal of any investigation is the creation and relative stabilization of a descriptive or explanatory account which provides a plausible model of our object of inquiry.*" (Archer *et al.*, 2016). By following a critical realist approach there has to be an acceptance that some accounts are more accurate than others. To decide which version of truth is more accurate, critical realists must employ judgemental rationality: explicit criteria for deciding which accounts of the world are better or worse (Archer *et al.*, 2016; Maxwell *et al.*, 2010).

Critical realism can inform many aspects of research. For the purpose of this chapter, it is positioned within the theoretical perspective section, as it is a meta-theoretical position. It does not link with either objectivist or constructivist epistemology as it was designed to move research away from positivism, but without fully rejecting it. It is *"often seen as a middle way between empiricism/positivism on the one hand, and anti-naturalism/interpretivism on the other"* (Zachariadis *et al.*, 2014, p. 856)*.* However, it can be linked to the pragmatic paradigm (Maxwell *et al.*, 2010; Mearns, 2011; Johnson and Duberley, 2011) to create pragmatic-critical realism, the critical element of which is the idea that "*as epistemic subjects we are **all** complicit in the processes through which we*

socially construct versions of reality" (Johnson and Duberley, 2011, p. 166 emphasis in original). By including pragmatism with critical realism, a structure is created that:

> *articulates an overt recognition of the active and projective role of the epistemic subject whose engagements are bounded by the tolerance of reality. Any knowledge is thus evaluated in the context of how successfully it may guide action towards the realization of particular objectives which express particular interests: that is in terms of what it does for, and to, various groups of human actors.*

(Johnson and Duberley, 2011, p. 26)

Pragmatic-critical realism provided a useful framework for the research conducted in this thesis. By following this paradigm, the research was explicit in exploring the social context of the actions of the subjects, reflected by the exploration of community as used by the organisations engaged in the CE. It also ensures reflexivity on the part of the researcher and the subject. The resulting knowledge produced has a practical real-world application, as required by a pragmatic epistemology. As critical realism doesn't influence a particular set of methodologies, using this perspective allowed for a mixed-methods approach to the research (Maxwell *et al.*, 2010; Zachariadis *et al.*, 2014), which is explored in the following chapter.

3.4 Methodology

The methodology is the overall approach that the research uses to identify which methods and techniques are most suitable for conducting the research (McNiff and Whitehead, 2005). "*This is the research design that shapes our choice and use of particular methods and links them to the desired outcomes.*" (Crotty, 1998, p. 7). Many methodologies lay out a framework for conducting research that contains within them a set of methods or techniques aligned to that approach (McNiff and Whitehead, 2005; Crotty, 1998; Birks and Mills, 2015). These are "*influenced by the theoretical perspectives of the researcher, and in turn their epistemological stance.*" (Gray, 2018, p. 21)*.* This section explores the methodologies considered for the research in this thesis, with a brief introduction of each one, how it is used and any restrictions around its use. Where appropriate diagrams are used to illustrate how research is conducted within that methodology. The methodology used within this research was mixed methods and case studies, the other methodologies included are illustrative of what else was considered.

3.4.1 Action Research

Action Research is a *"form of self-reflexive enquiry undertaken by participants in social situations",* (McTaggart, 1994, p. 317) that puts change at the centre of its objectives (Somekh, 2014; Gray, 2018; McNiff and Whitehead, 2005). It is usually conducted within an organisation by practitioners, with

managerial approval, and involves close collaboration between the researcher and participants. It informs a wide field of research and is instrumental in producing a dialogue between the sciences and the general populace (Chevalier and Buckles, 2013; Pant, 2014).
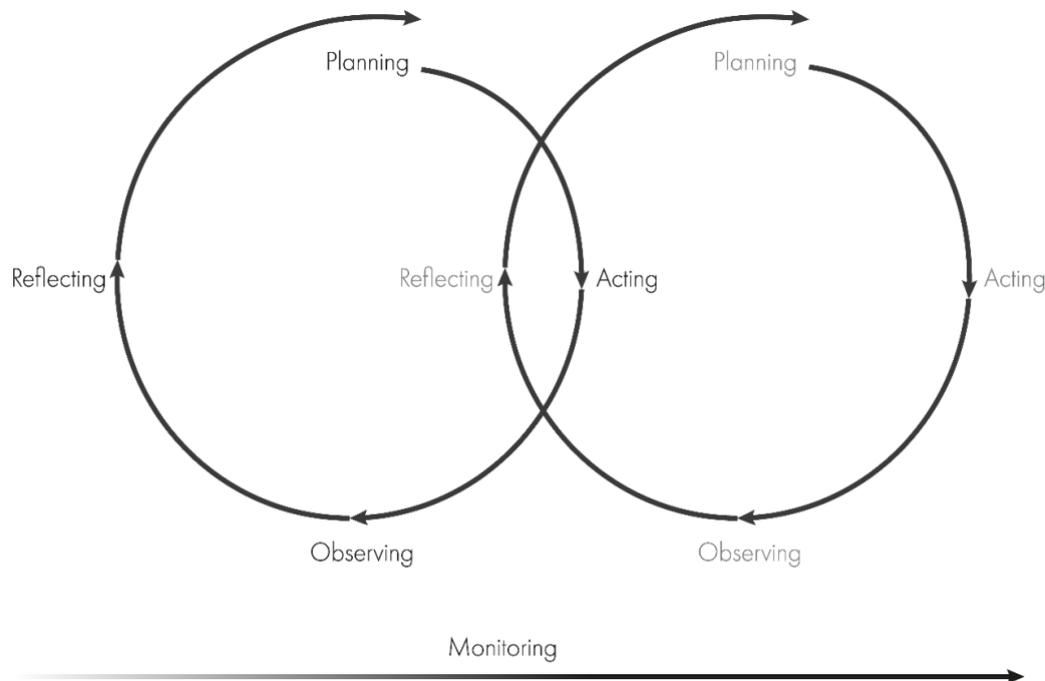
Figure 3-1: Action research model.

Adapted from Gray, 2018, p.325

Action research is a cyclical process, originally developed by Kurt Lewin (Gray, 2018; Somekh, 2014; McTaggart, 1994) that incorporates "*holistically rather than as separate steps*" (Somekh, 2014, p. 6): planning, acting, observing and reflecting, while ensuring each cycle is monitored and improved upon. Action Research "*developed out of critical theory*" (McNiff and Whitehead, 2005, p. 47), a theoretical perspective tied to constructionism, and as such favours qualitative approaches to data collection (Gray, 2018; McNiff and Whitehead, 2005). This can make it difficult to generalise as each action research project is unique to the context it is situated in (Gray, 2018). Problems can also arise in the power dynamics between the researcher and the partner organisation (see Waterson, 2000). This demonstrates that using this methodology is most suitable when the researcher and the collaborative partner have a very good relationship prior to the project being undertaken or the researcher has a proven track record of delivering successful action research projects. This was the main reason this methodology was rejected for the thesis research, as the researcher was approaching organisations to collaborate without knowing them previously and did not have a "proven track record" of delivering action research projects.

3.4.2 Grounded Theory

Grounded theory is a methodology that does not start with a theory but aims to use qualitative methods to develop one that is grounded in the research (Corbin and Strauss, 2015). It was developed by Barney Glaser and Anselm Strauss in the 1960s (Gray, 2018; Corbin and Strauss, 2015; Goulding, 2002; Birks and Mills, 2015; Lingard *et al.*, 2008) and is closely associated with the Symbolic Interactionism perspective (Crotty, 1998). As with most methodologies, many versions have developed over the years (Goulding, 2002).
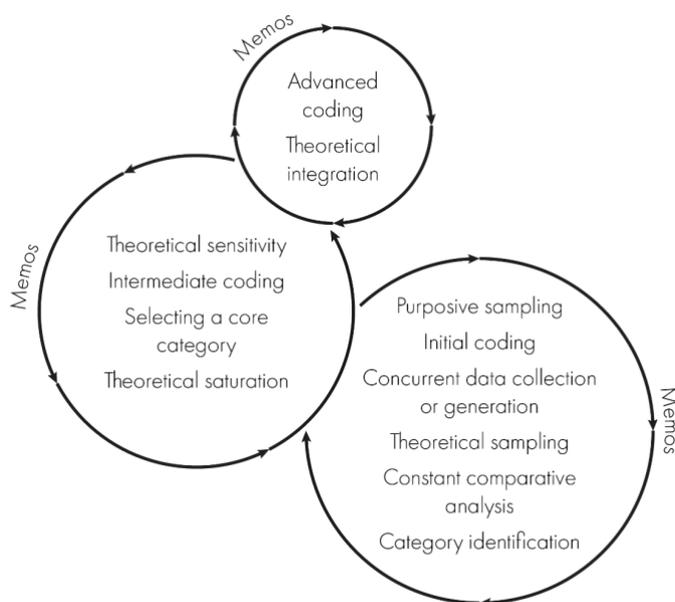
Figure 3-2: Essential grounded theory methods.

Based on Birks and Mills, 2015

The key features of any Grounded Theory project are the aim to generate a theory; the use of iterative cycles of data collection and analysis; constant comparison of data; the generation of themes through coding the data; the use of theoretical sampling; reaching a data saturation point before developing a theory (Corbin and Strauss, 2015; Birks and Mills, 2015; Goulding, 2002; Gray, 2018; Lingard *et al.*, 2008). Preferred methods for data collection are open interviews and observation as this allows participants to talk deeply about a subject with little influence from the researcher (Corbin and Strauss, 2015; Goulding, 2002). The use of memos or a journal by the researcher are also encouraged to add an element of reflexivity to the theory generation (Corbin; Goulding; Gray; Birks).

Grounded theory then, is useful when developing a research project where the researcher has no prior theory to test and has the potential to access a large amount of qualitative data. Grounded theory methods are often combined with other methodologies such as action research and case studies to inform the qualitative data collection (Birks and Mills, 2015). Grounded theory is included here as it was considered as a useful method when using interviews as the primary data source, however as frameworks were developed out of the literature, the need for this methodology was negated.

3.4.3 Case Study

Case study research is a type of design that is used in a variety of fields. They allow for an in-depth, focused study of phenomena, "*using a small sample of interest, and typically from a particular perspective*" (Gray, 2018, p. 262). There are no restrictions on what area of study could benefit from using case study design, however, Yin (2018) recommends that it is most suitable when *"a 'how' or 'why' question is being asked about a contemporary set of events over which the researcher has little or no control"* (2018, p. 13).

The word 'case' is commonly used in and out of academia (Gillham, 2000; Yin, 2018; Bartlett and Vavrus, 2017), so it is useful to define it in the context of this research. Gillham describes a case as:

> *a unit of human activity embedded in real world;*
> *which can only be studied or understood in context;*
> *which exists in the here and now;*
> *that merges in with its context so that precise boundaries are difficult to draw.*

(2000, p. 1)

This definition is echoed by Yin, who adds "*you would want to do case study research because you want to understand a real world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case.*" (cited in Bartlett and Vavrus, 2017, p. 29).

Case studies produce rich descriptions of what is being studied because they require researchers to draw a large amount of data from a variety of methods and sources (Hancock and Algozzine, 2016), and although they are usually situated within a qualitative approach, they are not restricted to just using qualitative analysis or data collection methods (Swanborn, 2010).

There are several different types of case study. A researcher must decide on whether the investigation is inductive and exploratory, or deductive and confirmatory; is the study based on multiple cases or just one; and is it holistic, where there is just one unit of analysis, or embedded, where there are multiple units (Gray, 2018). The more units of analysis a case study has, and the more cases, the longer the study takes, so it is important for a case study to set boundaries for length and detail (Hancock and Algozzine, 2016).

3.4.4 Mixed Methods Research

The previous examples of methodologies have been firmly based on a qualitative research framework. Mixed methods research (MMR) advocates a mixing of the two and is argued to be "*the third major research approach or paradigm*" (Gray, 2018, p. 195). John Creswell, co-founder of the Journal of Mixed Methods Research and prolific writer on the subject (Creswell, 2012; Flick and Creswell, 2009; Creswell and Creswell, 2018; Creswell, 2013; Fetters, Curry and Creswell, 2013; Creswell and Tashakkori, 2007), argues that many stories are now told using a mixture of qualitative and

quantitative data "*putting together the stories of people's lives as well as the numbers, the statistics, of what occurs*" (Creswell, 2015, 00:03:48). The use of both qualitative and quantitative paradigms can cause tension between the methods used, with each dictating a particular set of values and processes for gathering and analysing the data. However, "*these very tensions can generate new insights*" (Lingard *et al.*, 2008, p. 460) making this method very useful when wanting to investigate a topic that has been covered extensively or where not much is known

about it at all.

Design type	Implementation	Priority	Stage of Integration	Theoretical Perspective
Sequential explanatory	Quantitative followed by qualitative	Usually quantitative; can be qualitative or equal	Interpretation phase	May be present
Sequential exploratory	Qualitative followed by quantitative	Usually qualitative; can be quantitative or equal	Interpretation phase	May be present
Sequential transformative	Either quantitative followed by qualitative or qualitative followed by quantitative	Quantitative, qualitative, or equal	Interpretation phase	Definitely present (i.e., conceptual framework, advocacy, empowerment)
Concurrent triangulation	Concurrent collection of quantitative and qualitative data	Preferably equal; can be quantitative or qualitative	Interpretation or analysis phase	May be present
Concurrent nested	Concurrent collection of quantitative and qualitative data	Quantitative or qualitative	Analysis phase	May be present
Concurrent transformative	Concurrent collection of quantitative and qualitative data	Quantitative, qualitative, or equal	Usually analysis phase; can be during interpretation phase	Definitely present (i.e., conceptual framework, advocacy, empowerment)

Table 3-1: Six types of Mixed Methods Research designs by the four criteria.

Taken from Plano Clark and Creswell (2008, p.179)

There are four criteria for developing an MMR project, the selections made through these criteria determine the type of design being used. The criteria are: **implementation**, deciding whether qualitative or quantitative data is collected first or both concurrently; **priority** of method in the overall research design; stage of data **integration**; and whether there is an explicit or implicit **theoretical perspective** (Plano Clark and Creswell, 2008). These criteria feed into the design for the six main MMR frameworks, which demonstrate the integration of qualitative and quantitative methods within the

research study. The six frameworks can be divided into two primary areas of data gathering, either where one type of data gathering informs the next: sequential, or where data is gathered simultaneously: concurrent. The design frameworks that these criteria inform are explored in Table 3-1.

MMR uses an abductive reasoning approach to analysis, instead of either deductive (quantitative) or inductive (qualitative). "*Abductive reasoning can be understood as a process that values both deductive and inductive approaches but relies principally on the expertise, experience and intuition of the researcher.*" (Wheeldon and Åhlberg, 2012, p. 117). This type of analysis draws on deduction and induction to come up with a range of explanations for what has been observed, creating hypotheses to be confirmed or rejected once all the data has been gathered and analysed (Bryant and Charmaz Anon, 2007), see Figure 3-3.
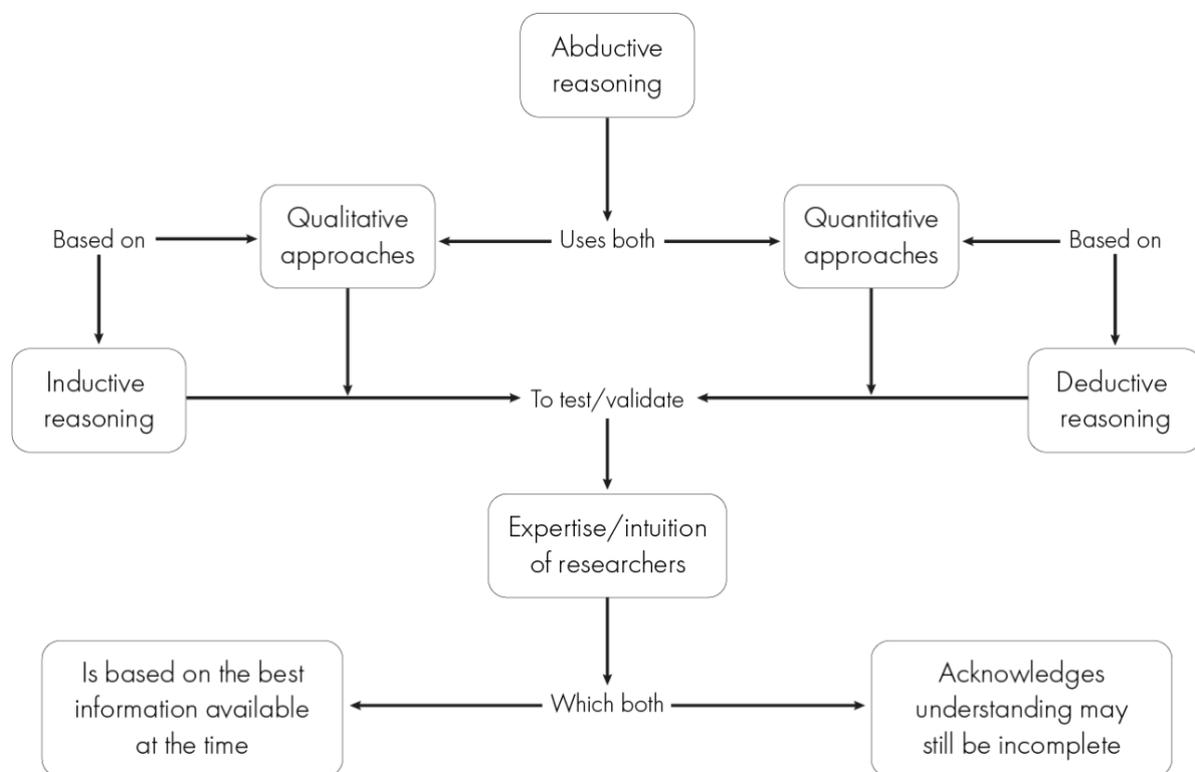
Figure 3-3: View of abductive reasoning.

Source: Wheeldon and Ahlberg, 2012

The research in this thesis embeds a multiple case study approach within an MMR framework, which is discussed in detail in Chapter 4.

3.4.5 Quantitative Methodologies

This section briefly outlines a quantitative methodology that is commonly used in human-focused research design: Social Network Analysis (SNA) and is used in this thesis.

SNA is a quantitative methodology designed to examine a network of "*individuals or groups as 'points'* *and their relations to each other as 'lines'.*" (Scott, 2017, p. 9). By presenting data in this way, patterns between points can be analysed, either visually or mathematically, and relationships between the points can be assessed.

> *Social network analysts map networks of these relations, tease out the prominent* *patterns in such networks, trace the flow of resources - such as information, love, or* *money - through them, and discover what effect they have on individuals.*

(Raine and Wellman, 2012, p. 48)

This methodology was adopted by the research design as it proved to be useful in producing unique visuals for research and allowed for maps to be created of the case study organisations' connections with the Community Capitals Framework applied.

3.5 Methods

Methods are divided into two distinct areas: quantitative and qualitative. Quantitative methods are associated with positivist approaches where a hypothesis is formulated, and data are gathered to either confirm, disprove or adjust it (Gray, 2018). Quantitative studies are interested in generating observable facts, using processes and tools that can be recreated. Their primary data output are numbers or statistics that can be used to demonstrate the research findings. As explored in previous sections of this chapter quantitative methods are usually used by researchers in the naturalist sciences.

Qualitative methods, on the other hand, are associated with more interpretivist approaches, favouring the development of theory through the gathering of personal accounts and stories. It uses an inductive approach, where data are gathered, and patterns are interpreted to determine whether any relationships or generalisations can be drawn from the data. Due to its interpretive nature the researcher becomes as much a part of the process as the data (Corbin and Strauss, 2015).

Although these methods have distinctly different approaches, and are traditionally used in very different research studies, data from both qualitative and quantitative methods can be used in the same study as explored in the previous section.

It is worth mentioning here that there are two broad approaches to research that are also used to inform the approaches used in research: nomothetic and ideographic. A nomothetic approach studies large groups to develop laws and general understandings; this approach is tied with the natural sciences. "*The goal is often to identify the average member of the group being studied or the average* *performance of a group member*" (Marczyk *et al.*, 2005, p. 17). Ideographic approaches, on the other

hand, are concerned with the individual experience of the life-world and aim to find the unusual and the intriguing (Crotty, 1998). Although these approaches can be seen to relate to different data collection methods, they are not restricted to either one or the other.

The methods a researcher uses are the fundamental underpinnings of any research project. These make up the foundations of the study and are the processes a researcher will use to gather data. When devising a research plan, Crotty recommends that this is where we start. "*First, we describe the concrete techniques or procedures we plan to use. There will be certain activities we engage in so as to gather and analyse our data. These activities are our research methods.*" (1998, pp. 6–7). He recommends that when describing the methods used in a study a researcher should go into as much detail as possible, especially as some types of data collection could have variations that are better suited to one type of methodology over the other, for example, interviews. A qualitative researcher might use open interviews where there are no strict questions but themes to gather open-ended thoughts and insights. Juliet Corbin describes an open interviewer setting the topic by saying:

> *Tell me about your experiences with cancer. I want to hear the story in your own words. After you have completed your narrative if I have questions about what you've said or need clarification on a topic (concept), I'll ask you. But for now, just talk freely.*

(Corbin and Strauss, 2015, p. 38)

A quantitative interviewer is more likely to conduct a structured interview, where standardised questions are asked of each respondent, in the same neutral tone. "*Structured interviews are similar to the use of questionnaires, except that the interviewer poses the questions; this is one way in which the researcher hopes that direct contact will increase response rates compared with postal or online questionnaires.*" (Gray, 2018, p. 381). Despite this example, the data gathering tools of qualitative and quantitative researchers are likely to be very different.

Quantitative research typically favours tools that allow for empirical data to be gathered in an experimental or quasi-experimental design. These studies often gather data from a representative population either of a random or non-random sample size. A control group is often employed to provide a neutral bed to test against (Gray, 2018; Creswell and Creswell, 2018).

> *However, for defensible **statistical inferences** to be made on the basis of the data, any research tools used (such as questionnaires, interview schedules and observation schedules) must be internally valid and reliable. To achieve external validity, such instruments must be designed in such a way that generalizations can be made from the analysis of the sample data to the population as a whole.*

(Gray, 2018, p.151)

Chapter 3: Methodology

In order for quantitative methods to be used they must be reliable and valid; there are a number of ways for the validity and reliability to be tested. Validity testing must prove that the tools used are testing what they claim to be testing, whereas reliability testing ensures the consistency between two measures of the same thing (Gray, 2018; Creswell, 2007; Marczyk *et al.*, 2005).

An example of a quantitative method is a survey, which is included here as a survey was conducted for this research, however it did not yield enough results to be included in the final analysis (see section 4.3.11 for a full discussion on the survey conducted). Surveys are used when a researcher wishes to systematically collect data from a wide field of respondents on a set of issues using a standardised set of questions (Gray, 2018).

> *Some surveys merely describe what people say they think and do. Other survey studies attempt to find relationships between the characteristics of the respondents and their reported behaviours and opinions.*

(Marczyk *et al.*, 2005, p. 151)

Surveys can be inductive or deductive, referred to as descriptive or analytical respectively. Descriptive surveys often use open questions to gather perspectives on a subject, whereas analytic surveys

> *take many of the features of experimental, deductive research and so place an emphasis on reliability of data and statistical control of variables, sample size, etc. It is hoped that the rigour of these controls will allow for the generalisation of the results.*

(Gray, 2018, p. 234).

Qualitative tools on the other hand, are not defined by one set of tools or methods. The instruments tend to be those that can gather a lot of contextual, descriptive data, such as open interviews, photographs, observations. Data gathered in this method tends to produce 'thick' descriptions of a subject area that describe the personal, cultural, or symbolic significance of an event, describing how and why things occur. As opposed to the 'thin' descriptions favoured by quantitative research (Gray, 2018). "*An action is thinly described as sticking pieces of flesh on the fire and thickly described as cooking or sacrificing to the gods, as the case may be*" (D'Agostino, 2010, p. 742). These descriptions are used to develop stories around the research, and often feature a certain degree of reflexivity, where the researchers voice is also part of the process. Qualitative processes are usually open to interpretation, which is why it is important that researchers using qualitative tools state their theoretical perspective when developing the research.

The following section describes the research design, exploring how the research questions are answered and goes into detail about which methods are most suitable for each question. It situates

the research within the overall methodological approaches selected and discusses the chosen theoretical perspective and epistemology.

Chapter 4
Research Design

The Research Design section specifies the philosophical position that this research takes. It describes the choices made for the research based on the theoretical framework, going into detail about the methodologies selected to answer the research questions. The final section takes a deep dive into the case study analysis method that is used in this research to gather and analyse the data.

4.1 Introduction

This chapter describes the research design, by exploring the methods used to answer the research questions and going into detail about which methods are most suitable for each question. It situates the research within the overall methodological approaches selected and discusses the chosen theoretical perspective and epistemology. The research questions developed through the literature review are below:

RQ 1: How do organisations approach the circular economy?

RQ 2: How important are Communities of Practice to an organisation's circular journey?

RQ 3: Which capital flows are the most important to an organisation's network?

RQ 4: How do organisations engage with and use their communities to further their circular economy ambitions?

Within this chapter, the literature review is situated as a guide to the research frameworks and details the rationale for the position selected. The selected research paradigm, perspective, methodology and methods are explored to give an overview of the theoretical and practical influences on the data gathered and its interpretation. Figure 4-1 gives an overview of the theoretical breakdown of the research design. The research in this thesis was conducted using a complex Mixed Methods Research (MMR) design: which consisted of case studies embedded into a MMR framework and followed a pragmatic-critical realist paradigm.

By using critical realism, the CE can be explored as real structure that interacts with the real mechanism of community. The research conducted in this thesis recorded the empirical reality of those interactions at the time of the data gathering. By combining critical realism within the pragmatist framework, the focus moved away from the methods used to answer the research question and onto the application of the research in real-world situations. It emphasised reflexivity of subject and researcher; using pluralistic approaches allowed the research to develop using the methods that best suited the lines of enquiry (Creswell and Creswell, 2018).

4.2 Designing the Research

During the development of the research question and proposal, the original aim was to develop Action Research projects with organisations that were moving towards CE principles. However, stakeholders for organisations initially approached made it clear they could not engage with Action Research projects. This made it necessary to refocus the research to work with organisations that were already operating in the CE and redesign the research to allow for a deeper understanding of how the organisations view and interact with the CE and their communities. The central questions of this thesis changed to explore the interaction with community on the function of organisations working within the CE. It required analysis on different levels to create insights for each of the areas, exploring the overarching mechanism of the CE as well as the interaction of this mechanism with community. This generated rich sets of data to inform an interesting and relevant research project.

Figure 4-1: Breakdown of theoretical elements of the thesis.

To answer the thesis questions, organisations already engaged in the CE were approached. Following an MMR framework, initially seven case studies were developed based around organisations with the capacity to engage with the research. However, based on the data provided from the interviews and the time constraints of the PhD, five case studies were selected to be included in the research. Flexibility with the number of case studies provided enough data to be able to identify patterns within the time constraints of the PhD research period and allowed the researcher to be more selective with which case studies to develop fully.

Case studies embedded within an MMR framework were used to build and analyse the data. The data for each case study was gathered using: a primary interview; publicly available documents; a network mapping activity drawn by the interview participants; and follow up questions that were deemed necessary. The analysis consisted of a thematic analysis of the interview and public document data, and a SNA. Data from the interviews and documents were explored through frameworks detailed in

this chapter, developed from the literature review. Data for the SNA was primarily drawn from the interview, documents, and mapping activity, it provided the framework for quantitative data analysis and a visual representation of the network data. As stated in Figure 4-1, and detailed in the previous chapter the research sits within a pragmatic-critical realist theoretical framework.

Notation	What it indicates	Example
Uppercase letters	Greater emphasis given to a method	QUAN, QUAL
Lowercase letters	Lesser emphasis given to a method	quan, qual
+	Convergent methods	QUAN + QUAL
→	Sequential methods	QUAL → quan
( )	Embedded within a design or framework	QUAN(qual)
→←	Recursive	QUAL→←QUAN
[ ]	Study within a series	QUAL → [QUAN+qual]

Table 4-1: Notations used within MMR diagrams.

The MMR plan is laid out in Figure 4-2 below, the line above it shows the data collection plan written in MMR notation shorthand. This conveys *"very important aspects of mixed methods research, and provide a way that mixed methods researchers can easily communicate their procedures."* (Creswell and Creswell, 2018, p. 235). The notation shorthand is shown in Table 4-1 where "QUAL" is used for qualitative and "QUAN" is used for quantitative.

LITERATURE REVIEW QUAL → [INTERVIEW QUAL + MAPPING QUAN → DOCUMENT SOURCES QUAL quan]
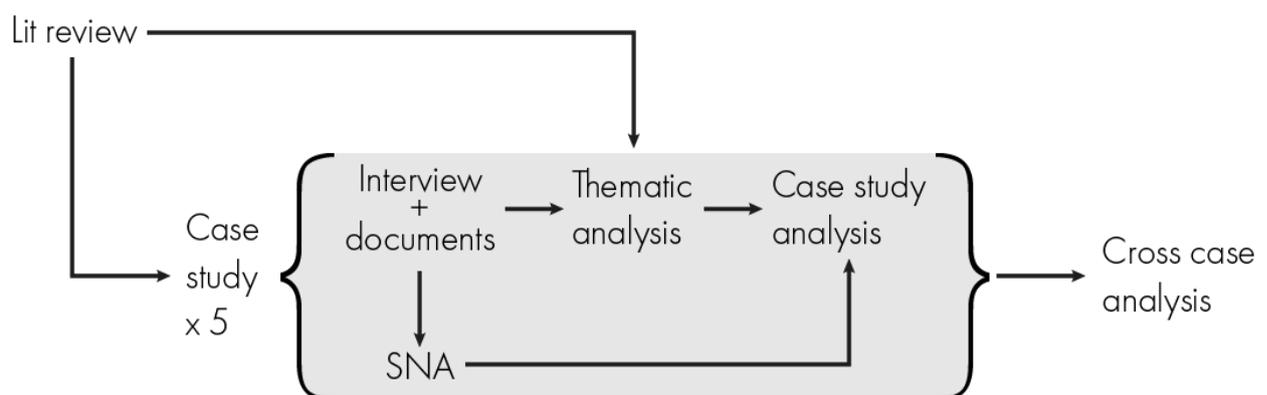
Figure 4-2: Mixed Methods Research project plan.

The project began with the literature review. This provided the first layer of qualitative data to build the framework for the case studies, informed the interview questions, and guided the themes for the

analysis. The interviews involved open-ended questions and an activity where the interview participant was asked to draw a map of their organisation's connections. This was the starting point for data collection relating to the SNA. The qualitative and quantitative data in the interview stage was integrated at collection, also known as a concurrent design. The document analysis provided an additional source of qualitative data relating to communities and CE, and further quantitative data for the SNA. The data from the interviews and the data from the documents were integrated at the analysis phase. The results and findings from each case study were then compared using a thematic analysis developed through the literature review. This MMR design is known as a concurrent nested design, where both quantitative and qualitative data are collected during the same phase, with one method given greater priority over the other.

> *Given less priority, a method is embedded or nested, within the predominant method. This nesting may mean that the embedded method addresses a question different to that addressed by the dominant method or that the embedded method seeks information from a different levels.*

(Plano Clark and Creswell, 2008, p. 184)

The SNA was the quantitative element nested within the qualitative framework of the research. Figure 4-2 demonstrates how the literature review influenced the case study and thematic analysis; how the different elements of the research project fitted within each case study; and how they were brought together for a cross-case analysis.

4.3 Research Design Methods and Rationale

Here follows a detailed examination of the methods that were used to conduct the research for this thesis, including a rationale for why these methods were chosen.

4.3.1 Literature Review

The literature review was conducted to determine what barriers and drivers have been identified to CE uptake and what aspects of CE research need further investigation. This review identified gaps in the research around the role of communities in the CE. The research undertaken in this thesis aimed to address this gap by focusing on organisations that were working within a CE framework, positioning these organisations as communities themselves and examining their interactions with other organisations through the Community Capitals Framework (CCF) lens. The research was well placed to add value and new knowledge to this area, through engaging with organisations, discussing the communities they are connected with, and identifying in what areas membership of these communities had benefited them.

4.3.2 Case Studies

The primary focus of the data-gathering phase of the thesis was to develop case studies centred on participating organisations, consisting of interviews and document analysis. This phase provided qualitative data for thematic analysis and quantitative data for a SNA of each case study. The focus of the PhD is the North West of England, so the case study organisations needed to be based in this area or have a connection to it. This made networking and establishing local relationships fit more easily into the remit of the PhD. The case study organisations were a range of sizes to gauge an understanding of the effect this might have on the depth of their community engagement and the number of communities they were involved with.

Type of Case Study

The research was conducted as multiple embedded case studies. 'Embedded' in the case study context, refers to using multiple units of analysis across the study (Gray, 2018). Case studies are used to draw *generalised* conclusions; these types of study are referred to as *pars pro toto,* meaning "*a part in representing the whole*" (Swanborn, 2010, p. 43). The research could have shown that there was nothing generalisable between each case study, however, that was not the case. Conducting five case studies allowed for a large enough number to conduct *a pars pro toto* study and time to analyse the results within the mixed methods research framework devised, and the time constraints of the PhD.

4.3.3 Selection Criteria

The cases were selected using the criteria from the research questions and the focus of the PhD. As previously mentioned, the case studies were developed with organisations based in the North West of England who had been working in the CE for over a year. Partners were identified through *reputation* samples.

> *'Reputation' samples, where experts, key persons, authorities 'in the field' are asked to provide information or possible informants, and with their help the researcher composes a frame of all eligible cases. Such people may also be useful in establishing contacts in the field. However, we need to guard against the fact that some informants may be influenced by these 'intermediaries' which may affect their participation in the research. To avoid this scenario, it is always advisable to consult more than one person or representative of an institution.*

(Swanborn, 2010, p. 46)

Collect → Transcribe

Read ⟷ Reflect

Explore ⟷ Play

Code ⟷ Connect

Review ⟷ Refine

Describe

Compare

Relate

Contend, defend and extend

More data? Create account
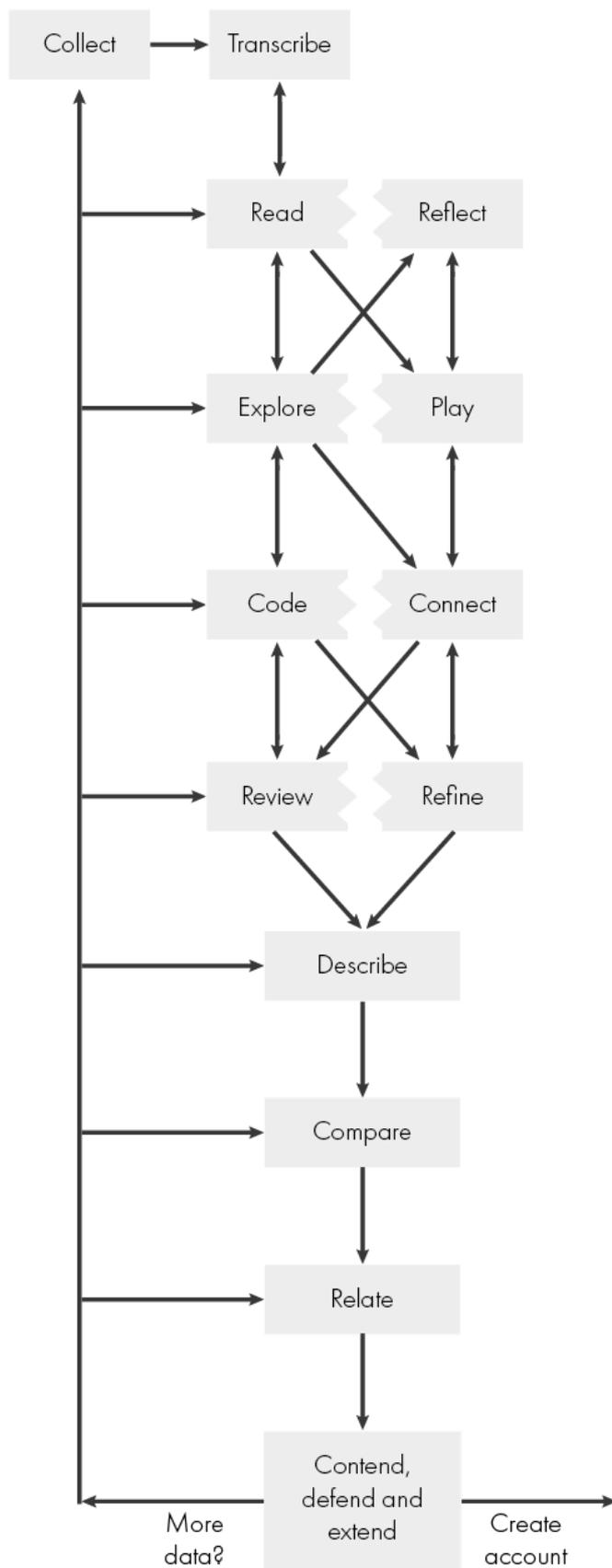
Figure 4-3: Flowchart of interview analysis.

Adapted from Gray, 2018.

The reputation samples were gathered from recommendations made by key stakeholders working in the region with knowledge of the CE. To avoid 'intermediary influence' recommendations were verified with other stakeholders. Once selected, potential participants were invited to take part in the research. A copy of the participant information sheet sent to each of the case study organisations can be found in Appendix 1.

4.3.4 Interviews

Interviews were conducted with the CEO or sustainability leader within the organisation, depending on the size. The interviews were primarily conducted face-to-face, however when this was not possible then the interview was conducted over video conferencing. The interviews were semi-structured and followed an *interview protocol* that lasted around an hour. The protocol is included in Appendix 3 of this thesis.

Semi-structured interviews allowed respondents to give expanded answers and encouraged a more open dialogue that could be useful to develop further. This technique was chosen as it "*may also allow for the diversion of the interview onto new pathways which, while not originally considered as part of the interview, help towards meeting the research objectives.*" (Gray, 2018, p. 381).

The interview protocol was useful to ensure that each interview followed the same

pattern even if the questions asked were slightly different, dependant on the interview participant. *"The interview protocol consists of several important components. These are basic information about the interview, an introduction, the interview content questions with probes, and closing instructions."* (Creswell and Creswell, 2018, p. 190).

The interviews were audio recorded and transcribed afterwards. The analysis of the transcripts used the guide laid out in Figure 4-3. It followed a theoretical thematic analysis approach, using coding developed through the literature review and the theoretical perspective adopted by this thesis. The coding was analysed with NVivo software. As patterns began to emerge, they were assigned to the themes developed and were used to draw comparisons across the case studies.

Following the interview, a critical analysis of the interview style and language was conducted in order to improve and adapt for the next participant organisation. A key part of qualitative research is reflexivity, so notes were taken during the interview, which captured thoughts and observations.

> *It is important to be aware during an interview of the reciprocal influence the participant and researcher can have on each other. Researchers can influence what participants say or do based on verbal and nonverbal responses. Participants can bring about a response in researchers, making them feel angry, sad, happy, or uncomfortable by what they say and do.*

(Corbin and Strauss, 2015, p.47)

The notes taken during the interview were recorded in the project journal and combined with other notes to aid in the reflexive process, examples of these are included in Appendix 4.
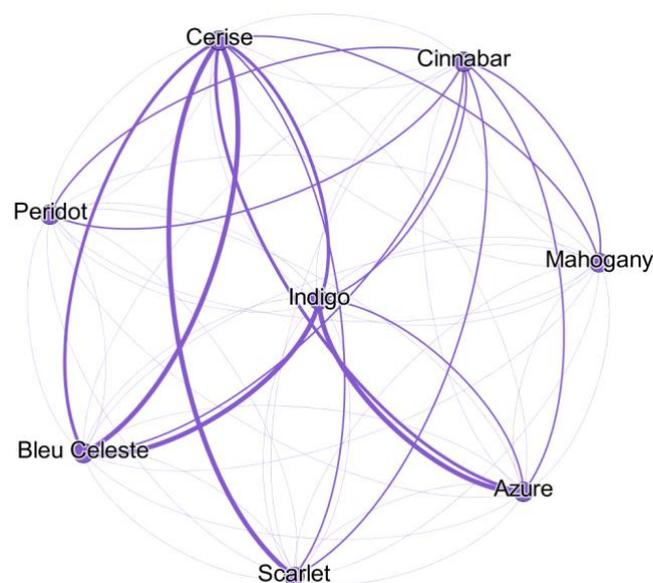
Figure 4-4: Social network analysis indicating interpersonal relationship change.

Source: Robins, 2019, p.10.

4.3.5 Mapping Activity and Social Network Analysis

During the interviews, respondents were asked to take part in a mapping activity, drawing out the links between the communities and networks their organisation is involved with. Using the free-recall technique, they were asked "*to 'recall' names based on the respondent's memory*" (Prell, 2012, p. 70), as well as describe how the different communities were linked and whether there was a specific personnel role or group within the organisation that facilitated that link. When the interview was not being conducted face-to-face the interviewer drew out the map while asking the participant to talk through the connections. The map drawing process was used as a focus point for discussions about the communities and networks their organisation were involved in (Robins, 2019). Using the map, and data gathered from the interview and documents, an ego network of each case study organisation was produced (Prell, 2012). Through this, a SNA of the organisation and its relationships was conducted.

Using the SNA technique built on the ideas that communities and the circular economy are connected and part of a larger ecosystem. This method situated the research of this thesis into new areas of literature.

SNA maps were created for each of the case studies and used to explore the relationships between the case study organisations and the communities they were involved with. By creating maps of stakeholders, the analysis created clear and accessible visualisations of a complex system (Manzini, 2015). Each SNA allowed for a broad examination of the networks utilised by each case study organisation, alongside an analysis of each connection. The connections were framed through the CCF to establish whether there was one or more capital relationship at work. Table 4-2 shows how the Community Capitals were used to determine the type of capital relationship that ties the case study organisation to their contacts, this is detailed further in section 2.5 Community Capitals. Organisations or bodies the CSOs were involved with were shown as the 'nodes' and the relationships were

Natural	Cultural	Human	Social
Involvement in projects/groups to enhance nature, green space, biodiversity.	Relationships with cultural organisations, grassroots community groups.	Connections that can enhance the knowledge or skills of the organisation or individuals within it.	Connections between individuals in a personal or professional capacity.
Political	Financial	Built	Digital
Links to structures that have the power to set policy, local, regional, or national.	Connections that provide or receive funding.	Connections that provide physical infrastructure.	Relationships that exist entirely online, digital infrastructure provision.

Table 4-2: How the community capitals were used in the Social Network Analysis.

Key
Nodes - Type of relationship

⬠ Community of Practice

💬 Advisory/Informative

Project based collaborations:

> Single/short term

> Multiple/long term

Outputs:

Report 📓   Project ✏️

Links - Community Capitals

Natural ⟶   Political ⟶

Cultural ⟶   Financial ⟶

Human ⟶   Built ⟶

Social ⟶   Digital ⟶

Figure 4-5: Social Network Map key

represented by the 'ties'. These networks were determined through the interviews with the case study organisation stakeholders and the maps they drew demonstrating their connections. The aim through these maps was to collect a *complete enumeration* of possible data sources.

This emphasis on complete enumeration reflects, in part, the small size of the groups involved and the relative ease with which complete data can be collected. More importantly, however, it reflects the difficulty of using sampling techniques with relational data.

(Scott, 2017, p. 28).

The maps developed with the interview participants included internal and external communities, CE related and not. In some cases, new nodes were added after further investigation of a key node by contacting the group or organisation directly or investigating online.

To get a deep understanding of how the different nodes linked with each other and with the case study organisation, the maps were created using Adobe Illustrator by the researcher. Through designing these maps by hand, the researcher gained an intimate knowledge of the networks that the case study organisations were involved with, which allowed for deeper insights and understandings to be developed. The hand drawn maps are in Appendix 4.

The key shown in Figure 4-5 illustrates the colour coding and symbols that were used in the stakeholder maps. Certain nodes are indicated by symbols representing a CoP-based relationship or one that is in an advisory or informative capacity. The nodes also showed project collaborations, illustrated by a single or double lined box, dependant on whether the collaborations involved one or multiple projects. The links between the nodes showed, where it is clear from the data, the type of community capital that was present in the relationship, with each type of capital represented by a

distinct colour, and arrows to demonstrate which direction the capital flows in. Where multiple capitals exist, this was made explicit through multiple lines.

Case Study	Data sources	
Ricoh	R1.	Interview, map exercise and follow-up questions asked by email.
	R2.	Sustainability presentation presented at interview.
	R3.	Corporate Sustainability Report.
	R4.	Ricoh sustainability webpages.
	R5.	Ricoh apprenticeship programme webpages.
	R6.	UK Gov policy document: *Our Waste, Our Resources: a waste strategy for England.*
	R7.	UK Gov policy document: *From Waste to Resource Productivity.*
	R8.	IEMA website.
	R9.	West Midlands website.
	R10.	BESST website.
	R11.	Industrial Symbiosis Programme website.
PPL	P1.	Interview, map exercise and follow-up questions asked by email.
	P2.	Precious Plastic's global website
	P3.	Precious Plastic Lancaster's website.
	P4.	PPL Instagram account.
	P5.	UK Precious Plastic Instagram account.
	P6.	International Precious Plastic Instagram account.
	P7.	Lancaster University's community outreach event.
	P8.	Re:Centre Facebook page, a collaborator.
	P9.	Plastic Tactics website, a collaborator.
	P10.	Lancaster and Morecambe Makers Facebook page.
Dsposal	D1.	Interview, map exercise and follow-up questions asked by email.
	D2.	Dsposal website.
	D3.	Dsposal website articles.
	D4.	Dsposal's CE podcast.
	D5.	Waste Compliance Taskforce website.
	D6.	Tip of the Binberg report.
	D7.	Chartered Institute of Waste Management website.
	D8.	The Federation co-working space website.
	D9.	Circular Economy Club Manchester webpage.
Ecospheric	E1.	Interview and map exercise.
	E2.	Ecospheric website.
	E3.	Food Hall project website.
	E4.	Magazine article provided by EIP during the interview.
	E5.	Manchester Evening News article about the food hall.
	E6.	Email correspondence with the CAT alumni.
	E7.	WASE website.
	E8.	SuperHomes network website and Ecospheric specific page.
	E9.	Greater Manchester Combined Authority Retrofit taskforce webpage.
	E10.	Manchester Metropolitan University Fuel Cell Lab website.
	E11.	University of Salford's Energy House website.
	E12.	Tyndall Centre (based at University of Manchester) website.
Arup	A1.	Interview and map exercise.
	A2.	Arup website.
	A3.	Arup report: The Circular Economy in the Build Environment.
	A4.	Arup report: From Principles to Practices: First Steps Towards a Circular Built Environment.
	A5.	Arup report: The Circular Economy Opportunity for Urban & Industrial Innovation in China.
	A6.	Arup report: The Future of Urban Consumption in a 1.5°C World.
	A7.	Arup report: Circular Economy in Cities.
	A8.	Arup report: Blockchain and the Built Environment.
	A9.	Arup report: From Principles to Practices: Realising the Value of Circular Economy in Real Estate.
	A10.	Resilient Cities Index Website and Arup webpage
	A11.	EMF website
	A12.	BITC CE taskforce webpage
	A13.	Research at Arup webpages

Table 4-3: Full data set used for each case study.

4.3.6 Document Analysis

Documentation was requested from each of the case study organisations, and contextualising searches were conducted online to give more information about any partnerships or connections mentioned in the interviews. These documents were analysed using the same thematic analysis approach as the interviews and were also explored for contributions to the SNA. They contributed towards a deeper understanding of the different links created by each case study organisation and helped to build up a deeper understanding of the background to the organisation. The coding used in NVivo to synthesise the document and interview text is recorded in Appendix 5.

Case Study Dataset

A research journal was kept to record thoughts and feelings about each case,

> *[t]he protocol, and the diary help to realise two goals that are central to data collection. The first is the creation of a case study database; the second is maintaining a chain of evidence between data and conclusions.*

(Swanborn, 2010, p. 75).

Datasets were developed for each case study that contained: the interview transcripts and completed protocol sheets; documents used in the document analysis; stakeholder maps used for the SNA; and research journal entries for each case, examples of these can be found in Appendix 3 and Appendix 4. The completed data sets for each case study can be seen in Table 4-3, the letter and numbers are used to indicate which source in used in the Case Study Chapter, further details of each case's data sets are included in the introduction to each case study.

4.3.7 Case Study Analysis

Each case study is made up of data from interviews, documentation, and network maps. The data gathered from these different methods made up the content for each case study and was analysed using a theoretical thematic analysis. This was based on the research questions and the theoretical frameworks described at the beginning of the chapter.

> *[A] 'theoretical' thematic analysis would tend to be driven by the researcher's theoretical or analytic interest in the area, and is thus more explicitly analyst driven. This form of thematic analysis tends to provide less a rich description of the data overall, and more a detailed analysis of some aspect of the data.*

(Braun and Clarke, 2006, p. 84)

The coding was conducted to follow the research questions and the overarching themes that developed from the literature review. The following section develops these themes and gives the rationale behind the choice of each. In deciding on the themes, consideration had to be given to both

aspects of the research areas: CE, and community and networks. The case study analysis explored the CE themes first and then looked at the community and network themes alongside the SNA. A step-by-step guide and a fully worked example of the data are included to demonstrate how the analysis took place.

4.3.8 Circular Economy Themes

- Interpretation
- Implementation
  - Barriers
  - Drivers

The themes of interpretation and implementation established the organisations' interpretation of the CE. This was important to establish as a number of definitions exist within the literature. To create a level analysis each case study needed to firmly demonstrate how the organisation interpreted CE in order to analysis how they implemented it.

Figure 4-6: European Waste Hierarchy.

Adapted from Department of Environment Food and Rural Affairs (2011).

Interpretation

Using the coding framework identified by Kirchherr et al. (2017) the analysis identified which aspects of the framework the case study organisations were working towards. The frameworks used are discussed in more detail in Chapter 2, but the following overview shows the core principles of CE as used by this thesis and how these themes were employed by the content analysis:

- the 4 Rs – reduce, reuse, recycle, and recover (Figure 4-6);
- taking a systems perspective – at the micro (product development, individual companies, and consumers), meso (regional or eco-park), or macro (national, international or industry) level;
- what the case study organisation identified as the aims of the CE – economic prosperity, environmental quality, and social equity;
- and whether there is a consumer focus.

These core principles were used as subthemes for the interpretation theme. This theme established the circular boundaries within which the organisations were operating. It was also used to identify whether a case study organisation was using an "ideal" or "subverted" definition of the CE.

> *CE must be understood as a fundamental systemic change instead of a bit of twisting of the status quo to ensure its impact. […] [A] distinction is needed between ideal and subverted CE definitions. If subverted definitions start dominating, CE implementation will only result in incremental improvements at best, with the CE concept then not*

> *delivering on its promise of fundamental change. The CE concept may then ultimately*
> *end up as just another buzzword in the sustainable development discourse.*

(Kirchherr et al., 2017)

Another advantage for exploring the case study organisation's interpretation of the CE was to identify if they were acting in any way that fell outside of *their* definition but within the framework definition.

A note on the decision to use the 4Rs rather than the expanded 10Rs. As this study explored many aspects of the CE and looked at the case study organisation's communities, the decision was made to stick to the 4R framework, as described in the European Waste Hierarchy, Figure 4-6. This was to prevent the research study becoming too focused in one area of the CE interpretation framework.

Implementation: Barriers and Drivers

The interpretation theme situates the case studies understanding of CE, whereas the other theme of the CE part of the analysis, *implementation* explores the barriers and drivers faced by the organisation when trying to establish CE as a business model. Drawing on the limitations to CE discussed in section 2.2.8, subthemes of barriers and drivers to implementation were developed. These are important to explore in the context of this thesis as they involved the understanding and acceptance of staff at diverse levels of the organisation and the wider supply chain. By understanding the subthemes, the research could explore the pain points for the different communities involved and identify cross overs between the two sides of the research areas.

The framework followed in this analysis was developed from these papers, following the seven categories laid out by Tura et al. (2019) but drawing specific emphasis areas from all three. These are detailed in Table 4-4, with the source for each category referenced. The categories developed from these papers were a useful starting point for the analysis, as they were diverse enough to cover all the case study organisations and provided a broad overview of which barriers and drivers should be explored.

Category	Barriers – emphasis areas	Drivers – emphasis areas
Environmental	• Lacking a company environmental culture beyond mandated policy♦	• Resource constraints ¤ • Preventing negative environmental impact ¤ • Company environmental culture ⅄
Economic	• High costs of implementation ¤ • Lack of capital ⅄ • Limited funding♦	• Cost efficiency improvements ¤ • New revenue streams ¤ • Business development, innovation, and new synergies ¤
Social	• Lack of social awareness ¤ • Lack of information ⅄ • Lack of market mechanisms for recovery ¤ • Lack of clear incentives ¤	• Increased internationalisation and global awareness of sustainability needs ¤ • Potential to increase workplaces and vitality ¤
Institutional	• Complex regulation ¤ • Lack of government support ⅄ ¤ • Lack of CE know-how among policy makers ¤	• Regulation and standards requirements ¤ • Support from the demand network ⅄ • Supportive funds, favourable taxation, and subsidy policies ¤
Technological and informational	• Lack of information and knowledge ¤ • Lack of technologies and technical skills ¤	• Potential for improving existing operations ¤ • New technologies ¤ • Increased knowledge sharing and networking ¤
Supply chain	• Lack of network support and partners ¤ • Strong industrial focus on linear models ¤ • Lack of collaboration and resources ¤ • Low virgin material costs♦ • Lack of standardisation♦	• Potential for reducing supply dependence, avoiding high and volatile prices ¤ • Open collaboration and communication ¤ • Increased availability of resources and capabilities ¤ • Management of reverse networks ¤
Organisational	• Lack of compatibility with linear operations and targets ¤ • Siloed thinking and fear of risk taking ¤ • Conflicts within existing culture and lack of cooperation ¤ • Lack of management support and strong organisational hierarchy ¤ • Lack of CE knowledge and skills ¤	• Potential to strengthen company brand and differentiate from rivals ¤ • Increased understanding of sustainability demands ¤ • Circularity ingrained in company strategy and goals ¤ • Development of skills and capabilities for a circular future ¤

Table 4-4: Framework of barriers and drivers to circular economy organisations

¤Taken from Tura et. al.. (2019)

⅄Taken from Rizos et. al.. (2016)

♦Taken from Kirchherr et. al.. (2018)

4.3.9 Community and Network Themes

- Communities of Practice
- Community Capitals Framework

Communities of Practice

The community literature explored theories around the different definitions of community, concluding that in common use, the concept of community is too slippery a term to mean the same to all the interview participants (Cohen, 2002). Due to this, the analysis identified specific examples of CoPs, which "*are not defined by place or by personal characteristics, but by people's potential to learn together*" (Wenger *et al.*, 2009, p. 11). CoPs take many forms, but all have a set of certain broad characteristics (Wenger *et al.*, 2002). These are detailed in Table 4-5.

The analysis compared these characteristics to identify any patterns within the organisations, and to enable comparisons across the case studies. Comparing the characteristics of each CoP enabled the analysis to closely examine the make-up of the specific CoPs used by each case study organisation.

Size	small, a few expert individuals → very large, usually structured by geography or subtheme.
Lifespan	months and years → generations (in terms of a specific artisan community).
Location	collocated or distributed, "sharing a practice requires regular interaction" but that interaction does not need to be face-to-face.
Make up	homogeneous (same discipline or expertise) or heterogeneous (across disciplines).
Level	micro (inside an office or business), meso (across a business or businesses), macro (national or industry level).
Formation	spontaneous or intentional.
Relationship to organisation	Unrecognised – Invisible to organisation and sometimes even to members Bootlegged – Only visible to circle of people in the know. Legitimised – Officially sanctioned as a valuable entity. Supported – Provided with direct resources from the organisation. Institutionalised – Given an official status in the organisation

Table 4-5: Characteristics of a Community of Practice

Source: Wenger, McDermott and Snyder (2002)

Community Capitals Framework

In contrast to the CoP examination, adopting the Community Capitals Framework (CCF), enabled the research to take a broad look at where each case study organisation was situated in terms of their networks and how they took advantage of their community connections. Alongside the CoPs, the CCF was used to examine the purpose of an organisation's network, and to establish what their contributions to the wider community were. The ties on the stakeholder maps used the framework laid out by Emery and Flora (2004) and Nogueira *et. al.*. (2019), as detailed in section 2.5.

The analysis sought to identify the case study's network community capital flows, what aspects they were utilising and whether there were any areas that were being neglected or were detrimental to

the case study organisation. This enabled the analysis to provide clear examples of how the network of each of the case study organisations contributed to the different community capitals and used them to their advantage.

4.3.10 How the Data was Analysed

The data was examined three to four times. Firstly, the interview data was transcribed by the researcher, key points relating to CE and community were identified and notes were taken to record where these points were and any thoughts that arose during the transcription.

Secondly, the transcripts and documents were printed off so that the data could be synthesised following the checklist in Appendix 5. Studying the transcript on paper first allowed the researcher to develop an understanding of the physicality of the data, mentally recording the whereabouts of key statements. Each of the themes on the checklist was examined on a separate read-through, using a unique highlighter colour to identify each theme. This allowed the researcher to focus on each of the themes, make notes, and highlight the data where references occurred.

Thirdly, the transcripts were then uploaded to NVivo along with the secondary documents. The steps above were repeated, labelling relevant examples with specific codes related to each of the frameworks: CE interpretation, and implementation, CoPs, and other stakeholders. The same process was followed with the additional documentation to back up the interview data and reveal any areas that hadn't been discussed.

Following the above process, once a CoP was identified, the researcher searched the internet, using Google.com to find out more about the structure of the CoP so that Table 4-5 could be completed for each CoP. The checklist was used during the analysis to determine the factors that made up each CoP the case study organisations were involved with and identify whether there were any patterns within the CoP data that could assist in answering Research Question 2.

The stakeholder maps drawn during the interviews were digitised through Adobe Illustrator to create the stakeholder maps. Any other organisations mentioned in the interview were added, where this was appropriate, and it was clear what the connection to the case study organisation was. Occasionally an organisation was mentioned as a reference to illustrate a point in the interview rather than as a connection, these were left out of the stakeholder maps.

When the analysis started, Social Capital was the only capital being examined. The first iteration of the analysis to the stakeholder maps only identified where bonding bridging and linking Social Capital were active. However, for many of the relationships, the application of this type of capital wasn't appropriate, so the CCF was introduced to expand the potential of the SNA. Where a stakeholder was discussed in the interview transcripts, the context of this discussion was examined to identify which

capitals played a role in the relationships, based on the CCF laid out in section 2.4. Colours were assigned to each of the capitals, and these were used as an overlay on the stakeholder maps for the SNA, see the map key in Figure 4-5. Where the stakeholder had a CoP-based relationship or a project-based relationship with the case study organisation, these were also indicated on the map. The following Figure 4-7 shows a fully worked example of the data taken from NViVo showing how the above analysis was applied to the interview transcripts.
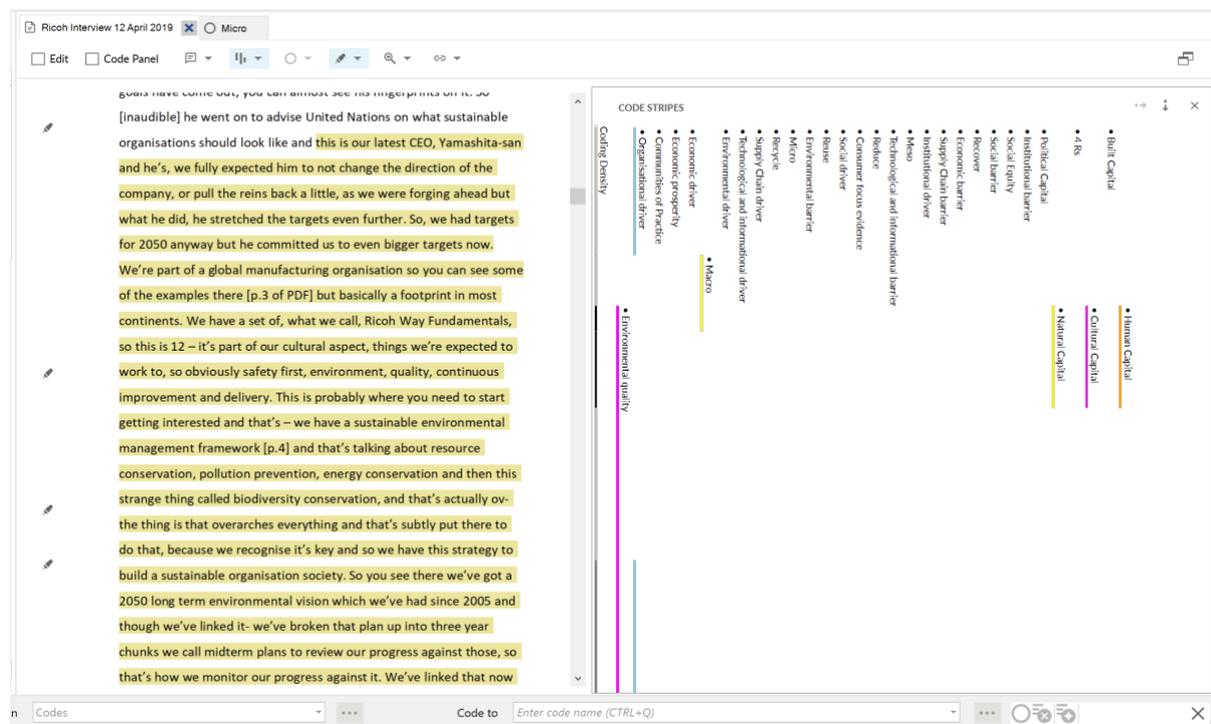
Figure 4-7: Fully worked example of Ricoh UK interview data in NVivo

4.3.11 Pilot Projects and Survey

Two additional organisations were approached to be case studies; however, due to reasons discussed below these were both rejected for inclusion in the study. The limitations of these two interviews informed the data collection and analysis of the other case studies, which will be discussed in the next section.

This section will also discuss the survey conducted and the limitations from this method which led to its rejection from the study.

Sawmill

Sawmill were an architectural salvage and furniture maker duo, who were engaged with the research due to prior association with the researcher. Their work uses reclaimed architectural salvage to create bespoke furniture and pieces for home décor. The data gathered for this pilot study consisted of an

interview and their website. The data gathered from this interview was transcribed and went through an initial coding, however, for reasons detailed below, it was rejected for inclusion in the study.

The analysis used an additional matrix developed when the project was focusing solely on Social Capital, before the CCF had been introduced to the research. The matrix, Table 4-6, was used to record the incidences of Social Capital uncovered during the analysis. The notes within the table are those which were taken during the analysis of Sawmill's data.

	Micro	Meso	Macro
Bonding		Suffered from exclusion when working in antiques & when speaking to big building firms. Exclusion from building sites due to whim of site manager.	
Bridging	Connecting with orgs through waste wood supply		
Linking	Discussion with company director due to previous acquaintance.		Started Sawmill through meeting scrap and antique merchant.

Table 4-6: Matrix to explore the different types of Social Capital being used by the case study organisations, annotated with Sawmill data.

This study was rejected for inclusion with the main case studies for a number of reasons:

This was the first interview conducted for the project, as such the questions hadn't been fully formed and lacked the direction of the following interviews. They were a small company and as such did not have much documentation to supplement the interviews, other than a website that consisted of photos of their work, a mission statement, and contact information.

An initial analysis of the interview transcript found that they did not engage with any Communities of Practice, which would have made Research Question 2 unanswerable for this study. At the time, the analysis was focusing solely on Social Capital, and the different types engage in by the organisation (see Social Capital in section 2.2.7). For this study, that seemed to be sufficient as there were examples of bonding, bridging and linking social capital, that affected the organisations both positively and negatively. However, once SNAs were conducted for the other case studies, solely examining social capital did not give a rich enough analysis so the CCF was used instead. A more detailed stakeholder map was needed to complete a Community Capitals analysis on the organisation which necessitated a follow up interview. However, it was not possible to arrange one, and unfortunately the organisation did not recover from the pandemic restrictions and was no longer operating after the COVID lockdowns.

Using the CE frameworks developed to analysis the interview transcript revealed that they focused mostly on one of the Rs – reuse, at a micro level systems perspective. As the case studies included two other organisations working in construction it was decided that the data was insufficient to include in the research. This study gave the researcher a starting point to refine the interview questions, especially when interviewing small organisations who may not have understood the CE concept. The discussion showed the importance of using terms that were in common use rather than jargon. It also gave an understanding of the importance of including built environment organisations within the study due to the scale of this industry and the complex challenges faced in reducing their environmental impact. The interviewee provided a list of websites to consult that discussed new regulations coming in that would affect the industry.

A sample from the annotated interview transcript and map drawn during the interview are available in Appendix 2.

Greens for Good

Greens for Good are a Liverpool based start-up who use high-tech solutions to grow salad under the Baltic Triangle, to distribute to offices, schools, and homes across the city. They were contacted for inclusion in the research in order to provide an example of an industry that was unrelated to the other case studies but had a local focus like Precious Plastics Lancaster. The interview was conducted by phone, and the interviewee could only give 30 minutes of their time. This meant that a stakeholder map couldn't be completed and there wasn't enough time to discuss any of the questions in depth. The interviewee was also taking part in the interview while out of the office on deliveries so couldn't give the interview their full attention. A follow up interview and a site visit were discussed once Greens for Good had got more established. However, the interview took place a few weeks before the COVID pandemic initiated nationwide lockdowns, which meant that follow up interviews could not take place. The interview transcript is included in Appendix 2.

Survey

A survey was developed for the research to get an overview of the field from an organisational perspective, and to try to recruit organisations to be case studies. It was written before the direction of inquiry had been finalised and consisted of broad questions relating to CE and involvement in CE focused groups or networks. It also included a follow up section that invited responders to take part in further research. It was distributed through CE themed groups on the social networking site Linked In and had an uptake of 17 responses. Of the responders only 5 were based in the UK, so the majority of answers were not relevant to the North West England focused research. The open-ended questions asked did not garner enough full enough responses to be useful and the multiple-choice questions needed to be more detailed, so the survey was abandoned in favour of interviews that would generate

more content for analysis. The survey questions and a report generated from the survey respondents is available in Appendix 2. Despite the survey not being used for the overall study, the questions were adapted for the interviews and informed the case study inquiries.

4.4 Summary

The research in this thesis was undertaken following an MMR approach, using a concurrent nested design. The data were gathered and explored through five case studies, made up of interviews, documentation, and a mapping exercise. The interviews and documents provided the predominant qualitative data to be analysed through a theoretical thematic analysis. The quantitative datasets drawn from the mapping exercise were used to conduct SNA of each organisation, which illustrated the qualitative data provided in the interviews and, where needed, the document analysis, providing a narrative around the findings. The research was situated within a pragmatic critical realist paradigm. This ensured that the research conducted was contextually aware of the mechanisms behind it and the causal links were thoroughly explored. By using a pragmatic approach with the critical realist paradigm, the research was evaluated in terms of how successful it was in guiding action around the role of community in CE organisations.

The following chapters detail the specific research undertaken through the case studies. It starts with the introduction of the case study organisations and how they relate to one another before each case study is examined.

Chapter 5
Case Studies

The following chapters detail each of the case studies undertaken in the research, exploring their relationship with CE principles, and looking at their communities and networks, following the research design laid out in Chapter 4.

There are five case studies covering two large corporations and three SMEs, all using principles of sustainability and working towards a CE. The case studies are principally based on interviews conducted with representatives from the different organisations, which was followed by online document research based on interview discussions. The case studies are synthesised for analysis in this chapter following the frameworks developed in the previous chapters.

5.1 Case Study Layout

The case studies are laid out in the following way: Ricoh UK, Precious Plastic Lancaster, Dsposal, Ecospheric, and Arup. Through the development of the case studies the research found that the five individual case studies can be loosely grouped into three areas that have some overlap: manufacturing, waste, and built environment. The case studies fit into the Venn Diagram of these subjects like so:
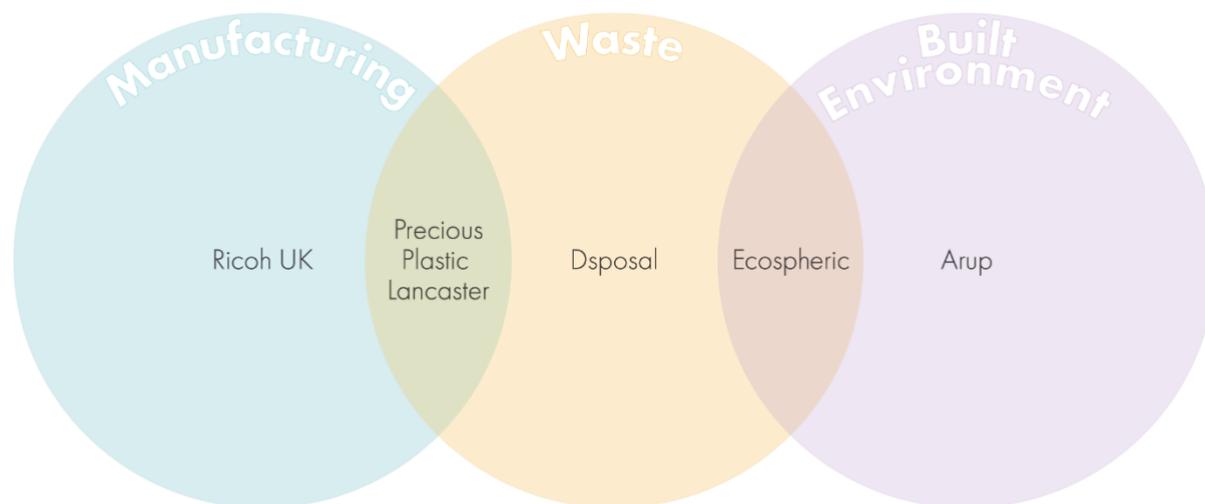
Figure 5-1: Venn diagram of how the case study organisation industries overlap.

Laying out the case studies like this shows the grouping of the industries covered and dictates the order that the case studies follow in the analysis. Following this Venn Diagram as subject guidance also means that the SME case studies are book-ended by the large multinationals, creating an analysis that moves up and down the business size scale.

5.1.1 Circular Economy Themes

A thematic analysis begins each case study: firstly, looking at the case study's interpretation of the CE through the different areas laid out by Kirchherr *et. al..* (2017) and developed in Chapter 4, Research Design. This covers the 4Rs; the systems perspective taken by each case study; which of the aims are seen as most important; and whether the case study takes a consumer focus. The next section looks at the implementation barriers and drivers each case study has faced on their CE journey. Using the frameworks developed in the Research Design, the interviews were coded in NVivo to each of the barriers and driver categories by finding examples of each. The description of each category is listed in the order of frequency of the examples. The themes are used in the cross-case analysis to draw out similarities and differences between the different case studies, showing whether there are patterns across the different industries or whether the similarities are industry-based.

5.1.2 Communities and Social Network Analysis

While the thematic analysis examines the data through the lens of the themes developed in the Research Design chapter, the second half of the analysis uses the maps developed through the interviews and subsequent Social Network Analysis to visually explore the different networks that the case studies are part of. Indicated on the map through the *nodes*, are the relationships that form the network for each case study. These nodes are identified as CoPs; advisory or informative; project-based – short and long-term, as illustrated in Figure 4-5: *Social Network Map key* in the previous chapter. Where this is not clear from the data the nodes have been left with just a name. Where a project-based collaboration has been identified, symbols are used to show whether the outcome of this collaboration was a report, advisory document, or a completed project (see Figure 4-5: Social Network Map key). The *ties* between the nodes are coloured according to the type of Community Capital identified as playing a part in this relationship. The relationships identified through the maps are described in the Social Network Analysis in the final sections of the case studies.

To easily identify the data sources used in each section, the numbering system R1, P2, D3, etc. is used to correspond with the numbering in each of the case study's Data Source paragraphs.

5.2 Ricoh UK

5.2.1 Introduction

This section introduces the first case study, Ricoh UK, a multinational manufacturer, that has had some level of circular economy implemented since 1994, the most established CE agenda of any of the case studies. Its journey towards circularity has been taking place over the last 30 years and has been a continuous cyclical process, being updated whenever technology or policy changes. The interviewee credited its circular success with strong relationships formed through a supportive network, which is examined in detail in section 0.

Insights

On the surface, Ricoh UK's CE strategy is focused only on zero-waste to-landfill initiatives. However, through the analysis, the data has revealed that Ricoh UK has a comprehensive approach to CE: from the reuse and recycling of its smallest parts to influencing government policy on CE. The organisation benefits from extensive use of the networks set up by the Ricoh interview participant, and the capital flows created by these networks. Much of its solution-based approach to CE problem-solving and its high-level influence can be attributed to these networks. For Ricoh UK, community plays a vital role in allowing it to develop and implement CE strategies: helping to maintain biodiversity targets; sharing best practice internally and externally; and extending its influence on the highest points of government. This analysis reveals and brings together the various parts of its CE strategy and the effect that its participation in the different communities identified, has on it.

Background

- Multinational corporation with headquarters in Japan, established in the 1930s.
- Manufacturers of printers and office equipment.
- Interview focuses on manufacturing base on Telford, who are the European supply base of toner and large office stationery.
- Have had sustainability strategy in place since 1994, including CE model for products.

Data sources

R1. A first-person interview conducted with an environmental manager in April 2018 over a video link and follow-up questions asked by email in April 2020. Referred to as RIP (Ricoh Interview Participant).

R2. Sustainability presentation pdf adapted and presented at interview.

R3. Corporate Sustainability Report [2]

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[2] https://www.ricoh.com/-/media/Ricoh/Sites/com/about/integrated-report/pdf2017_e/all_E.pdf?rev=f41fed6f27e74cb4a4997acc71614ae4#page=67 [opens pdf]

R4. https://www.ricoh.com/sustainability Ricoh sustainability webpages, only including a portion of the content of the sustainability report.

R5. https://ukproducts.ricoh.com/careers/apprentice-programme/ Ricoh apprenticeship programme.

UK Government policy documents:

R6. https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england Our Waste, Our Resources: a waste strategy for England

R7. https://www.gov.uk/government/publications/from-waste-to-resource-productivity From Waste to Resource Productivity

Other relevant data sources:

R8. https://www.iema.net IEMA website

R9. https://www.sustainabilitywestmidlands.org.uk/ Sustainability West Midlands website

R10. http://www.telfordbesst.co.uk BESST website

R11. https://international-synergies.com/ourprojects/nisp/ Industrial Symbiosis Programme

Overview

For this case study the RIP adapted a pre-prepared presentation and PowerPoint. As this was one-on-one interview there were opportunities to ask questions during the presentation, but the data gathered did not follow the plan laid out in the Research Design. However, the data was extensive enough to be able to follow the themes developed for analysis and examine the networks of Ricoh UK Products Ltd (hereby known as Ricoh UK, unless stated otherwise) and the RIP through a Community Capitals Framework (CCF) lens. The additional sources are used to verify the information that was revealed in the interview so as not to overwhelm the data.

Due to the nature of the RIP's position within the company, they provided a specific perspective of sustainability approaches undertaken by Ricoh UK. The RIP has held their position for over 30 years and has extensive knowledge of Ricoh UK's work towards CE. Through their role, the RIP has led on a number of internal and external initiatives to include other organisations in the local area in Ricoh UK's sustainability journey. The primary focus for Ricoh UK and the CE is zero-waste to landfill, which was first achieved at the UK site in 2001, led by the RIP. This focus has been in continual development since then as company directives, local, national, and international laws, and attitudes change.

5.2.2 Circular Economy Interpretation

Ricoh UK's interpretation of the CE is firmly based on the comet life cycle assessment model which it established in 1994. Ricoh UK developed its approach and interpretation towards CE before the Ellen MacArthur Foundation (EMF) developed its butterfly diagram and the term CE was in common parlance. The "Comet Life Cycle Assessment" strategy was developed in 1994 (Hopkinson *et al.*, 2018) and it was the role of the RIP to manage and deliver its implementation. Added to the Comet Life Cycle diagram is the aim of zero-waste to landfill, which is also part of the RIPs remit.
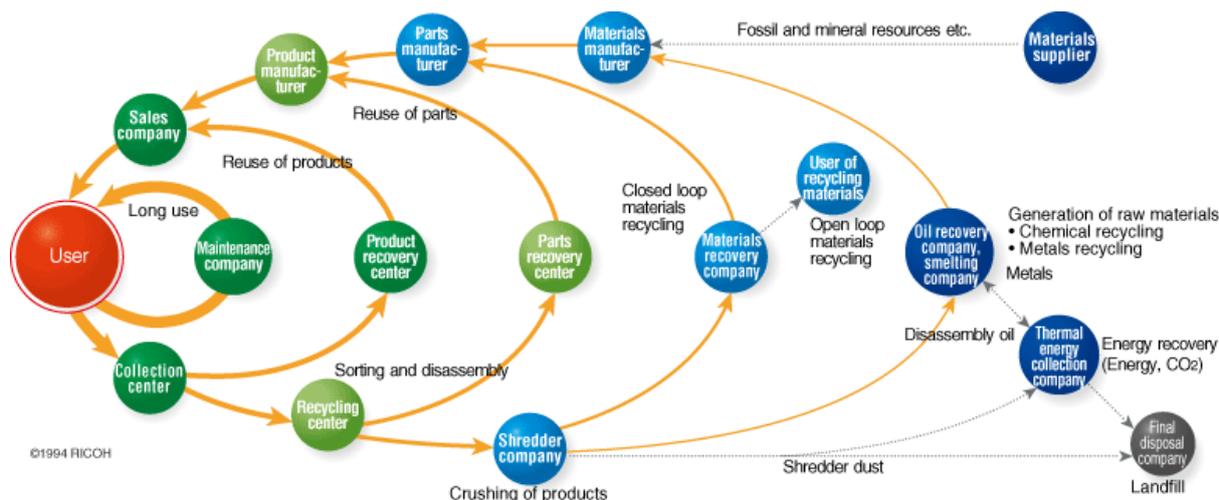
Figure 5-2: Ricoh UK's Comet Lifecycle Assessment Diagram.

 Ricoh UK's CE interpretation follows the diagram closely and incorporates most of the themes developed through the research design. The relationship between Ricoh UK and the CE is one that is ever evolving, influenced by changing government directives, UK waste and recycling capacity, and employee innovation. It uses a *"continuous improvement process"* (RIP interview) to maintain its zero-waste status as part of the CE. It has developed multiple small loop systems within the organisation, through encouraging employee innovation and working with its suppliers to create up-chain solutions to waste issues (R1, R3). As the RIP understands more about the CE and Ricoh UK's place within it, they can build new ideas and methods into the organisational approach to follow the sustainability diagram and achieve the zero-waste-to-landfill aim. The understanding of CE has developed through the connections Ricoh UK has formed with other businesses in the area, professional bodies it is part of, and top-down company directives.

This section takes a deeper look into the areas of CE interpretation defined in the research design and explores how Ricoh UK approaches each of these areas.

4Rs

Table 5-1 summarises the incidences of each of the 4Rs in the data: *reduce*, *reuse*, *recycle*, *recover*, and adds in *dispose* to indicate where waste is sent to landfill. The 4R initiatives that Ricoh UK takes part in are primarily concerned with income generation through the creation of new revenue streams or reducing the disposal costs of raw materials. The table above shows that its main focus is on recycling, but that it engages with all of the 4Rs through different projects, and at different parts of its products' life cycles. By focusing so heavily on recycling, Ricoh UK could be missing opportunities to develop in other areas further up the R framework chain. As recycling is a high-energy process it is not

the most desirable way to deal with waste. The cross-case analysis develops a comparison of the different CSOs attitudes towards the 4Rs.

Reduce	• "Operation clean sweep" to record and reduce plastic pellet waste.
Reuse	• Employee-led reuse of packaging materials. • Employee-led reuse of delivery pallets. • Remanufacture of old printer and copier units with warranty certificates. • Return and refill of toner cartridges.
Recycle	• Onsite recycling centre established in 2000/2001. • Waste streams used as viable material sources for other businesses. • Segregation of recycling at source as part of its employees' daily duties. • Reverse logistics system in place for recycled PET toner bottles. • Damaged toner bottle are returned up the supply chain to be recycled into automotive carpet.
Recover	• Zero-waste-to-landfill aim includes energy recovery from waste.
Dispose	• Small, variable percentage of waste is sent to landfill each year

Table 5-1: Summary of Ricoh UK's 4R engagement.

Systems Perspective

Ricoh UK, as a global group, engages across all the different levels of CE from a systems perspective. It is through this framework that the data starts to reveal where Ricoh UK's community relationships are influencing its attitude and engagement with the CE. Community influences both its meso and macro level systems perspectives, with the RIP actively creating communities at the meso level to share best practice around CE implementation. The following section describes how Ricoh UK engages with each of the different perspectives.

Micro

At the product level, Ricoh UK is working in many areas of CE, following its Comet Lifecycle Assessment strategy. As previously indicated, it operates reverse logistics on its toner bottles which are refilled and resold; it refurbishes old machines and sells them with new warranties to build confidence in, and standards for, refurbished products; it works with other companies in its networks to develop recycling solutions; and sends products back up the supply chain to be recycled into new products (R1, R4).

Meso

At the meso level, Ricoh UK, through the work of the RIP, has developed a strong network of businesses trying to work more sustainably. The RIP founded and chairs a local CoP, the Business Environmental Support Scheme Telford (BESST), made up of small to large businesses from the area that work on creating best practice for their region, linking the business communities and the rural communities that surrounds them (R10). Through this CoP and other regional groups Ricoh UK and

the RIP develop and set local industrial strategy, which is then fed into regional aims and targets, ultimately influencing government policy. Figure 5-3 shows where the BESST sits with other local groups and how it interacts with other nature and environment-focused partnerships in the area, feeding into the Local Enterprise Partnership (LEP) and in turn, providing data and advice for central government (R1, R2).
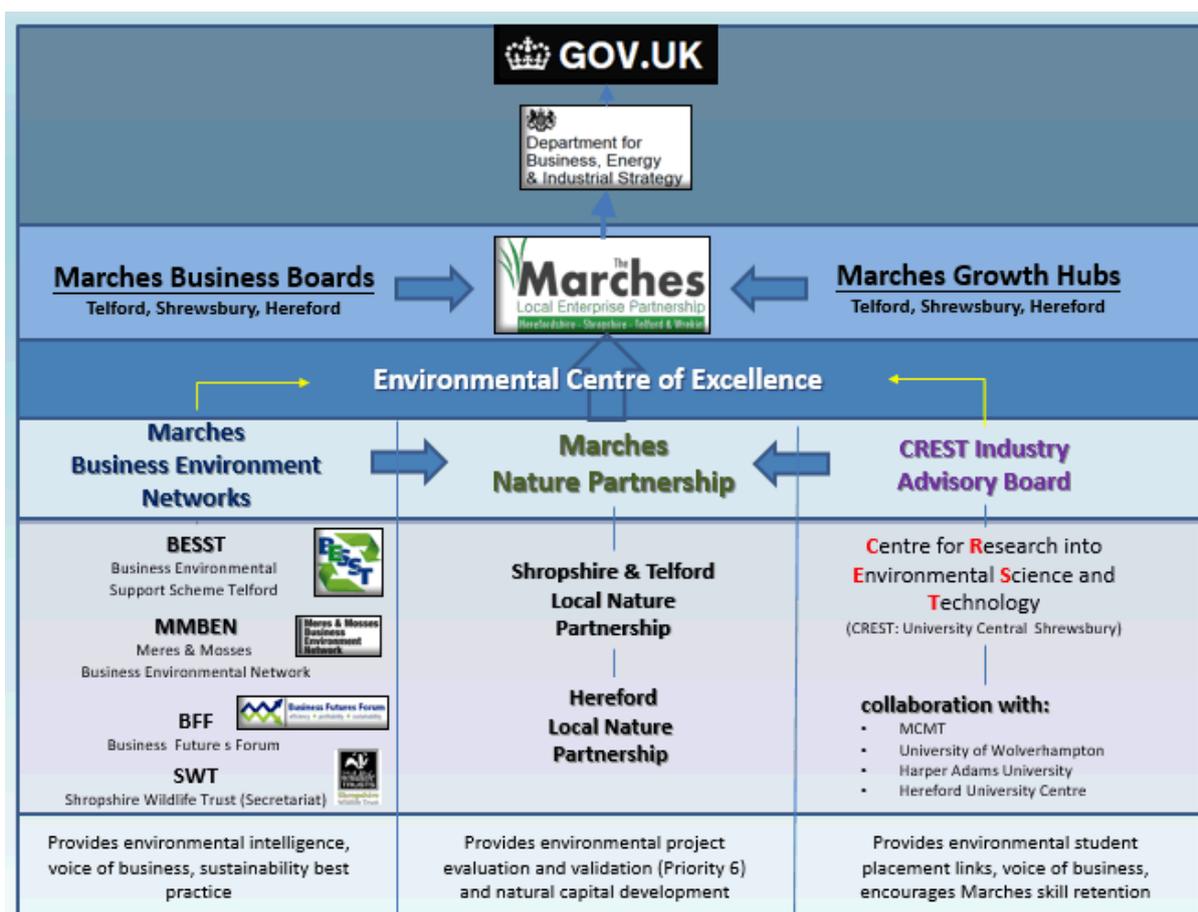
Figure 5-3: Ricoh's local connections through business boards and how they feed into wider regional and national policy.

Taken from the PowerPoint presentation shared by the RIP during the interview.

Macro

Ricoh UK, as a global company, has a vested interest in the macro implementation of CE. Having had circular systems in place within its business strategy for over 20 years it can position itself as an industry leader, which gives it good leverage to influence at a national government and UN level.

Through its networks and CoPs, Ricoh UK works at the macro level of CE with branches of government and other advisory groups, taking part in round tables, consultations and report writing.

> [T]hese are key milestones from the resources and waste strategy, and I'm interested
> in that because they're going to affect me as a business and actually slap down on me

> *which I'm going to have to conform to. So, the more we can shape them to be*
> *appropriate, the better for us.*

(RIP interview)

The RIP's experience in creating networks and CoPs led them to be invited to contribute to the National Industrial Symbiosis Programme in 2015, where workshops were conducted to examine and map waste flows in the UK (R11). This led to a "speed dating for waste" system, which has since been used internationally. This is another example of where Ricoh UK is influencing CE development at a macro level.

Aims of the Circular Economy

For Ricoh UK, the aims of the CE are focused on *environmental quality* (EQ) and *economic prosperity* (EP). *Social equity* (SE) is not something that can be deduced from the analysis as an aim of Ricoh UK's CE involvement.

Environmental Quality

The RIP was very keen to talk about the work they were doing to improve the EQ of the area. A few days prior to the interview Ricoh UK received recognition for its environmental work, which may have contributed to the enthusiastic discussion in this area. Ricoh UK has developed a sustainability strategy that has biodiversity regeneration as a fundamental overarching part of it (R3).

> *Not many companies do something to repair their damage to the planet, so that's*
> *where the biodiversity activities come in and the Natural Capital enhancement, so*
> *you're putting something back.*

(RIP interview)

Ricoh UK has led in the regeneration of its local environment through a collaboration with the Wildlife Trust[3]. The project that started this ongoing relationship was designed to transform its 55-acre site from a well-mowed "green desert" into a nature friendly space with biodiversity buffer zones and walk throughs for employees. The aim for this project was to learn conservation techniques while finding environmentally friendly ways to recycle wood waste the site produced and use these techniques in local public areas (R1).

The work on Natural Capital enhancement projects led the RIP to consider the decline in pollinators and the effect that would have on the large agricultural community in the area. This led to a collaboration with the local beekeeper's association to keep hives onsite, where they are protected

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[3] Ricoh is a global mass manufacturing company and the major impact areas are not assessed in this thesis and cannot be commented on.

by 24/7 security. This onsite conservation model is used to educate other local businesses with large sites and encourage them to consider its place in the natural ecology of the local area. They aim to change the narrative of Natural Capital enhancement from "*just a nice fluffy conservation story, into strategic business alignment*." (RIP interview).

Economic Prosperity

EP is closely tied to the work the RIP does as the sustainability and environment manager, many of the examples they used to illustrate Ricoh UK's CE commitments were linked back to the financial savings that could be gained from their implementation. The RIP had to be able to argue for the projects by demonstrating their economic viability, and the presentation they had adapted for the interview included many examples.

Social Equity

SE is only discussed in the Corporate Sustainability Report:

> *We accordingly endeavor to resolve social issues through business, reinforce our operational underpinnings, and contribute to society, and will help to reach Sustainable Development Goals (SDGs) agreed to by the international community.*

(Ricoh Group, 2017, p. 19)

However, Ricoh limits its commitment to the SDGs, only focusing on eight of the 17, and SE specifically is not discussed in the report. In the interview, no link is made between SE, the work Ricoh UK does, or CE.

Consumer Focus

Ricoh UK does have a consumer focus and can demonstrate a clear understanding of how the consumer fits into its work on the CE. It provides reverse logistics for its products in terms of refillable toner bottles and refurbished office machinery.

5.2.3 Circular Economy Implementation

Ricoh UK's CE implementation has taken place over a 30-year period. Some of the barriers discussed below were overcome at the start of its journey towards circularity but are included to emphasise the long-term nature of Ricoh UK's approach. The RIP discussed frequently how implementing circular strategies was a cyclical process, of trying and refining new approaches as technology and policy changes. Table 5-2 below summarises the barriers and drivers faced by Ricoh UK in its CE implementation.

Barriers

Ricoh UK has been instituting sustainability and CE models since 2000, having faced and overcome many barriers and challenges. Within the following section, many of the barriers are ones that have come about over the last 20 years and strategies have been implemented to mitigate them.

Environmental

When Ricoh UK launched its sustainability strategy in 2000, there was a lack of understanding among staff who had to implement the strategy. This policy was introduced before the passing of the UK's

Category	Barrier	Driver
Environmental	✓ Lacking a company environmental culture beyond mandated policy.	✓ Preventing negative environmental impact. ✓ Company environmental culture. • Resource constraints.
Economic	✓ High costs of implementation. • Lack of capital. • Limited funding.	✓ Cost efficiency improvements. ✓ New revenue streams. ✓ Business development, innovation, and new synergies.
Social	✓ Lack of social awareness. ✓ Lack of market mechanisms for recovery. • Lack of information. • Lack of clear incentives.	✓ Increased internationalisation and global awareness of sustainability needs. • Potential to increase workplaces and vitality.
Institutional	✓ Complex regulation. ✓ Lack of CE know-how among policy makers. • Lack of gov. support.	✓ Regulation and standards requirements. • Support from the demand network. • Supportive funds, favourable taxation, and subsidy policies.
Technological and informational	✓ Lack of technologies and technical skills. ✓ Lack of information and knowledge.	✓ Potential for improving existing operations. ✓ New technologies. ✓ Increased knowledge sharing and networking.
Supply chain	✓ Lack of standardisation. ✓ Strong industrial focus on linear models. • Lack of network support and partners. • Lack of collaboration and resources. • Low virgin material costs.	✓ Open collaboration and communication. ✓ Increased availability of resources and capabilities. ✓ Management of reverse networks. • Potential for reducing supply dependence, avoiding high and volatile prices.
Organisational	• Siloed thinking and fear of risk taking. • Conflicts within existing culture and lack of cooperation. • Lack of compatibility with linear operations and targets. • Lack of management support and strong organisational hierarchy. • Lack of CE knowledge and skills.	✓ Potential to strengthen company brand and differentiate from rivals. ✓ Increased understanding of sustainability demands. ✓ Circularity ingrained in company strategy and goals. ✓ Development of skills and capabilities for a circular future.

Table 5-2: Barriers and drivers of circular economy for Ricoh UK.

Household Waste and Recycling Act in 2003, which would support a lack of general understanding of the importance of recycling. The RIP had to adapt the marketing for the new strategy, making it specific to Ricoh UK's manufacturing processes to help staff understand what was required. Initially, this caused a lot of resistance within the administrative offices, especially to the idea of segregating waste. As most waste was identifiable to an employee it was easy to recognise who the repeat offenders were and offer them more training. Segregating waste was easier in the manufacturing departments as the staff already had to follow strict rules, so the changes were more easily adopted into routines (R1).

Economic

The main economic barrier to engaging with the CE and zero-waste policy is that when there is no dedicated waste stream, the waste must be stored until a solution can be found.

> *We ran out of storage in our own area and then started paying for offsite warehouse storage, until about six months later a solution provider will came up with a high temperature incineration process, but that turned out to be incredibly expensive, about £2,200 a tonne, which is a lot more than £116 a tonne we pay for normal incineration.*

(RIP interview)

This prompted the RIP to look to other organisations and to use their extensive network to develop solution-based collaborations. These collaborations are explored further in the section below.

Social

As previously discussed, this barrier centres on a *lack of social awareness* around the implementation of zero-waste principles within the office and the difficulties the RIP had in encouraging its adoption by staff. It also faced barriers through a *lack of market mechanisms for recovery*, which is discussed in the institutional section below.

Institutional

When the zero-waste to-landfill strategy was first implemented, a solution could have been incineration, however, a lack of capacity in the UK drove the RIP to find alternative, more recycling-based solutions. This has occurred repeatedly during the RIP's time working on the CE. For example, in 2015 there was a change in the classification of its toner bottle caps to Waste Electrical and Electronic Equipment recycling (WEEE) as they contain an RFID (radio frequency identification) tag. This meant that its toner caps could not be put into normal waste streams (R1, R3).

Technological and Informational

The changing of the toner bottle tops to be WEEE classified meant that Ricoh UK had to develop new solution-based collaborations (which is discussed later in the chapter) and adapt the labelling of its goods to make identifying the right waste streams easier for staff.

Supply Chain

In 2013, Ricoh UK experienced two major disruptions to its supply chains. An international corporate downturn led to the Telford base being reassigned to deal with complex plastic, which coincided with China's decision to limit the amount of recycling it would take from around the world. "*We [were suddenly] left with having nowhere to put a lot of our waste streams, so we went through a complete review, looking at a plastics hierarchy [within the manufacturing base]*" (RIP interview). Since then, the RIP has promoted the work it does to its networks, which has contributed to the local market becoming more saturated. The recycling contractor can now choose the quality of recycling it takes, which has led to the waste being stored and incurring costs, prompting the RIP to develop new solutions.

Drivers

Environmental

Within the Environmental category of the Drivers framework, a key emphasis for Ricoh UK is "*preventing negative environmental impact*". This manifests through extensive work locally, developing the Natural Capital of its site, local schools, and woodlands. The strong emphasis on Natural Capital enhancement is shown through the interview and report data as a way to engage employees with the company's sustainability targets and aspects of the CE (R1, R2). Through collaborations with the local wildlife charity and other nature partnerships, the RIP has found that the UK Government has a more robust reporting structure for collaborative achievements within business-based nature partnerships, than for business sustainability networks. Focusing on nature partnerships gives the RIP a formal route to record and report on the work they do.

Economic

As discussed above, the early adoption of zero-waste initiatives caused Ricoh UK to find innovative ways to change its waste streams as it moved from a system of paying to have its waste disposed of, to segregating it and selling it on.

> [we] developed value in the material, so this waste to product process does actually mean that in 1999 we were paying £46,000 to get rid of our waste, ten years later we were making £59,000 selling it.

(RIP)

Some of the initiatives it has implemented have created a less tangible economic benefit, however, the RIP stressed the importance of capturing the business value of all the different ways Ricoh UK was reducing waste. This ensures that CE initiatives are seen as valuable to the business, even if the savings are not explicit.

Social

Sustainability and CE are a part of the culture at Ricoh UK and its principles are introduced to all employees as part of their training (R3). This includes the apprenticeship programme; whose students all spend time working with the RIP on Natural Capital projects. The RIP encourages employees to take part in rewilding initiatives and rewards those who develop sustainability skills in their own time. Through these links, Ricoh UK has developed projects with the Environment Agency and the Wildlife Trust providing volunteers and building the Natural Capital at their site.

Institutional

The sustainability work that Ricoh UK does complies with the International Organisation for Standardisation Environmental Management framework (ISO 14001). This standard comes with a certain set of rules and procedures that need to be followed in order for the ISO certificate to be awarded.

> *we recognise waste as a resource, waste-to-product, we teach segregation at source at induction, but legislation is driving us to this anyway, the circular economy strategy and the drive [for sustainability] in the UK are making us look at trying to maintain the quality within the material.*

(RIP interview)

The RIP has time allocated within their work schedule to develop connections, to attend and contribute to government round tables and policy development which directly impacts the organisation (R1).

Technological and informational

As demonstrated through other CE drivers, Ricoh UK has developed some innovative technical solutions to some of its waste stream issues. Many of these problems have led to collaborations developed through networks set up by RIP, which is discussed further in section 0.

Supply Chain

Through its extensive waste reduction programme, it has found itself moving up the supply chain. It is a final product manufacturer, but it also supplies other industries with materials taken from its waste streams. An example of where it has moved positions on the supply chain also coincides with a waste stream solution. Through the interview, it transpired that one of the biggest environmental challenges

the RIP had faced was finding a waste solution for Ricoh UK's biggest plastic waste source, namely PET with fire retardants in it (PETFR). The fire retardants are a market requirement, but their inclusion made recycling very difficult due to the large supply of pure PET to the recycling market. Searches for a solution provider were unsuccessful, so they returned to the original supplier of PETFR to develop an up-chain solution and found that the supplier could convert waste PETFR into automotive floor coverings (R1, R4).

Organisational

Ricoh UK has long-held sustainability policies in place, which shows a strong organisational driver. Demand on the headquarters from the Japanese consumer base, following the Kyoto Protocol in 1992, led to the development of a version of the CE for its product manufacturing lines, over a decade before CE started to become a more well-used term. Strong leadership on sustainability has remained a priority of the subsequent CEOs of the organisation (R1, R3, R5). The current long-term environmental vision has CE built into it, "*our intention is by 2050 to have 93% of what we bring in should be from biomaterials, recycled or reused*" (RIP interview). This plan is incorporated into the performance reviews of all the employees, which encourages them to implement sustainable strategies in their daily work.

5.2.4 Communities and Social Network Analysis

This part of the synthesis details the findings developed through the SNA map, shown in Figure 5-4, and explores the communities highlighted in the data. It first examines the types of connections (nodes) revealed through the analysis, including the CoPs Ricoh UK is part of, and then follows on with an exploration using the CCF (ties) evident through the relationships. As Ricoh UK has been working in the area of zero-waste and sustainability for a long time many of these links are well established and the projects mentioned in the SNA are examples used to illustrate the relationships.

Nodes

This analysis highlights the key relationships that Ricoh UK and the RIP have developed throughout their CE journey. It explores the CoPs Ricoh UK is part of and discusses any other important nodes in the network.
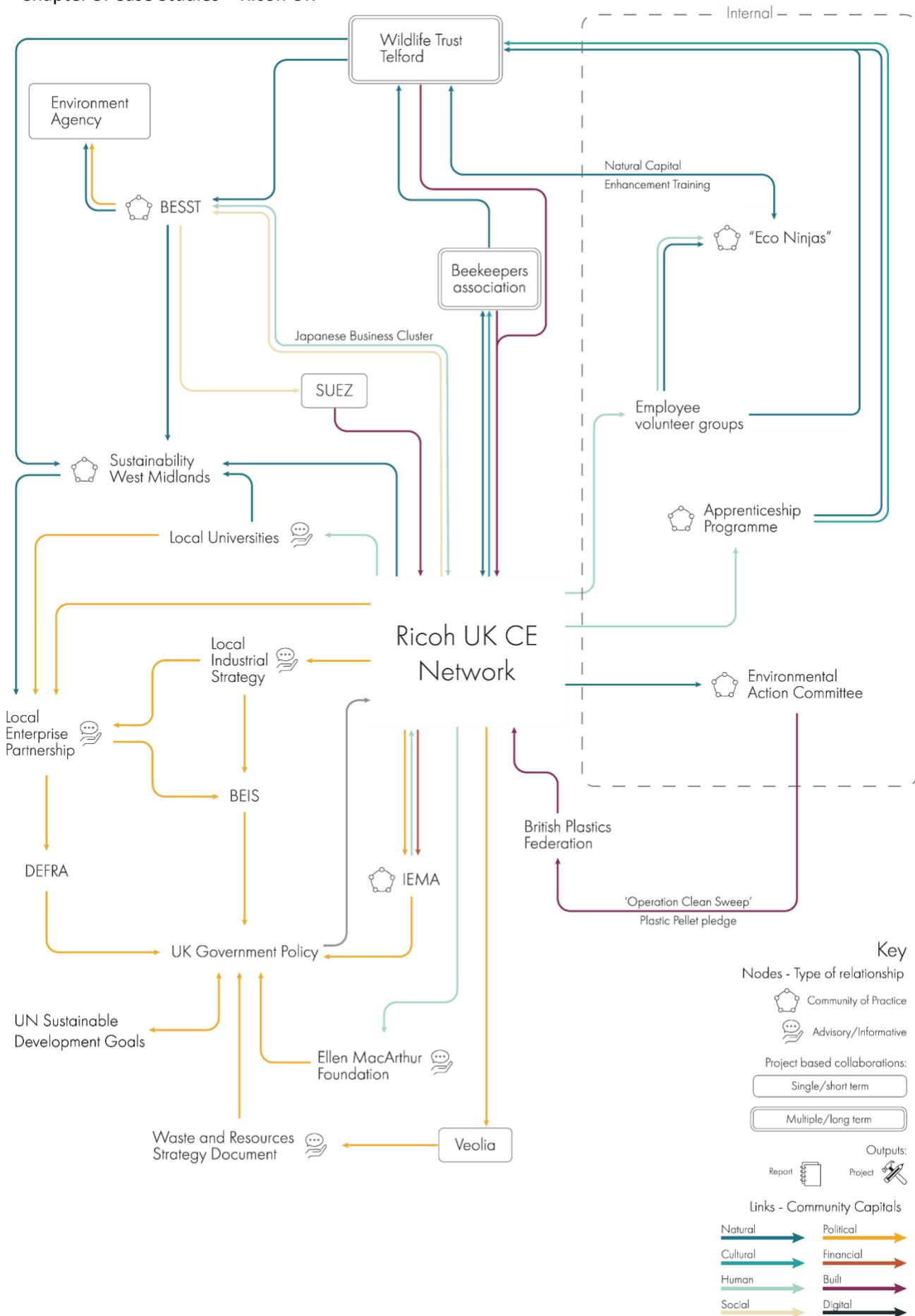
Figure 5-4: Ricoh UK Social Network map with Community Capitals Framework applied.

Communities of Practice

The RIP places a lot of value on the benefit of taking part in CoPs. The networks and exchanges developed through these interactions are:

> *fundamental. […] It's about practitioners like myself, standing up and saying "we had this issue, we worked with company X and we came up with a solution and you're quite welcome to speak to company X if you want or go away and do it yourself" but it's a case of sharing that experience, knowledge and sector intelligence so that you collectively improve.*

(RIP interview)

As previously mentioned, the RIP has set up CoPs in their local area to develop best practice around sustainability. This was due to Telford being a "Japanese cluster" of businesses who all experienced the implementation of environmental strategies before the UK. This was the catalyst for the RIP to develop a CoP to learn from their neighbours to comply with the new rules from their headquarters.

Community of Practice	Category description	Ricoh EcoNinjas	Environmental Action Committee	Apprenticeships
Size	small, a few expert individuals → very large	Small	Small	Large
Lifespan	months and years → generations	10 years	Requirement of ISO 14001 since 1996 - awarded to UK Ricoh UK in 1996	Since 1990
Location	collocated or distributed	Collocated	Collocated on site (but also distributed as ISO14001 is an international standard that applies across the org)	Collocated
Make up	homogeneous or heterogeneous	Homogeneous - all members have completed extra eco training from the Wildlife Trust	Heterogeneous - members from across UK base	Heterogeneous - they work in different areas of the company, coming together for sustainability
Level	micro, meso, macro.	Micro	Meso	Micro
Formation	spontaneous or intentional.	Spontaneous	Intentional	Intentional
Relationship to org.	*Unrecognised Bootlegged Legitimised Supported Institutionalised*	Supported	Institutionalised	Institutionalised

Table 5-3: Internal Communities of Practice participated in by Ricoh UK.

Internal

The internal network nodes revealed through the analysis consist mainly of the three internal CoPs that RIP is involved with. These are just a small snapshot of the internal networks that exist within Ricoh UK, focusing on the involvement of the RIP and nodes revealed through the data.

Ricoh EcoNinjas was set up by RIP to recognise staff going beyond the company remit to learn and engage with biodiversity issues, attending a course run by the local Wildlife Trust.

Environmental Action Committee is a mandated working group whose role is primarily concerned with ensuring various environmental standards are kept to within that site. It works on Natural Capital projects around the site with Telford Wildlife Trust. It also worked with the plastic trade association to reduce plastic pellet wastage (R2).

Apprenticeships have been running since 1990, and some of its employees have come through this programme. Although not directly related to the CE, they work with the RIP taking part in a range of activities to develop skills related to manufacturing (R5).

External

Community of Practice	BESST (Business Environmental Support Scheme for Telford)	Sustainability West Midlands	IEMA (Institute of Environmental Management and Assessment)
Size	Small - 12 organisations are represented	Medium - 69 organisations	Large - membership across UK - divided into regional subgroups
Lifespan	Since 2001	Since 2002	Since 1998
Location	Collocated	Distributed	Distributed
Make up	Heterogeneous - a mix of local orgs	Heterogeneous	Heterogeneous - professional body for those working in environment and sustainability
Level	Meso	Meso	Macro
Formation	Intentional	Intentional	Intentional
Relationship to org.	Legitimised	Legitimised	Legitimised within Ricoh UK but external

Table 5-4: External Communities of Practice participated in by Ricoh UK.

BESST was jointly set up by the RIP in the early 2000s to share best practice around sustainability with other businesses in the area. The membership of this group is controlled by a selection interview, it *"involves an initial meeting to assess why an organisation is joining (compliance, continuous*

improvement, or just out to sell a service - which we don't normally allow) and what they can bring to the network (resources, best practice etc.)" (RIP follow up email).

Sustainability West Midlands is a broader CoP that is fed into by the Local Enterprise Partnership and local universities. The regional sustainability network feeds into the national strategies on sustainability, the environment, and CE, which is developed by a few government departments, as demonstrated in Figure 5-3.

IEMA are a professional body representing sustainability professionals around the world. It ensures that sustainability standards are understood and upheld in many global organisations (R8).

Node Highlights

For Ricoh UK, a key node in its network is that of the BESST network. Many of its links have come from its involvement in this CoP, including a project with Suez to recycle its toner caps, and developing the relationship with the local Wildlife Trust, which led to the development of the Ricoh Eco Ninjas CoP and is now a part of the apprenticeship programme. Suez is a waste management company, that attended a CE workshop run through BESST by the RIP. During this session, the RIP spoke about the issue of recycling its toner bottle caps, after its waste class had changed from plastic waste to WEEE (Waste Electrical and Electronic Equipment Directive), which has very strict restrictions on its disposal in the UK. Suez had a recycling plant designed for breaking up fridges, which it suggested might be suitable for Ricoh UK's waste item, despite it being considerably smaller in size and different in structure. However, it was discovered that the plant could break up the waste into its component parts, creating an avenue for a new product made from one of the waste streams (R1).

Through the BESST Network, and as a separate member Ricoh UK is part of the Sustainability West Midlands network, which brings together different groups and organisations in the West Midlands to develop practical solutions to climate-based problems (R9). Ricoh UK advises local universities on course modules around sustainable manufacturing. Together these groups feed into the regional Local Enterprise Partnership (LEP), and the local industrial strategy. As is indicated on the stakeholder map Ricoh UK has an advisory role with all of these organisations.

Ties

This section explores the capitals at use in Ricoh UK's relationships. The incidences of the different Community Capitals are shown in Table *5-5*, as revealed through the data and shown on the SNA in Figure 5-4. Each connection is recorded numerically to make comparing in the cross-case analysis easier.

Type	Incidences of Capital
Natural Capital	14
Cultural Capital	2
Human Capital	8
Social Capital	2
Political Capital	15
Financial Capital	1
Built Capital	4
Digital Capital	0

Table 5-5: Incidences of Community Capitals in Ricoh UK's network.

Natural and Political Capital

The majority of capital in Ricoh UK's ties are Natural (14) and Political (15) Capital. Many of the relationships that involve Natural Capital are locally based such as the Wildlife Trust Telford, and BESST. The network map shows how the local Natural Capital ties develop into Political Capital through the different local groups Ricoh UK is part of. It has other direct links to local and national government, where they "*feed into the local industrial strategy and regional development and also policy and powers. And that feeds DEFRA and UK government strategy targets*" (RIP). These go on to influence government policy on sustainability and the CE, which in turn dictates policy that Ricoh UK must follow.

Other Political Capital ties are developed through its involvement with EMF, IEMA, and through a report that the RIP was invited to contribute to by the government's chief scientific advisor. The relationships with EMF and IEMA have also been identified as Human Capital links; EMF learned from Ricoh UK in the establishment of its organisation, and the RIP is a paid member of IEMA (Financial Capital), which provides sustainability training and keeps its members up to date with current legislation (R8). The RIP attends round tables through IEMA in order to influence UK sustainability policy (R1). The rest of Ricoh UK's Human Capital relationships exist through the CoPs and the local universities. These relationships work in both directions to improve the knowledge and skills of Ricoh UK's employees and the university course participants.

Built Capital

The Built Capital ties highlight the relationships that have altered Ricoh UK's infrastructure in some way. The tie with British Plastics Federation reduced its material loss (R2, R1); through Suez, it made improvements to its waste separation and sorting for recycling; and the tie with the Wildlife Trust and beekeepers encouraged a rethink of the environment around the factory.

Social Capital

The Social Capital ties are expressed through the BESST CoP, the RIP actively created and maintains this group and uses these relationships to create connections with other regional businesses indicated through Figure 5-3. This has helped to build Ricoh UK's Social Capital within the area and identify it as an industry expert in zero-waste and CE.

Cultural Capital

The Cultural Capital ties have been developed through Ricoh UK's apprenticeship programme and the ties to the beekeepers, which is helping to keep a traditional, local industry going, while also contributing to the resilience of the local farming community who rely on bees to pollinate their crops. The apprentices work with school and community groups on Natural Capital and other projects (R1, R5).

Digital Capital

There were no Digital Capital ties identified in the SNA. Ricoh UK has a digital infrastructure in place for clients, but the lack of it in this analysis highlights the emphasis put on local face-to-face relationships within its CE communities.

5.2.5 Summary

This case study has provided a snapshot of a large manufacturing multinational and some of its approaches to the circular economy. Ricoh UK has long-established CE initiatives, which have been updated and refined over several years. The interview participant has built up a strong network, through proactive development of a longstanding CoP that has led to successful collaborations. Much of its network connections focus on Natural Capital enhancement and also influencing policy at different levels. Including Ricoh UK in this research has given insights into one of the few global organisations that have had CE principles implemented for decades. As CE is so embedded within the organisation, it can expand its CE remit to focus on other initiatives such as Natural Capital enhancement.

The next section explores a manufacturer at the other end of the size scale, a local recycling initiative connected to a global network of grassroots groups.

5.3 Precious Plastic Lancaster

5.3.1 Introduction

This section introduces the second case study; a plastic recycler and manufacturer at the opposite end of the size scale to Ricoh UK. Precious Plastic Lancaster (PPL) is a volunteer-led Community Interest Company (CIC) with one paid member of staff, who turns low-value post-consumer plastic into sellable, long-life products. It is the newest organisation studied and had a basic understanding of the circular economy at the interview. Despite being recently established, with a very small team, it has a strong network supporting its circular journey.

Insights

The analysis in this case study shows that PPL is working in circular economy beyond its remit as a small-scale recycling and manufacturing centre. Its engagement with CE is shown on many levels, and it demonstrates how a CIC, or not-for-profit business, can engage with the principals. Through the development and maintenance of an extensive network, it has access to different capitals, which enables opportunities beyond its local environment; giving it access to markets it might not have come across without its network. Community, in this instance, gives PPL an identity through the global Precious Plastic network; funding and development opportunities through many of its affiliations; and a connection to different markets and new clients for collaborations and commissions. Much of its network can be attributed to the Precious Plastic community, however, it is demonstrated here that careful maintenance of these links; forging new ones locally and with other groups and networks, is also crucial for giving PPL opportunities beyond the scope of Precious Plastic.

Background

- Small start-up, initially voluntary, now employ a small number of staff.
- Based in Lancaster.
- Part of the Precious Plastic network, a loosely affiliated international group that use open-source platforms to share ideas and methods around hyper-local plastic recycling.

Data sources

P1. Face-to-face first-person interview with one of the co-founders and follow-up questions asked by email in March 2020. Referred to as PPLIP (Precious Plastic Lancaster interview participant).
P2. http://preciousplastic.com/ Precious Plastic's global website
P3. https://www.relicplastic.com/ Precious Plastic Lancaster's website, since 2021 it has been Relic Plastic, but it is still associated with Precious Plastic.

Social media accounts and websites referred to in the interview:
P4. http://instagram.com/relicplastic PPL account
P5. http://instagram.com/preciousplasticuk UK Precious Plastic account

P6. http://instagram.com/realpreciousplastic international Precious Plastic account
P7. https://www.instagram.com/campusinthecity/ Lancaster University's community outreach event
P8. https://www.facebook.com/recentrelancaster/ RE:Centre Facebook page, a collaborator
P9. https://plastictactics.com Plastic Tactics website, a collaborator
P10. https://www.facebook.com/groups/lamm.uk/ Lancaster and Morecambe Makers Facebook page

Overview

This case study is made up of an interview, social media data, and web-based research. The interview was conducted face-to-face with one of the founders of PPL, who is one of the only full-time paid members of staff. Precious Plastic Lancaster is part of Precious Plastic, a global network of small-scale plastic recyclers. The Lancaster group was started to reduce plastic waste in Lancaster and facilitate conversations with the public. It highlights the importance of plastic as a versatile material that can be reused again and again; initiates conversations around the difficulty of recycling single-use plastic; and the damage these materials can do to the environment if not disposed of properly.

Within the research, PPL represent a grassroots approach to operating in CE. It is a CIC, and this community-led focus is the lens through which it approaches waste recycling and manufacturing. This is a contrast to the other CSOs which are all businesses and are ultimately profit driven.

5.3.2 Circular Economy Interpretation

At the interview, the PPLIP's understanding of the term "circular economy", as defined by this thesis, was not fully formed. However, it became clear in the interview that they were following many of the principles without using the term. Despite being a small organisation, PPL's work and approach reflects many of the parameters developed in the research design. Through the analysis, the data shows that even without focusing on different CE principles, an organisation can still incorporate them within its business models. A key part of PPL's approach to sustainability, and the CE, is its outreach work and connection with its local communities. By framing the organisation as a CIC, it gives the impetus to engage the community in its work and broaden the scope of PPL as a CE organisation.

4Rs

PPL primarily focuses on recycling, but it is working on ways to encourage reuse and design its products with longevity in mind. It is very conscious of where its work falls within the 4R framework:

> *we are recycling, which is third on the hierarchy, but recycling for us is really exciting, so one of our unique selling points is the idea that you could come to us in a workshop with waste plastic and then you can leave with a product which you feel is valuable.*

(PPLIP interview edited for clarity)

However, analysis of the case study data has revealed that PPL touches upon every aspect of the 4Rs through its manufacturing and outreach work. The 4Rs are the first point in the analysis where PPL engage with its communities: it relies on its networks to source material to recycle, and it positions itself as an expert on types of plastic when conducting outreach to advocate for a reduction in plastic use. Table 5-6 shows a summary of PPL's 4R engagement and the following section describes in more detail how it is working with each part of the framework.

Reduce	• Act as advocates for reduction of plastic use through community engagement.
Reuse	• Create products that are designed for long-term reuse. • Exploring a returns system for broken products.
Recycle	• Primary business as manufacturers of recycled plastic goods. • Recycle plastic waste that is supplied by local sources.
Recover	• Actively campaign against energy recovery
Dispose	• N/A

Table 5-6: Summary of PPL's 4R engagement

Recycle

Through their primary business, PPL are heavily focused on the recycling part of the 4Rs. Engaging with local businesses to take plastic waste that is difficult to recycle commercially and develop it into products through a process of shredding and extruding.

The directors recognise that recycling is at the lower end of the European Waste Hierarchy (Department of Environment Food and Rural Affairs, 2011), but they aim to demystify the recycling process for the public, and the PPLIP expressed a lot of enthusiasm for plastic:

> *the recycling for us is really exciting, one of our unique selling points is the idea that you could come to us in a workshop with waste plastic and then you can leave with a product which you feel is valuable.*

(PPLIP)

Reduce

Through its own research into different types of plastic it is well placed to educate the public about the challenges of recycling each type, and advocate for a reduction in their use. PPL use outreach through markets and community engagement events to educate people on the useful but destructive nature of plastic and demonstrate a move away from a total reliance on it (P1, P4).

Reuse

By making useful products from waste plastic, it is turning something that was previously single use, into something more permanent that can be reused again and again. The purpose of Precious Plastic

is to reduce plastic waste, PPL do this by creating more permanent products than the original intention of the plastic, advocating through practical means, the benefits of reuse.

As part of its business offering, it is also looking into offering a returns service for items.

> *Things like our coasters or soap dishes they're basically like a block of thick plastic so in terms of any structural stuff they are going to be quite safe, whereas a comb as it's got quite thin prongs, we might see that they become more brittle over time, the more we recycle our plastic, but that's something we will find out.*

(PPLIP interview)

The returns service would give it greater control over some of its resource flows as it knows the exact original composition for reuse and remanufacture. A local reverse supply chain should be reasonably easy to implement as there are already collection and drop-off points around Lancaster (P1).

Recovery

PPL actively advocate *against* recovery, defined as creating energy from waste through specialised incineration:

> *Energy from Waste is a good solution for bio-waste, but it's a lazy solution for perfectly recyclable plastic which has been used once. We see this as not only a huge problem, but as a huge opportunity.*

(Precious Plastic Lancaster, n.d.)

Recovery is seen as a permanent solution that removes useful material from the supply chain and increases reliance on virgin plastics.

Systems Perspective

Even as a small, locally focused organisation, PPL's perspective crosses all three levels of a systems view. Community plays an important role in the meso and macro systems levels. Its primary work as manufacturers looks at the product or micro level; its work developing sources of plastic to recycle and outreach it does in the local community covers the meso-level; and its contributions to the global Precious Plastic community engage with the macro-level. The following section describes in more detail how it engages with each systems perspective.

Micro

The perspective at this level centres around developing products that are useful to its community, from hard-to-recycle waste plastic. PPL is engaged at a very local level collecting local plastic waste and turning it into markable products, which are primarily sold back to its local community through maker and craft markets (P1).

Meso

The meso-level perspective is defined by taking a regional view of CE. PPL demonstrates its focus on this perspective through its engagement and outreach work at Lancaster University; in the city of Lancaster (P7), and in the surrounding areas. It can also be seen through its engagement with local businesses that supply plastic waste, and through collaborations to develop new products. For example, it collaborated with a local soap maker to develop a durable soap dish that could be sold in gift sets with homemade soap.

Macro

Through its engagement with the wider Precious Plastic community, it is also taking a *macro* perspective and contributing to a global movement by tackling the plastic problem locally. The insights gathered are shared with an engaged global audience and built upon to create best practice for the benefit of the whole community.

Aims of the Circular Economy

For PPL the three stated aims of the CE are very interlinked. It sees the aims of working within sustainability and the CE as focused on EQ and SE. EP is only seen as a means to achieve the other aims.

Environmental Quality

EQ is the most important aim for PPL, this is demonstrated through its remit to reduce plastic waste and to educate the public about plastic pollution. The PPLIP has a background in Earth Sciences and together with the co-director saw Precious Plastic as a way to reduce the impact of plastic on the environment and improve the public's attitude to and relationship with plastic (P1).

Social Equity

The importance of SE to PPL is reflected in the decision to become a CIC. As a CIC, it purposely established the organisation with the remit to improve its community, rather than to exist for shareholders (GOV.UK, n.d.). PPLIP explains it as:

> *We officially became a Community Interest Company last year at the end of February [2019]. That means that we can trade like a business, but it's for the benefit of the community. It's not about making us richer, it's about the money we might generate through trading the resources that we build for the community. We see that as doing outreach and education, [or it] might be that we create employment opportunities for people, we try and increase their skills, so we work with other makers who are learning with us, or it might be just recycling more plastics. We see all of those things as benefits to the community.*

(PPLIP interview, edited for clarity)

Economic Prosperity

Within the context of CE aims, EP did not come out of the data as a specific priority. However, as mentioned in the quote above, some level of economic security is important to be able to act on its other aims. *"Precious Plastics now is starting to get money and turnover in so we can start earning money and paying people, which is exciting!"* (PPLIP interview). PPL see EP in relation to SE and EQ, it is more interested in being able to engage its community and offer employment than create a profit.

Consumer Focus

PPL has a clear consumer focus through its engagement with the public, both through using its equipment to make saleable products and creating outreach programmes for schools (P1). Its consumer focus is closely linked to its communities and networks. It engages with feedback from its consumer base to develop products that would be useful, using online surveys and collaborations to make sure that it is creating products that are needed (P4).

5.3.3 Circular Economy Implementation

This section explores the CE themes around the barriers and drivers for PPL, as defined in the Research Design.

Table 5-7 highlights which of the barrier and driver categories PPL has faced when setting up the organisation. As the table shows not every category was identified in the data due to PPL's status as a small start-up. It lacks some of the organisational structures that were highlighted in the original research used to develop this framework and were set up to tackle a specific issue within the CE so did not have to change its organisational policy or culture to bring in CE models. However, as PPL is a location-based group the analysis placed PPL within the wider context of its network to examine the barriers and drivers faced which meant that some additional categories could be. The following discussion identifies where its wider network has contributed to a barrier or driver.

Barriers

The barriers faced by PPL have been around the unique challenges faced when setting up as a CIC, especially around its own knowledge, skills, and capacity. This has resulted in opportunities being missed, and a desire to take on more projects than it has the capacity for (P1). Community has featured very heavily in helping PPL to overcome the barriers identified. The following section discusses each of the barriers it has faced and highlights whether community has been a part of overcoming that barrier.

Economic

Despite getting funding when it was established, PPL found that it needed more and more funding: to help keep up with the challenges around its aims as a business; for improved equipment; and its

workforce expectations. Its community and networks have helped it to overcome these barriers, through providing funding sources and the development of commercial projects. These links are discussed further in the Communities and Networks section.

Social

PPL's main barrier to working in the CE has been social. It has struggled with a lack of social awareness and a clear incentive for others to engage with its business. It initially struggled to get people involved and found it hard to find volunteers to work with its and develop the project.

Category	Barrier	Driver
Environmental	• Lacking a company environmental culture beyond mandated policy.	✓ Preventing negative environmental impact. • Resource constraints. • Company environmental culture.
Economic	✓ High costs of implementation. ✓ Lack of capital. ✓ Limited funding.	✓ New revenue streams. ✓ Business development, innovation, and new synergies. • Cost efficiency improvements.
Social	✓ Lack of social awareness. ✓ Lack of information. ✓ Lack of clear incentives. • Lack of market mechanisms for recovery.	✓ Increased internationalisation and global awareness of sustainability needs. ✓ Potential to increase workplaces and vitality.
Institutional	✓ Complex regulation. • Lack of CE know-how among policy makers. • Lack of gov. support.	• Regulation and standards requirements. • Support from the demand network. • Supportive funds, favourable taxation, and subsidy policies.
Technological and informational	✓ Lack of technologies and technical skills. • Lack of information and knowledge.	✓ New technologies. ✓ Increased knowledge sharing and networking. • Potential for improving existing operations.
Supply chain	✓ Lack of network support and partners. ✓ Lack of collaboration and resources. • Lack of standardisation. • Strong industrial focus on linear models. • Low virgin material costs.	✓ Open collaboration and communication. ✓ Increased availability of resources and capabilities. • Management of reverse networks. • Potential for reducing supply dependence, avoiding high and volatile prices.
Organisational	• Siloed thinking and fear of risk taking. • Conflicts within existing culture and lack of cooperation. • Lack of compatibility with linear operations and targets. • Lack of management support and strong organisational hierarchy. • Lack of CE knowledge and skills.	✓ Increased understanding of sustainability demands. ✓ Development of skills and capabilities for a circular (sustainable) future. • Potential to strengthen company brand and differentiate from rivals. • Circularity ingrained in company strategy and goals.

Table 5-7: PPL's engagement with the barriers and drivers for a CE.

> *A lot of people have nibbled but not bitten and chewed, so whether that's just what it is or the typical thing of volunteers that they can give it up at any time because [they're] giving up their time, or maybe we haven't got a good enough system of managing and handling people. That feels like it's been a challenge.*

(PPLIP interview)

PPL is overcoming this barrier through outreach work, by increasing its opportunities for engagement and developing its local networks (P1, P4).

Institutional

The institutional barrier is shown in public distrust around recycling in general: caused by news stories revealing how little is recycled domestically; and the mismanagement of plastic waste sent abroad. This barrier is also being overcome through increased outreach through its networks and public engagement with its recycling processes (P1).

Technological and Informational

The technological and informational barrier relates to the struggles it has faced with the administrative side of setting up a CIC:

> *the skills: a degree, versus skills you need for setting up a community interest company, all the admin side of that and you have to get into finances, and there are gaps in knowledge such as social media and marketing, so there are gaps of knowledge between […] the directors to try and build different elements of the company.*

(PPLIP interview)

Supply Chain

The supply chain barrier emerges through its attempt to engage with its university network on an unsuccessful collaboration with students, resulting in a loss of time, money, and equipment (P1).

Drivers

As PPL is a new start-up set up with sustainability ambitions, it covers many of the driver categories. The analysis included the organisation category as it reflected the attitudes of the founders and its ambitions for the wider network. Most of the drivers are related to community, as it is a CIC, however, not all of them, the following section discusses each of the drivers identified and highlights whether community is a particular focus of that driver.

Environmental

The major environmental driver for PPL is preventing negative environmental impact: by reducing local plastic waste; reducing the amount of plastic being sent overseas for recycling; and educating the public. PPL was created with these goals in mind, and it is an overarching ethos of Precious Plastic

globally (P2). This driver forms the basis of its Precious Plastic membership and contributes to its local network and community; by recycling plastic waste and reducing local pollution.

Economic

The plastics market is a major economic driver in this area of CE. PPL's preferred plastic type has a low market value as a waste bundle, however, it can use this material to create marketable products with a much higher return rate (P1).

At the time of the interview, PPL's income was high enough to employ one director full-time. The ambition was to build PPL so it could offer employment to people, and actively contribute to the local economy. Since the interview, it has built up a core team of employees (P3).

Social

This category starts to show the networks and connections of the CSO. The analysis looked at Precious Plastic as a global movement, through which PPL has connected and collaborated with other groups tackling plastic waste in their parts of the globe. The "potential to increase workplaces and vitality" relates to PPL's ambitions to build links between the university population and the city residents, it is included to look beyond the assumption that all CSOs are large companies.

Technological and Informational

Part of the appeal of Precious Plastic for the directors is demystifying the plastic recycling process and providing opportunities for the public to try their equipment. PPL share the knowledge it gains through their work and public interactions with its networks, through Precious Plastic and other groups.

Supply Chain

This is another category that is heavily influenced by PPL's broad network. The Precious Plastic group encourages collaboration (P2) and PPL also works with other small-scale plastic recyclers around the UK, outside of Precious Plastic. Through its work locally, and building connections with plastic waste suppliers and recycling groups, it has increased its range and supply of resources (P1).

Organisational

Precious Plastic is based around an open-source framework, with passionate and dedicated groups around the world, who all contribute their expertise to the community (P2). This collaborative approach allows PPL, and the other global groups, to continuously develop skills and capabilities for a circular future. As climate change is higher on the public agenda, and through PPL's outreach, it is developing an understanding of the public's recycled products and sustainability demands.
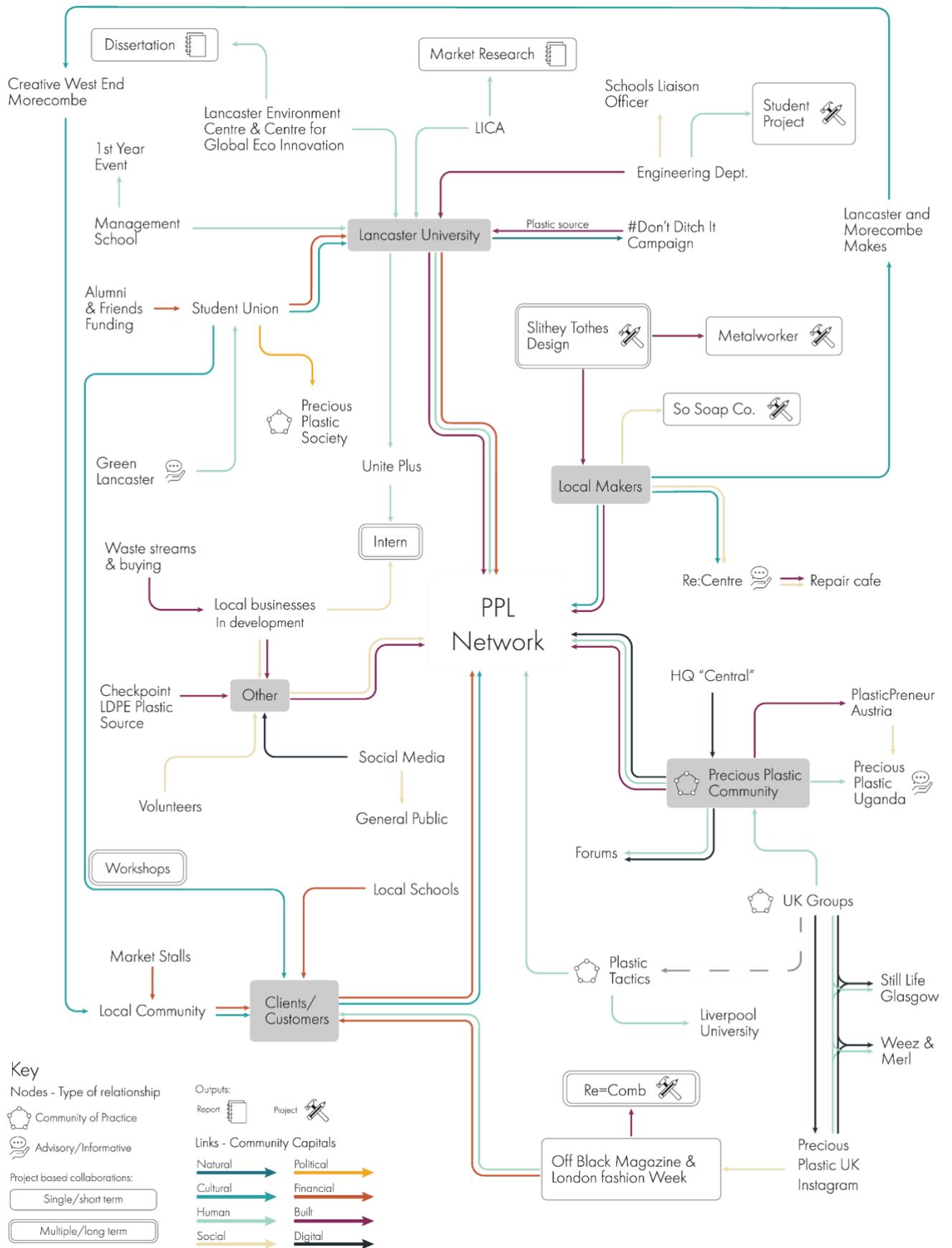
Figure 5-5: PPL Social Network map with Community Capitals Framework applied.

5.3.4 Community and Social Network Analysis

This part of the chapter details the findings developed through the SNA map and explores the communities highlighted in the data. It first examines the types of connections, or *nodes*, revealed through the analysis, including the CoPs PPL engages with It then follows with an exploration of PPL's *ties*, using the CCF lens to discuss the types of capital evident through the relationships.

Figure 5-6: the original map drawn by the PPLIP, showing the categories of connections.
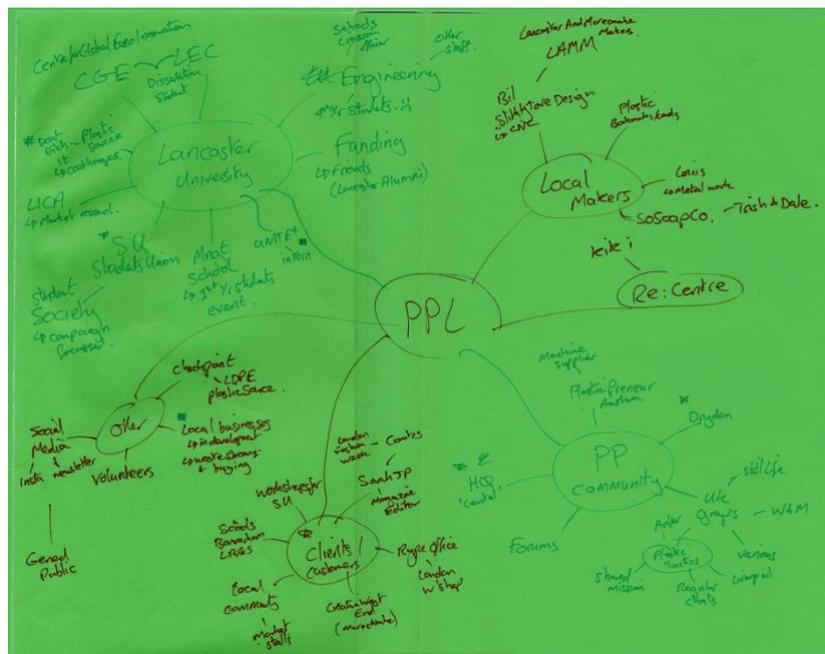
The map for the SNA was created using the mapping exercise completed during the interview, shown in Figure 5-6. The analysis has retained the categories used by the PPLIP of **Lancaster University**, **Local Makers**, **Precious Plastic Community**, **Clients/Customers**, and **Other**. The categories are indicated on the map with a grey background. Retaining these categories within the SNA shows how PPL approach its relationships and how these relationships interact with one another.

Nodes

This part of the analysis explores the nodes of the SNA map: firstly, discussing the CoPs that PPL is involved with, before moving on to discuss the other nodes in the map. It shows that PPL has a very extensive network across its local area, nationally and internationally, which includes relationships within its industry of small-scale plastic recyclers.

Communities of Practice

PPL only take part in external CoPs as they are too small for any internal ones. Through the analysis, it is clear that there are a few different CoPs that PPL engage with under the banner of Precious Plastic, with some overlap between members. Two important collaborations have also been listed in Table

5-8, one with Plastic Tactics, and another with Re:Centre. These are included here, as although they are very small, they both function as CoPs through shared interests and knowledge exchanges.

Community of Practice	Category description	Precious Plastic	Precious Plastic UK	Collaboration with Plastic Tactics	Collaboration with Re:Centre
Size	small, a few expert individuals → very large	Very large – 80,000 members worldwide	Medium – 21 PP groups in the UK	Small – just PPL and Plastic Tactics	Small – just PPL and Re:Centre
Lifespan	months and years → generations	Since 2014	Since about 2018	Since about 2018	Since 2019
Location	collocated or distributed	Distributed (global)	Distributed	Distributed (North West England)	Collocated
Make up	homogeneous or heterogeneous	Homogeneous	Homogenous	Homogeneous	Heterogeneous
Level	micro, meso, macro	Macro	Macro	Meso	Meso
Formation	spontaneous or intentional.	Intentional	Spontaneous	Spontaneous	Spontaneous
Relationship to org.	Unrecognised Bootlegged Legitimised Supported Institutionalised	Institutionalised – how PPL started	Supported	Legitimised	Legitimised

Table 5-8: Communities of Practice that PPL engage with.

Precious Plastic

PPL was started as part of a large, international community. Through the open-source nature of the business model, anyone can set up a Precious Plastic group with as much or as little technical knowledge as they want. There is an active forum, as part of Precious Plastic, that acts as a CoP hub and is used to share projects, ideas, troubleshoot equipment etc (P2). The analysis shows that many of the CoPs that PPL is involved with are through the Precious Plastic Network, however, the PPLIP admits that they act more as a peripheral member. In terms of skill and knowledge sharing, PPL get the most value from its connection with the UK arm of Precious Plastic (P1).

Precious Plastic UK

The UK Precious Plastic network helps PPL build on relationships through visits to each other's sites around the country, and through informal conversations (P1). The primary catalyst in the UK Precious Plastic CoP is the Precious Plastic UK Instagram account. The person who runs this account proactively connects UK-based makers with each other, creating opportunities for collaboration with other small-scale plastic recyclers or consumers. "*He's a bit of a connector, suggesting we do this or saying I'd like to buy some of your products for this place.*" (PPLIP interview).

Plastic Tactics

Plastic Tactics, in Liverpool have been key in helping PPL set up its CIC (P9). This group are not part of the Precious Plastic network but are affiliated through industry connections; this is indicated by the dashed line on the stakeholder map.

> *[It is doing] cool interesting stuff and it's good to have regular chats, shared learning, shared opportunities, so we might have an opportunity that's more suitable for him or he has one that's more suitable for us.*

(PPLIP interview)

PPL has found it has a shared mission with Plastic Tactics, are reasonably local to one another, and are at similar stages in their journeys to become CICs, which makes their mutual support and advice very valuable, shown in Figure 5-7.
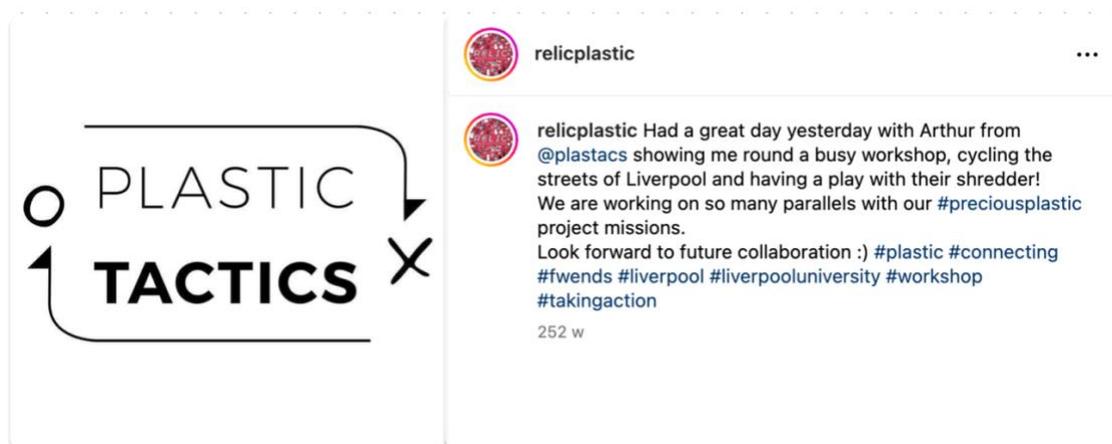
Figure 5-7: Modified screenshot of an Instagram post about Plastic Tactics.

Re:Centre

The other CoP-like collaboration is with Re:Centre, a group initially set up to sell non-toxic, industrial waste to the public, for example, unfinished emulsion paint pots. It ran into a problem with access to space in Lancaster, to get its centre up and running, but it has joined with a local repair café once a month (P8). It shares a joint mission with PPL around community making and mending and are looking at a longer-term collaboration that would allow the creation of a hub for makers and recyclers.

Non-CoP nodes

This section highlights the other key relationships PPL has, using the categories developed in the interview. Starting in the top left and working clockwise the analysis works through the different categories, discussing the relationships in each.

Lancaster University

The analysis starts with Lancaster University; the PPLIP is an alumnus and started to develop an interest in recycling and engineering while a student at the Lancaster Environment Centre. The university provided a lot of support to PPL in the initial set up years through alumni support and direct contact with different faculties (P1). It has provided funding through the Alumni & Friends Funding group; business advice; students from different departments to collaborate on projects; and a student intern through Unite Plus, a business support programme in Lancashire that connects students with local businesses (P1).

Through the Student Union, it has set up a Precious Plastic Society which provides a link between students and PPL. The PPL student society is labelled as a CoP on the stakeholder map, although their activity tends to focus more on on-campus campaigning. In this CoP, PPL is a peripheral member, giving some time and advice but enabling the society to function of its own accord. The society fulfilled a function that the founders wanted for PPL but lacked the capacity to achieve. This peripheral involvement is why it is not included in the CoP section above (P1).

Local Makers

The local makers around Lancaster and Morecambe have created a neighbourhood community. It has developed a trusted network of small businesses that benefit one another through shared goals and opportunities (P1 & P10). Through working together, they can create small-scale markets that benefit one another and share shop and workspace. They also work to promote each other through online opportunities. PPL collaborate frequently with Slithey Toves Design which produces tester moulds for its products. Through this collaboration, prototypes can be developed that are suitable for its products.

> *ideally you make a metal mould and that will last you a long time but we've learnt we need to prototype and work out what we're doing before we make a metal one, and obviously plastic is cheap so we use that and it's easy to cut so it's been really good […] although the plastic we use to do this isn't very recyclable and the only thing we've justified it with is if we can buy some virgin plastic in order to recycle kilos and kilos of plastic then it's worth it.*

(PPLIP interview)

Through Slithey Toves Design, PPL has been introduced to a local metal worker to collaborate with on the final moulds (P1).

By developing relationships with other local makers, PPL is getting to know, and building trust, with other people working in similar ways. Through the local makers network, it has had different opportunities for collaboration with other makers; new product development; access to local makers'

fairs and markets; and opportunities to run workshops with the public. It has also brought connections with local individuals who want to develop community spaces with PPL's involvement, to provide fabrication equipment for use. This would give PPL more space to work and more exposure to the public (P4, P1).

Precious Plastic Community

Through the wider Precious Plastic community, PPL has found opportunities for product development and new business outputs. Precious Plastic UK put PPL in touch with a fashion magazine editor wanting to develop recycled combs for London Fashion Week, developing into a long-term product line for PPL (P1, P4, P5). Through working with Plasticpreneur Austria, which builds plastic recycling machinery, PPL has been contacted to advise on its outreach programme to set up a Precious Plastic business in Uganda, based around micro-hydropower.

Clients/Customers

An important part of the PPL network is its clients/customers, as this is how it earns money and gets its message out to the public. Specific clients that it has worked with within Lancaster are local schools, which have been important to the set-up of PPL. PPL presented its equipment and discussed the work it does at various secondary schools, and, as a result, was chosen to receive seed funding from a school whose students wanted to support a local green business (P1).

Ties

Type	Incidences of Capital
Natural Capital	1
Cultural Capital	6
Human Capital	15
Social Capital	7
Political Capital	1
Financial Capital	5
Built Capital	10
Digital Capital	6

Table 5-9: Incidences of the different Community Capitals in Precious Plastic Lancaster's SNA.

This section uses the CCF to explore the ties created between the relationships listed in the SNA. Using the PPLIP's map layout, shown in Figure 5-6, the SNA is divided into sections that feed into the PPL in the centre, and examined in Figure 5-5. Table 5-9 counts the number of connections within each category, not the lines that feed into PPL in the centre. The ties are arranged like this to make the map easier to read by reducing the number of lines connecting with the centre. By arranging the map like this the analysis reveals that each of the categories provides a different combination of capitals. The Capitals most present in each category are listed below, the rest of the chapter goes into more detail about the ties.

- Lancaster University: Human Capital, Financial Capital, and Built Capital
- Local makers: Cultural Capital, and Built Capital
- PP Community: Built Capital, Human Capital, and Digital Capital

- Customers/clients: Financial Capital, and Cultural Capital
- Other: Social Capital, and Built Capital

Human Capital

PPL was newly established when the interview took place, so much of its network is concerned with developing Human Capital: through improving knowledge of plastic waste; understanding local community needs; learning business administration; developing skills in equipment building and maintenance; and creating desirable products. PPL's primary sources of Human Capital are Lancaster University and the Precious Plastic community. The ties it has established with different groups through these organisations have contributed to the development of PPL and the continuous improvement of its offering. It has created good relationships with Lancaster University, establishing ties with different departments that benefit itself, the staff, and the students it works with (P1, P4).

Built Capital

Four of the categories used in the SNA are sources of Built Capital, this is due to the definition of Built Capital including any kind of infrastructure on many different levels. For PPL this includes the different sources of plastic for recycling at the micro level, and collaborations to create new products; at the meso level, equipment for the different stages of the recycling and remaking processes; and at the macro level, spaces to keep the equipment and use the equipment (P1, P3).

Social Capital

As a newly established CIC, PPL is developing its Social Capital through the creation of trust within its networks. As discussed in the CCF chapter, trust is an essential component of Social Capital, which can take time to build up, especially if you are new in an area (Putnam, 2000; Halpern, 2005). It is developing its Social Capital through its relationships with established local makers and other grassroots plastic recyclers. It is also utilising an intern to develop relationships with suppliers and other local businesses, through this Social Capital development, PPL is hoping to create new links for Built Capital material sources (P1).

Digital Capital

Most of PPL's Digital Capital ties come through the Precious Plastic Community; developing Digital Capital through the use of social media to create and maintain relationships with volunteers, customers, and potential collaborators. For PPL, Digital Capital is a resource to potentially develop other sources of capital, the images in Figure 5-8 show different ways PPL use its Instagram page to engage its audience. One of the key relationships that has developed out of its social media presence is the work it did with Off Black Magazine and London Fashion Week. This collaboration used Digital Capital to form the tie with the UK Precious Plastic Instagram account, using the Social Capital the

account holder had developed through his online presence and digital connections. PPL was able to take advantage of this Social Capital link, to create a relationship with Off Black Magazine and London Fashion Week and develop the Re:Comb project (P1). Since the interview, this collaboration has scaled up and become an important project for PPL (P4). Through this collaboration, PPL has developed Social, Built, Financial and Human Capital flows.
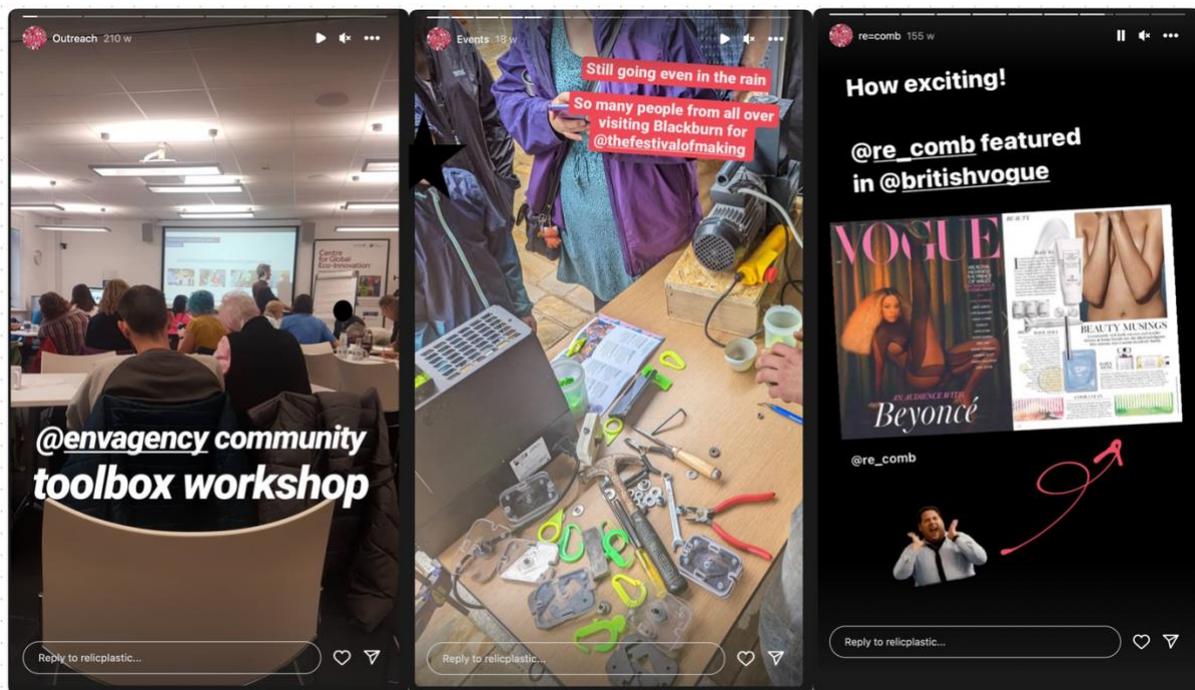
Figure 5-8: A selection of screenshots from PPL's highlighted Instagram stories showing an outreach workshop, community engagement event, and product publicity.

Cultural Capital

PPL is helping to build the Cultural Capital of its area by engaging with local makers and creative communities, through individual events, and maker markets. Cultural Capital, as discussed in section 2.5.3, is a collective capital that is developed through many groups' contributions and can uniquely reflect the culture of an area. Through this understanding, PPL is also contributing to the culture of Lancaster University through setting up the *Precious Plastic Lancaster Society*, run as part of the Student Union.

Financial Capital

Through the interview, it is clear where PPL had received Financial Capital, the majority of this capital at the time of the interview was for setting up PPL (P1). However, it was starting to build sources of Financial Capital through the development of ties with clients, and through collaborations on products.

Natural Capital

PPL is involved in a Lancaster University campaign, #DontDitchIt. This campaign encourages students not to throw away old possessions at the end of term, as this contributes to landfill, fly-tipping, and general pollution. PPL's involvement in this campaign can be seen as its Natural Capital contribution, which also provides a source of recycling material, i.e., Built Capital (P1).

Political Capital

The PPL student union society was set up with the aim to include a campaigning element, indicating that PPL has ambitions to influence local government. However, at the time of the interview, these ambitions had not yet been realised (P1).

5.3.5 Summary

This case study has demonstrated the attitudes and approaches of a small recycling initiative set up to deal with local plastic waste through the manufacture of recycled, longer lasting products. At the time of the interview, Precious Plastic Lancaster, was being run almost entirely voluntarily but it was developing a strong network of connections to help it grow and respond to the needs of the city. The inclusion of a Community Interest Company has allowed the research to examine an approach to the CE that has a strong social remit rather than a for profit model. PPL also links the manufacturing industry case studies with the waste industry as its business model gives equal focus to both.

The next section explores a tech start-up also based in the waste industry, who have a strong circular economy ethos and position themselves as an organisation who can close supply chain loops.

5.4 Dsposal

5.4.1 Introduction

This chapter introduces the third case study, a Manchester-based tech start-up, Dsposal, which is focused on closing the loop between waste producers and organisations that can utilise that waste stream. As a B2B (business-to-business) waste management platform, it sits a little outside of a traditional circular economy company, however, its inclusion in this research allows for an examination of a digital-service-based organisation, which are identified as being increasingly important in the move to a circular economy (see section 2.2.6).

Insights

This case study shows how Dsposal aligns its work with the CE, after recognising shared values between the CE models promoted by EMF and its work. Its approach to CE has its roots in the founders' life experiences and is influenced by EMF. However, the case study shows that Dsposal has a clear vision of what a CE looks like, and where it fits into it as an organisation.

Beyond the day-to-day work on the tech platform, Dsposal has developed collaborations with a broad spectrum of organisations, to run projects and develop research. Its participation in CoPs only focuses on one group, however, this group provides a lot of high-level connections. Its participation in other community groups is clear and is obviously advantageous for the business. It uses its community connections to develop ways to overcome the barriers it has found working in a disruptive area of an established industry; to develop different projects; and to build its business within the CE.

Background

- Green tech start-up based in Manchester. Have been operating since March 2017.
- Primary business is a digital platform to help waste producers safely, legally, and locally dispose of waste.
- Secondary business outputs include a CE podcast and speaking at conferences.

Data Sources

D1. Face-to-face first-person interview with co-founder in November 2019 with follow up questions asked by email in May 2020, herby known as DIP (Dsposal interview participant).

D2. https://dsposal.uk Dsposal website.

Online news articles and blog posts:

D3. https://dsposal.uk/articles/ Dsposal website articles.

D4. Dsposal's 6-episode CE podcast content. The analysis includes the podcast transcripts of the first 5 podcasts and an overview of the 6th, found here: https://dsposal.uk/articles/?tag=Circular+Economy. This was pointed to in the interview as a place where the company discusses barriers to CE and explores different strategies.

Other relevant data sources:

D5. https://wastecompliancetaskforce.org.uk/ Waste Compliance Taskforce.
D6. *Tip of the Binberg* report[4].
D7. https://www.ciwm.co.uk/ Chartered Institute of Waste Management.
D8. https://www.thefederation.coop/ The Federation co-working space
D9. https://www.circulareconomyclub.com/club/manchester/ Circular Economy Club Manchester

Overview

This case study was conducted face-to-face at the DIP's office in Manchester. The interview followed the interval protocol, but as the questions were quite open there was flexibility for the DIP to elaborate on certain areas. The interview was conducted face-to-face, which meant that the stakeholder map was drawn by the DIP, although the data analysis revealed some more connections that were added later. Dsposal did not start out to be a CE organisation, but it soon realised that what it was doing fitted with the principles, so have developed its work to fit. Much of their interpretation of CE comes from discussions with experts and even family members. As is explored later in the chapter, the connections made by Dsposal are numerous. The DIP placed a lot of emphasis on networking and developing conversations with different people and companies.

5.4.2 Circular Economy Interpretation

The majority of the interview focused on Dsposal's community connections and the networks it has developed. To analyse its CE interpretation, the DIP referred the interviewer to its podcast, which gave a deeper insight into its CE interpretations and understanding. The podcast uses expert testimony from academics and business practitioners to explore aspects of the CE (D4).

Dsposal is a service provider, working within CE, and as such, the metrics for analysis developed in the Research Design do not always fit with its model and approach to CE. These metrics look more closely at manufacturers and other micro-level CE businesses. However, to remain in keeping with the rest of the case studies they are used as a guide. Each section discusses whether there are limitations to the metrics used and explains how an equivalent analysis is achieved.

4Rs

Dsposal's primary business does not clearly sit within the 4Rs but straddles across them all. This demonstrates a failure of the metric when examining companies that sit outside of traditional CE spheres such as manufacturing. The R framework, as a metric, needs to be updated to examine service

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[4] https://wastecompliancetaskforce-org-uk.stackstaging.com/wp-content/uploads/2020/07/Tip-of-the-Binberg.pdf [opens PDF]

providers working in CE. However, this 4R analysis focuses on where the most impact is made through its service. Table 5-10 briefly describes Dsposal's engagement with the 4Rs.

Dsposal is positioned as a connection in the supply chain, linking waste producers with waste consumers, looping resources within the system. Dsposal was initially set up to help waste producers dispose of their waste correctly, which sits within reuse and recycling, but it found that in some areas certain waste was a valuable resource (D1). Through its technology platform: it is contributing to waste reduction, by keeping materials in the system; and enabling the reuse of materials, by linking producers and consumers.

Reduce	• Advocate for the reduction of production
Reuse	• Enable the reuse of materials and resources through its platform
Recycle	• Enable the recycling of materials and resources through its platform
Recover	• Do not mention recover.
Dispose	• Have moved from promoting the safe disposal of materials to enabling suppliers to keep materials in the system through recycling, or reuse.

Table 5-10: Summary of Dsposal's 4Rs engagement.

Systems Perspective

The systems approach followed by Dsposal deviates from the three categories laid out by Kirchherr *et. al.* (2017) in the Research Design. Dsposal are focused on extending the potential "end-point" of a product or material's lifecycle, using their platform to keep that material in the system for longer. To allow for a comparison to be drawn through the cross-case analysis, the following section takes into consideration Dsposal's position as a service provider within a circular loop system, which gives the analysis scope to apply the different perspectives to the data.

Micro

The assumption through the Research Design is that organisations engaged in the CE are working at the beginning of the product lifecycle, in primarily manufacturing industries. Dsposal is working in waste and material flows, engaging in the micro level of CE through individual material flow (D1, D2). This is an important part of the CE and where further analysis could be focused, once more materials and products enter a circular system.

Meso

Dsposal's digital platform connects individual material waste producers with the right waste consumer, see Figure 5-9. This fits very well with the definition of meso-level systems perspective; which considers how CE is enacted at the regional level. It is developing its platform to ensure that

there are greater material flows in England, with the aim to expand to cover the rest of the UK (D1, D2).
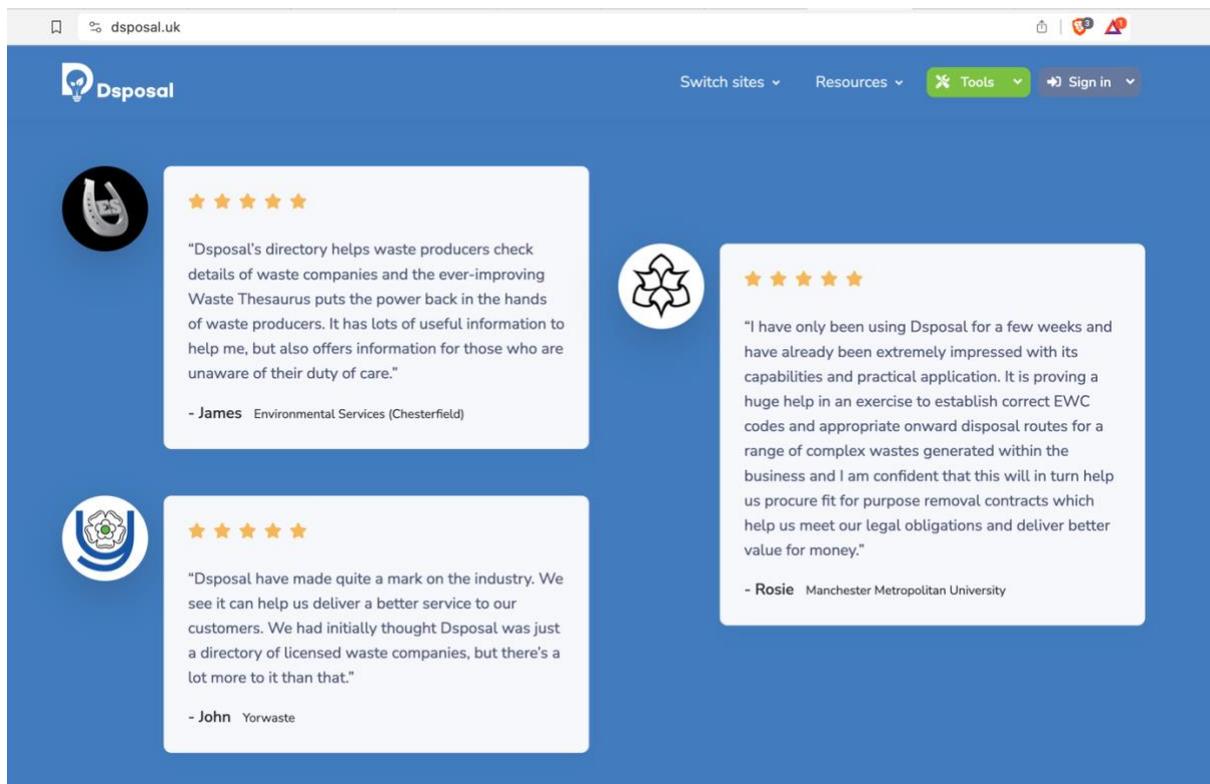
Figure 5-9: Client feedback on Dsposal website showing influence at micro and meso levels.

Macro

The data shows that Dsposal is working on CE from a macro perspective through its work with universities, regional governments, and national government departments. It is developing new systems to help waste classifications for the waste industry and working with universities on projects to develop better understandings of waste flows (D1, D2, D3).

Aims of the Circular Economy

Of the three aims of the CE developed in the Research Design, Dsposal is primarily focused on SE and EQ. During the interview, they expressed a preoccupation with creating a service that improves SE, as a priority over the other aims, although EQ is also a focus. As a business, it needs to make money but is not driven by profit over the other CE aims (D1).

From this analysis the data reveals that all three of the aims are important to Dsposal, however, as SE and EQ are the only two discussed in detail, and recorded through the paragraph coding, they can be highlighted as the priority for Dsposal. The following paragraphs discuss the data that has led to these results.

Environmental Quality

The founders' ethos towards EQ is credited to their experiences following graduation, where they had to live by sustainable practices.

> *Post-university we found ourselves living on a sustainable education centre in Dorset, where- we had very meagre salaries, [….] we lived there for 15 months and we had a one acre walled garden where we grew [lots] of our own food, and we tried to do stuff in the most sustainable, resource efficient way possible.*

(DIP interview, edited for clarity)

DIP credits this experience with teaching them to prioritise EQ through repair, reuse, and self-sufficiency over capitalist goals of ownership.

Social Equity

Through the data, it is clear that SE is important to the Dsposal ethos. As discussed later in the barriers section, it is working towards providing a more equitable service, however, it is finding it is less straightforward than its commercial platform. In the interview, DIP spent some time talking about their misgivings with CE adoption:

> *if the circular economy is actually going to really deliver any real long term benefits it's not just about doing things more efficiently, it's about how do you reimagine the economy so that it works for people and for the planet and for society and is regenerative and is restorative and is open and accessible […] in the [current] circular economy everyone seems to just forget about that bit and just says "look, I do really good recycling, okay?".*

(DIP interview)

For Dsposal, it is working out ways to make sure it is keeping the economic transformation in mind, striving for a redistribution of resources and materials.

> *How could we, even as a tiny start up, start reimagining how we think about our services and how we provide access to them […]. We provide a lot of what we do for free because we want to help people do the right thing. But even the paid for bits, are we just reinforcing a system that maintains the status quo, consolidating power in the hands of the few, not being restorative and regenerative?*

(DIP interview, edited for clarity)

The pandemic and subsequent lockdowns provided an avenue for Dsposal to work on SE. There was a lot of interest in its services from householders so it launched a not-for-profit arm of the company to ensure that individuals could access the right waste services (D3).

Consumer Focus

Moving beyond its ambitions for SE mentioned above, as a start-up tech platform, Dsposal is almost entirely consumer-focused; establishing relationships with users to evolve and develop its platform to

fit with consumer demands. Another angle of *consumer focus* is the work it does on raising awareness of waste crime in its industry, through the development of programmes and modules with different institutions, including Manchester Metropolitan University (MMU) and Greater Manchester Combined Authority (GMCA) (D6, D5). This demonstrates where consumer focus has been developed through its network connections and can be seen as where a *Consumer Focus* overlaps with EQ aims of the CE.

5.4.3 Circular Economy Implementation

This section explores the barriers and drivers Dsposal have faced in establishing its organisation. As discussed, there is a lack of awareness among Dsposal's potential clients of how useful its service could be for helping the environment and helping them to be compliant with new waste disposal laws. This ties into a lack of information and incentives from the regulators that could drive clients to use its service (D1).

 uses the guide developed in the Research Design chapter to analyse the barriers and drivers of CE implementation through the data. The interview was coded in NVivo to each of the barriers and driver categories, by finding examples of each. The description of each category below is listed in the order of frequency of the examples.

The barriers and drivers discussed in this section focused mainly on the founders' areas of expertise, namely: waste recycling and disposal, technology as a solution, and supply chain management. As the interview was conducted with the founder, and the company is a small start-up, the analysis looked at the wider industry as the organisational structure. The following discussion identifies where the wider network has had an influence on the driver or barrier.

Barriers

Much of Dsposal's work is focused around engaging external organisations with its services. Most of these organisations are in the waste industry, where "*there are not a lot of early adopters*" (DIP interview). As a new business who have developed a new service for the waste industry, its potential users are often wary of engaging with its services for fear of the unknown, causing potential clients and supporters to be reluctant to come on board.

Economic

The economic barriers Dsposal faced, centred on securing support and investment for service that provides a solution to a problem people are unaware it has. This attitude brings barriers to potential funding streams and new clients. However, as CE ideas and concepts are becoming more widespread, and there is an increased uptake in digital platforms since the pandemic, it is finding more potential investors and collaborators.

Category	Barrier	Driver
Environmental	• Lacking a company environmental culture beyond mandated policy.	✓ Preventing negative environmental impact. • Resource constraints. • Company environmental culture.
Economic	✓ Lack of capital. • High costs of implementation. • Limited funding.	✓ Business development, innovation, and new synergies • Cost efficiency improvements. • New revenue streams.
Social	✓ Lack of social awareness. ✓ Lack of information. ✓ Lack of clear incentives. • Lack of market mechanisms for recovery.	• Increased internationalisation and global awareness of sustainability needs. • Potential to increase workplaces and vitality.
Institutional	✓ Lack of CE know-how among policy makers. ✓ Complex regulation. • Lack of gov. support.	✓ Regulation and standards requirements. • Support from the demand network. • Supportive funds, favourable taxation, and subsidy policies.
Technological and informational	• Lack of information and knowledge • Lack of technologies and technical skills.	✓ Potential for improving existing operations. ✓ New technologies. ✓ Increased knowledge sharing and networking.
Supply chain	✓ Lack of standardisation. ✓ Strong industrial focus on linear models. ✓ Lack of network support and partners. ✓ Lack of collaboration and resources. • Low virgin material costs.	✓ Open collaboration and communication. ✓ Increased availability of resources and capabilities. ✓ Management of reverse networks. • Potential for reducing supply dependence, avoiding high and volatile prices.
Organisational	✓ Siloed thinking and fear of risk taking. ✓ Conflicts within existing culture and lack of cooperation. ✓ Lack of CE knowledge and skills. • Lack of compatibility with linear operations and targets. • Lack of management support and strong organisational hierarchy.	✓ Circularity ingrained in company strategy and goals. ✓ Development of skills and capabilities for a circular future. • Potential to strengthen company brand and differentiate from rivals. • Increased understanding of sustainability demands.

Table 5-11: Barriers and drivers of circular economy for Dsposal.

Social

As discussed, there is a lack of awareness among Dsposal's potential clients of how useful its service could be for helping the environment and helping them to be compliant with new waste disposal laws. This ties into a lack of information and incentives from the regulators that could drive clients to use its service (D1).

Institutional

Dsposal has found that weak policy on waste and waste codes has created a lack of understanding among policymakers on the best ways to sort different waste streams. This has caused a barrier when developing its system, looking at municipal waste for example, this can mean that multiple waste streams are put together, which causes contamination and results in waste that is no longer suitable for reuse (D1, D4).

It has also found, when working with large institutions, such as GMCA, that it is not willing to explicitly recommend Dsposal's services to its clients for fear of being uncompetitive, but instead advises the use of Google.

Supply Chain

Within the waste industry, there are a number of communication barriers; Dsposal has found that there is no standard way of talking about materials and resource flows across the different parts of the waste industry. There is also no standard way of recording waste, with EU classifications covering either a very large range of waste under one code, or specific materials classed by industry, i.e., chemical waste (D1).

Dsposal is positioning itself to be a key part of the circular supply chain. However, as this is an emerging area in an industry with a strong focus on linear models, it has struggled to get its message across to potential suppliers and clients, who are not engaged with circular principles. It has found that through the larger organisations that are aware of CE, there is a lack of network support for small start-ups. As previously mentioned, there is a lack of collaboration within its industry, and Dsposal has to create the networks in areas where they do not already exist (D1).

Organisational

As Dsposal is an SME, the analysis has placed it within its industry to examine any organisational barriers it has faced. Within the waste industry, there is very siloed thinking and a distrust of new methods:

> *It's hard to communicate with people why they need to change the way they do things and that you have the solution to a problem they didn't know exists or maybe they want to pretend doesn't exist.*

(DIP interview)

As explored throughout this section, communication with its industry has been its biggest barrier and the one that all the categories have pointed to.

Drivers

Dsposal set up with a knowledge of the CE and circular systems, driving its organisation towards these goals. Its primary business is closing the loop on waste products and extending the life of resources. It

recognised the potential for improving existing operations within the waste industry, which led to the development of its digital platform that could connect waste producers with recyclers and waste as resource clients.

Beyond the scope of this analysis, it is also exploring how to move beyond traditional economic models, reflected in EMF focused CE approaches, to ensure that CE is restorative and regenerative, progressing beyond the concentration of resources into the hands of a few international conglomerates.

Environmental

As discussed in the EQ Aim, Dsposal is committed to preventing negative environmental impact through its work in the waste industry and its values (D1, D2).

Economic

Despite the economic difficulties explored in the barrier section, Dsposal is an innovative organisation and see themselves as a pioneering company without any direct competitors, "*there are a few other people who kind of do certain parts of what we do but we haven't found anyone who's approached in it the holistic sense*" (DIP interview). This puts it at a strong advantage to lead its industry towards a CE.

Institutional

Dsposal is looking to influence regulation and standards requirements through the development of an open data standard for classifying waste, which could improve recycling and resource flows. It has developed a prototype with Open Data Manchester, a collaboration that is explored in more detail in the next section, the development of this standard can also be classified under *Technological and Informational*, as it is driven by the development and dissemination of new technologies (D1).

Technological and Informational

The main drivers for Dsposal's work in the CE are technological. It utilises digital tech to solve problems faced by the waste industry through its tech platform.

> *[I]n the waste industry that there's two types of waste data: there's terrible waste data and no waste data. When we founded Dsposal we knew it was vital that we have to use tech to make it easy for everybody to improve the data. Because if we understand where those resources are and there's this real step into the right direction.*

(Dsposal, 2019, 00:14:46-00:15:10 minutes)

Dsposal also advocates for knowledge sharing by sending staff to speak at conferences outside of its industry to talk about waste. It has open communication channels with clients and its platform is constantly being updated as feedback is received (D1).

Dsposal has positioned itself as a waste disposal expert and uses this position to create new knowledge-sharing and networking opportunities. It has developed training modules for buildings and maintenance staff at universities to sort waste and track it through the supply chain (D1, D2).

Supply Chain

This category includes the potential uses for Dsposal's platform in its analysis, which includes the potential for avoiding high and volatile prices and reducing supply dependence for clients. The platform also enables clients to manage its reverse networks if needed (D2). Engagement with the supply chain is a key part of Dsposal's business strategy, it understands how to track waste through the system, and have developed a tool that allows clients to map out its waste supply chain and identify all the stakeholders along it (D1, D3).

Organisational

When starting Dsposal, the founders recognised that their values aligned with that of the CE, so found it easy to ingrain circularity into their company strategy and goals. Through their secondary work on the circularity podcast and talking at conferences, they are constantly developing knowledge and strategies to make Dsposal more circular, and questioning how they view the economy part of the CE (D1, D2, D4). This is discussed further in the cross-case analysis.
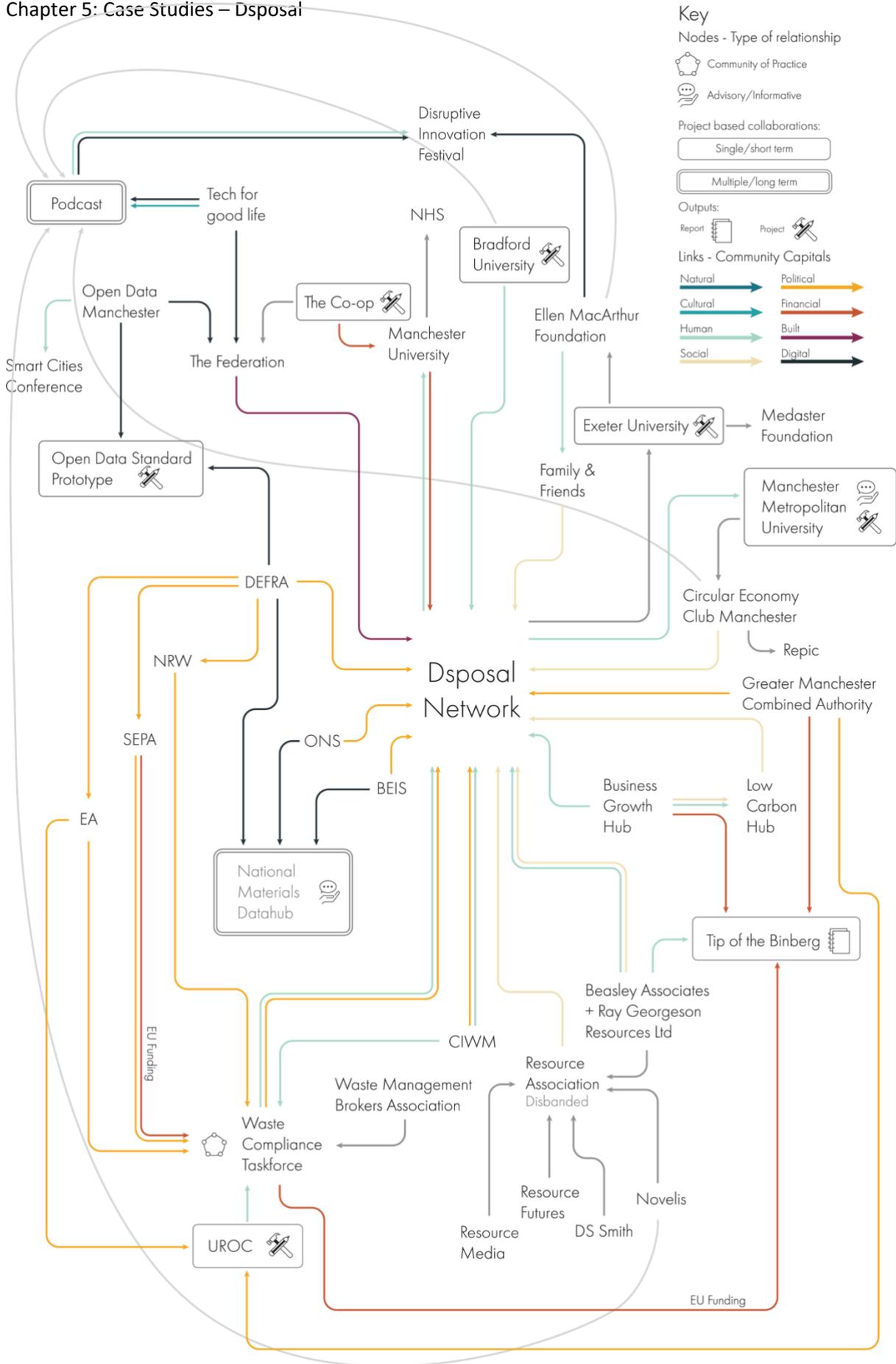
Figure 5-10: Dsposal Social Network map with Community Capitals Framework applied.

5.4.4 Communities and Social Network Analysis

This part of the chapter details the findings developed through the SNA map and explores the communities highlighted in the data. It first examines the types of connections (nodes) revealed through the analysis, including the CoP Dsposal is part of, and then follows on with an exploration using the CCF (ties) evident through the relationships. Dsposal's platform acts as a connection point between waste producers and consumers, and this network is reflected through the other connections it has made while trying to establish its business and develop projects beyond the primary scope of the organisation.

The SNA follows the map, as drawn by the DIP in the interview and built on during the synthesis phase. One university connection has been removed as the project was unconfirmed at the time and didn't connect to anything else. In this SNA there are extra curved lines in grey that indicate members of the network who have taken part in the podcast, this indicates everyone that it has interviewed but shows the participation of their networks in creating this project. The grey node represents a project that Dsposal was consulting on but has not actively participated in, it is included due to the nodes it is tied to.

Nodes

The analysis highlights the key relationships that Dsposal has developed while indicating where there are connections that could be attributed to their community connections. Firstly, this section explores the CoP that Dsposal is part of and then goes on to discuss the other important nodes in their network.

Communities of Practice

As it is a small start-up, it does not have any internal Communities of Practice, this is to be expected. Despite its extensive networking, Dsposal is only involved with one CoP, which is detailed below:

Waste Compliance Taskforce

Dsposal is heavily involved in the Waste Compliance Taskforce (WACT), both as members and on its board. Through this group it has developed a project, *Tip of the Binberg*, that explores waste crime in Greater Manchester, with a particular focus on fly-tipping. This project brought together a number of collaborators beyond the CoP and was funded by the EU Regional Development Fund (D1, D6).

This group has also conducted an exercise to map all the actors in the group working in waste crime, to find out where connections might exist and where they might be missed. They used this work to start developing connections where they were missing (D1). This work and other experiences have led the DIP to develop a deep understanding of the importance of networking for them and others.

> *having those broad conversations and being really open about what you're doing and trying to get by in collaboration I think is a good step towards preventing those massive total overlaps of work and/or people pulling in completely the wrong direction.*

(DIP)

This attitude has led to a very large, involved network of collaborators for Dsposal, that it uses to develop links and projects.

Community of Practice	Category description	Waste Compliance Taskforce
Size	small, a few expert individuals → very large	Small – 16 member organisations
Lifespan	months and years → generations	Officially less than a year old – was in development at interview having come out of an EU funded project 'LIFE SMART Waste'
Location	collocated or distributed	Distributed (within UK)
Make up	homogeneous or heterogeneous	Heterogeneous
Level	micro, meso, macro.	Macro
Formation	spontaneous or intentional	Intentional
Relationship to org.	Unrecognised Bootlegged Legitimised Supported Institutionalised	Legitimised

Table 5-12: Communities of Practice participated in by Dsposal.

Non-CoP nodes

Within the SNA there are some key highlights which are discussed here. WACT has previously been identified as Dsposal's only CoP, however, for a small group it has powerful members representing three of the UK's devolved governments, England's Environment Agency (EA), Scottish Environment Protection Agency (SEPA), and Natural Resources Wales (NRW). This group was set up following an EU-funded project led by SEPA (D1). Dsposal is not just a member of WACT, one of its directors is the secretary of the group, so it is central to the CoP. This group also connects to a local project run by Dsposal, in association with GMCA and funded by the Business Growth Hub. The Business Growth Hub gave Dsposal a lot of admin support during its initial setup, through the Low Carbon Hub, the branch for environmental business support. Also associated with the *Tip of the Binberg* report, is the Resource Association, which was due to disband at the time of the interview, however, it was important to keep in the stakeholder map as it demonstrates some key ties and project partnerships.

The second area of focus on the SNA is Dsposal's links with MMU. They have worked together to develop a set of learning modules for the estates team around waste consignment notes, which it is

now rolling out to other clients. It has also featured MMU staff on its podcast. MMU run the Manchester branch of the Circular Economy Club (CEC), an international movement designed to connect businesses working within the CE, of which, Dsposal is a member (D9).

The top left of Figure 5-10 shows the network created through the shared office community at The Federation, and how important this is to Dsposal's network. This has led to the development of the podcast, and a collaboration with EMF; the collaboration with Open Data Manchester for the DEFRA project mentioned previously; and projects with the University of Manchester (UoM) and the Co-op (D1, D8).

The founders are both members of the Chartered Institute for Waste Management (CIWM) which is the professional body for its industry and includes membership from other nodes on the map, but for clarity, only those ties that have led to other collaborations are included. It is an important node to mention as it acts as the gatekeeper for the waste and resource industry, providing qualifications and influencing policy, including that around CE. It is another key member of WACT (D1, D5).

Ties

This section uses the CCF to explore the value attributed to each of Dsposal's ties by identifying the type of Community Capital provided by each connection. Table 5-13 shows the incidences of each type of capital revealed through the SNA. The following section examines each of the capital ties more closely, exploring the highest incidences first.

Type of capital	Incidences of Capital
Natural Capital	0
Cultural Capital	5
Human Capital	14
Social Capital	6
Political Capital	11
Financial Capital	6
Built Capital	1
Digital Capital	10

Table 5-13: Incidences of Community Capitals in Dsposal's SNA

Human Capital

The highest incidences of capital among Dsposal's network are *human*. Dsposal uses much of its network to build new projects and increase the visibility of its brand, through its own learning and development; sharing this with others. Its connections with universities exist either through alumni networks, where the arrow direction is towards Dsposal, or through projects it has developed with the universities, where the arrow direction, on the map, is pointing away from Dsposal. Other key ties that allow Dsposal to build its Human Capital are the link with the Business Growth Hub, which helped it set up as a business; WACT, Dsposal's only CoP; and the CIWM, which provides resources, training, and connections for its members (D5, D7). They also attend conferences outside of the waste sector to provide knowledge of its work and provoke discussion with a broad audience (D1).

Political Capital

Dsposal's political ties exist on regional and national levels. Most of the national connections come through the Waste Compliance Taskforce, with the English, Welsh and Scottish environmental agencies all feeding back to DEFRA (D1, D2). Its work advising on the National Materials Datahub has provided connections to other areas of government too, the Office for National Statistics (ONS) and the Department of Business, Engineering, and Industrial Strategy (BEIS). Dsposal also has links with GMCA through the *Tip of the Binberg* report and the Business Growth Hub, and at the time of the interview was trying to persuade them to recommend its service to their contractors.

Despite the high number of links to Political Capital, it is not entirely clear whether this provides Dsposal with much influence on national policy.

Digital Capital

A high number of Dsposal's connections are based on the value provided by Digital Capital. Beyond the scope of its digital platform, Dsposal work on other digital projects, such as the development of the Open Data prototype for DEFRA and advising on the National Materials Datahub (D1). Their podcast is developed with Tech for Good Live, a tie created through its workplace, which also builds on Dsposal's human capital as it educates listeners on areas of the CE (D4).

Financial Capital

The Financial Capital ties indicated on the SNA all relate to where funding sources have been identified through the different relationships. The funding doesn't necessarily directly relate to Dsposal but might indicate who funded certain projects that Dsposal collaborated on, such as the *Tip of the Binberg* report; or groups that it is part of (D1).

Social Capital

On the SNA map, the Social Capital ties indicate where collaborations and connections have evolved out of interpersonal ties: the Low Carbon Hub provided many networking opportunities for Dsposal, as did its membership of the Resource Association, and the CEC Manchester. The founders have family ties to EMF, who provided guidance in CE when Dsposal was founded and hosted its podcast during the Disruptive Innovation Festival, EMF's flagship CE festival (D1).

Built Capital

Dsposal's office-based community at The Foundation in Manchester is demonstrated by Built Capital. As shown by the SNA and previous sections, this location has provided many opportunities for collaboration and projects for Dsposal (D1, D8).

Cultural and Natural Capital

As far as the data shows, Dsposal does not have any connections with cultural organisations or grassroots community groups, and it does not contribute directly to any Natural Capital projects (D1). However, it can be argued that through its project, *Tip of the Binberg*, tackling fly-tipping, it is indirectly influencing the Natural Capital of Greater Manchester (D6).

5.4.5 Summary

This case study has explored the attitudes and approaches of a digital service SME to the circular economy, which discovered an alignment of values with the CE once it was established, rather than being deliberately set up as a CE venture. It has actively developed an extensive network, to cultivate a reach that is much wider than its remit as a waste and compliance platform; and it proactively maintains collaborations across industry, policy, and academia that build on its knowledge and standing as an expert in its field, while broadening the reach of the platform.

The next chapter explores an architecture consultancy firm working within a sustainability remit, but which does not believe it is working in the CE.

5.5 Ecospheric

5.5.1 Introduction

This chapter explores a Manchester-based "eco-retrofit" consultancy, Ecospheric, a case study that is firmly based within the built environment sector, but also has a zero-waste remit so can be included in the waste category of this research. Concerning the CE, Ecospheric takes a very strict view of what circularity means. It had previously positioned itself as a consumer of circular products for its retrofits but struggled to find products that fulfilled its CE criteria. However, throughout this case study there are multiple examples of where it is applying circular principles and working towards a CE more generally. The interviewee had reservations about the economy part of the CE, which are valid, and echoed in some of the other case studies, these reservations are explored further in the cross-case analysis.

Insights

The case study has revealed that Ecospheric has managed to build a secure sustainability business through a niche area of architectural consultancy, which gives it the ability to take risks and experiment with innovative tools and processes. Its network of connections gives it access to research, which can further its experimental "integration engineering" approach to sustainability in the built environment, influencing other parts of its industry and local government. It has developed a relationship with the local government and has used its flagship Passive House+ project as a model for good practice, with the aim for it to be replicated across Greater Manchester.

Background

- SME based in Manchester.
- Initially started as an eco-retrofit consultancy, have created "UK's greenest retrofit" as an example to others of how it can be done.
- Experimenting with creating an energy neutral and zero-waste food hall.
- Founder started in chemical engineering working in future focused energy projects. Through a family involvement in architecture realised that there was little knowledge of the sustainable products on the market of property development, and how to make the most out of them.
- Founder retrofitted their own house to reduce the carbon emissions by 80% and became a member of the Superhomes network – opening up their house to other low carbon enthusiasts. This developed into consultancy work for the founder, who helped people reduce the carbon output of their homes.
- Ecospheric started after the founder realised that they were not having the impact they wanted decarbonising the homes of the super wealthy, so looked to develop projects that could be replicated on a wider scale, with bigger impact.

Data Sources

E1. Face-to-face first-person interview with the director of Ecospheric, herby known as EIP (Ecospheric Interview Participant).

E2. https://www.ecospheric.co.uk/ Ecospheric website.

Other relevant data sources:

E3. https://www.levysortingoffice.co.uk/ Food Hall project website.

E4. J. Cradden, 2018, 'The Deepest Greenest Retrofit Ever?', *Passive House + UK edition*, (28), pp. 28-39. Magazine article provided by EIP during the interview.

E5. https://www.manchestereveningnews.co.uk/whats-on/food-drink-news/sorting-office-levenshulme-food-hall-14488116 Manchester Evening News article about the food hall.

E6. Email correspondence with the Centre for Alternative Technology (CAT) alumni coordinator and Manchester CAT food alumni network coordinator (Appendix 7).

E7. https://www.wase.co.uk/ WASE website.

E8. https://superhomes.org.uk/ and http://www.superhomes.org.uk/superhomes/manchester-chorltonville-the-thorns SuperHomes network website and Ecospheric specific page.

E9. https://www.greatermanchester-ca.gov.uk/what-we-do/environment/homes-workplaces-and-public-buildings/retrofitgm/ Greater Manchester Combined Authority Retrofit taskforce webpage.

E10. https://www.mmu.ac.uk/fuel-cell/ Manchester Metropolitan University Fuel Cell Lab website.

E11. https://www.salford.ac.uk/our-facilities/energy-house-labs University of Salford's Energy House website.

E12. https://tyndall.ac.uk/ Tyndall Centre (based at University of Manchester) website.

Overview

Throughout this case study, the data collection and subsequent analysis have tried to follow the protocol laid out in the research design. However, the EIP had much of their own agenda to discuss, so, due to time constraints, not everything was covered in the interview. The research had to expand the dataset to include correspondence with other people in the EIP's network, in order for a full analysis to take place. Through the interview with EIP, it became clear that they are quite sceptical about CE and its current practical application, particularly in relation to their projects, and its wider use beyond theory. The interview was conducted under this caveat and as such, this analysis starts by exploring Ecospheric's definition of a CE. The rest of the analysis follows the same layout as the previous analyses but applies the thematic terms to the general sustainability approach of Ecospheric, rather than looking specifically at CE.

The interview was focused on Ecospheric's two major projects, the *Passive House + project* (PH), which has been completed, and the *Food Hall project* (FH), which was in early stages of development at the time of the interview but has been on hold since the pandemic (E3).

5.5.2 Circular Economy Interpretation

Much of the work discussed in the interview was done *"without any thought to the circular economy whatsoever"* (EIP interview). However, there are many points in the discussion and analysis where the principles used fit with the CE, even if it is not recognised by the EIP. The following section explores where the conflicts exist between the EIPs CE understanding, and that which is laid out by this thesis. In the interview, EIP expressed a very fundamental view of CE, stating that they interpret it as re-using the same materials to make the same final product, *"truly circular goes back to producing the same thing that was consumed"* (EIP interview). Compared to the definition of CE put forward in this thesis, which incorporates broader points gathered from the literature, their definition is quite restrictive. They dismissed any ideas that didn't result in the same product being created as that which was consumed. They also expressed concern with the economy side of the CE, which is something expressed by other interviewees and is discussed in Chapter 6.

Through the projects discussed in the interview, Ecospheric is aiming for zero-waste, net-zero-energy use, and zero-petrochemical use, which demonstrates overlap with the CE definition discussed previously, specifically around zero-waste aims. This section of the analysis explores its interpretation using the discussions around these topics rather than CE. The analysis is based on the understanding of CE detailed in the Research Design chapter, and identifies where the EIP's understanding, and that of this research, overlap and where they conflict.

4Rs

Reduce	• Aiming to reduce waste in its supply chain (FH). • Will employ innovative preservation and storage methods to reduce food spoiling (FH).
Reuse	• Reuse of original materials in building project (PH) • Considered the future reuse of the building materials (PH)
Recycle	• Developing collaborations to employ small scale, on-site recycling (FH)
Recover	• Collaborating on fuel cells powered by food waste methane (FH)
Dispose	• N/A

Table 5-14: Summary of Ecospheric's engagement with the 4Rs.

In the interview, the EIP stated that "*reduce, reuse, recycle is specifically cut out of circular economy*", as they are not new concepts and do not produce the same thing as that which was consumed. However, in the work Ecospheric is undertaking it does engage with the 4Rs, but not under the banner of CE. The following sections are explored in order of importance to Ecospheric, as summarised in Table *5-14*.

Reuse

Within the PH retrofit,

> *almost all the 200 tonnes of brick in the property as well as all the original joists and rafters are still in place. "It's keeping the embodied energy, the embodied carbon that was put in there when it was originally built… keeping that on site," says its developer.*

(Cradden, 2018, p. 30)

It has also included instructions with the house for what to do with the timber and bricks once the house's useful life comes to an end, however, for EIP this isn't an implementation of CE now (E1).

Reduce

The wider analysis revealed a focus on zero-waste in the new FH project, where Ecospheric is aiming to work with its suppliers to reduce the amount of waste that comes onto the site, in the form of packaging and spoiled food. This also involves innovative preparations for the preservation and storage of food either onsite or further up the supply chain, reducing food waste (E1).

Recycle

The examples of small-scale, on-site recycling that the EIP discussed included a machine to powder broken glass so it can become glass stoneware that can be made into crockery for use in the FH. At the time of the interview, the EIP was looking for other collaborations that would do similar things and could be tested on its FH site.

Recover

The EIP used the example of a project Ecospheric is developing with a waste recycling company, and MMU, that would produce methane fuel cells from food waste, with the aim to use this in its FH delivery vehicles. According to EIP, this process would not fit with the CE as they see it:

> *it's not circular though, in the sense that truly circular goes back to producing the same thing that was consumed, whereas what we're doing is taking the green waste and we're producing energy from it and then we're using that energy to cook, [and create] more green waste, so it's nearly there, but it's not quite.*

(EIP interview)

From the perspective of this research, it is a great example of one of the loops on the nutrient cycle in the EMF butterfly diagram (see Figure 2-1: *Circular economy butterfly* diagram.).

Systems Perspective

Through broadening the analysis to include Ecospheric's approach to sustainability, the data shows that its perspective cuts across all three levels of the system, micro, meso, and macro. However, just examining its narrow view of CE reveals that it only takes a micro perspective on CE, although the EIP has explored CE on a regional level through work with GMCA but states that implementing a CE on this level is too complicated and difficult.

Micro

Ecospheric's perspective in terms of CE is very micro-level focused. It is at this level where the EIP's biggest reservations about the CE lie. When they were investigating what CE could offer, Ecospheric looked to connect with CE companies to provide products or tools that could be implemented within projects to transform a waste or pollution problem. For both the built environment and the food and agriculture sector (E1).

Meso

Broadening the thematic analysis to include Ecospheric's approach to sustainability in general revealed that it puts a lot of emphasis on the meso level; creating showcase projects to inform and educate, as well as act as a test bed for sustainable tools and products (E1, E4).

The EIP is also on GMCA's housing board, advising on retrofits, and expanding the influence of their knowledge and expertise in this area. The PH has been opened to public tours to show architects, city planners, local government, and the public how retrofits can be done with a greatly reduced carbon footprint (E2). Ecospheric has ongoing collaborations with all three of the local universities, UoM, MMU, and the University of Salford (UoS), to research and develop sustainable solutions for its projects (E1).

Macro

At the macro level, Ecospheric is expanding its influence on its industry through its attendance of conferences and trade shows, offering educational workshops for industry peers, and national media attention of its projects. Through involvement in these events and publicities, it is developing and building on the sustainability narrative for the built environment industry (E1, E2).

Aims of the Circular Economy

For Ecospheric, CE and sustainability provide a space for experimentation, through developing technology alongside engineers to reduce human impact on the environment, and, in terms of its FH, improving health through a greater connection to food and nutrients (E1). It has moved beyond the aims specified in this thesis towards very specific targets, which could explain the frustration with current CE models.

Environmental Quality

Through the case study analysis, Ecospheric clearly employs a strong sustainability ethos to improve EQ. The EIP attributes this to work they did with the Tyndall Centre at the UoM, which is Europe's largest climate change centre. They also spent time at CAT, developing their knowledge of green building as a driving factor. They have a background in chemical engineering and place value on

integration engineering, being able to experiment with technology once it is out of the lab and in situ to develop that technology to suit the environment (E1, E4).

Economic Prosperity

EP was not expressed at interview as an aim for Ecospheric specifically. It has developed a strong client base through its EcoHome consultancy, working on some exclusive builds. In developing and consulting on EcoHome projects for a niche market, it has gained financial security and can experiment with more public-facing projects. For Ecospheric, financial security is not a motivation for working in sustainability, but a means to develop its more ambitious projects.

> *It may seem somewhat ironic that, for a project that aims to preserve as much of the building fabric as possible, Ecospheric ended up spending far more than it budgeted on the building fabric. However, part of this was clearly down to [it] being a test bed for a "breathable, organic, fabric-retaining solution" for passive house retrofits.*

(Cradden, 2018, p. 33)

Through the creation of PH and the EIP's first SuperHome retrofit, Ecospheric opened itself up to a network of funding that enables experimentation in its sustainable building projects. The PH established Ecospheric as an expert on sustainable retrofits, which led to the EIP consulting on developing a more sustainable built environment for GMCA and has provided insights for future developments (E1).

Social Equity

SE isn't stated or alluded to as an aim of working sustainably. The EIP's role within GMCA is to advise on the retrofit of Greater Manchester's housing stock, but this was not stated as being related to SE (E1).

Consumer Focus

Ecospheric positions itself as a *consumer* of tools to improve sustainability, creating projects that test the tools in a real space rather than in a lab. It is keen to work with the producers to develop these tools to be more efficient and effective, using its expertise and connections to showcase the projects and tools to others who may wish to use them. It acts as a go-between for manufacturers and final consumers (E1, E2, E4).

5.5.3 Circular Economy Implementation

This section explores the CE themes that have arisen from an examination of the barriers and drivers that Ecospheric has faced. As with the previous parts of this chapter, the analysis looks at CE and wider sustainability as Ecospheric's definition is considerably narrower than the one put forward in this thesis. The following paragraphs describe the data explored in Table 5-15, which highlights the barriers

and drivers Ecospheric have come across on its CE journey. Not every category is identified in the data, due to Ecospheric being an SME, set up to provide sustainable house builds and renovations, so it has not had to change its culture or organisational policy. The *Organisational* category includes the wider work the EIP does for GMCA and its position within the built environment industry.

Barriers

The barriers faced by Ecospheric are in part due to its expectations that CE technology is considerably further along than it is; ready to be implemented in real world situations, to be tested and tweaked. The barriers discussed in the interview included some that the EIP felt affected the wider adoption of

Category	Barriers	Drivers
Environmental	• Lacking a company environmental culture beyond mandated policy.	✓ Preventing negative environmental impact. • Company environmental culture. • Resource constraints.
Economic	✓ High costs of implementation. • Lack of capital. • Limited funding.	✓ New revenue streams. ✓ Business development, innovation, and new synergies. • Cost efficiency improvements.
Social	✓ Lack of social awareness. ✓ Lack of information. • Lack of market mechanisms for recovery. • Lack of clear incentives.	• Increased internationalisation and global awareness of sustainability needs. • Potential to increase workplaces and vitality.
Institutional	✓ Complex regulation. • Lack of CE know-how among policy makers. • Lack of gov. support.	✓ Support from the demand network. • Regulation and standards requirements. • Supportive funds, favourable taxation, and subsidy policies.
Technological and informational	✓ Lack of technologies and technical skills. • Lack of information and knowledge.	✓ Potential for improving existing operations. ✓ New technologies. ✓ Increased knowledge sharing and networking.
Supply chain	✓ Lack of network support and partners. ✓ Strong industrial focus on linear models. ✓ Lack of standardisation. • Low virgin material costs. • Lack of collaboration and resources.	✓ Potential for reducing supply dependence, avoiding high and volatile prices. ✓ Management of reverse networks ✓ Open collaboration and communication. • Increased availability of resources and capabilities.
Organisational	✓ Lack of compatibility with linear operations and targets ✓ Lack of CE knowledge and skills. • Siloed thinking and fear of risk taking. • Conflicts within existing culture and lack of cooperation. • Lack of management support and strong organisational hierarchy.	✓ Increased understanding of sustainability demands. ✓ Development of skills and capabilities for a circular future. • Circularity ingrained in company strategy and goals. • Potential to strengthen company brand and differentiate from rivals.

Table 5-15: Barrier and driver category breakdown for Ecospheric.

sustainability models in the built environment, rather than ones faced by Ecospheric directly. These are included to highlight the attitude of the EIP, and create a richer cross-case analysis, where this the case it has been highlighted below.

Economic

For the EIP, a major part of the problem with sustainability or 'eco' as a buzzword for home building and renovation, is the fact that it can lead to elitist greenwashing, keeping sustainability out of reach for most of the population. However, this is not a barrier for Ecospheric working in the CE but one that the EIP sees as a general barrier to large-scale CE and sustainability adoption in the built environment (E1).

Social

The consultancy work EIP did, after becoming part of the SuperHomes network, led to work on large-scale, private residential projects. They felt that their work had become disconnected from the original purpose of creating low-carbon homes with minimal impact to creating large, luxury homes with eco-credentials. Despite being a positive financial driver for Ecospheric, this lack of social awareness from its clients acted as a barrier to developing its message and creating tangible applicable examples for others in the industry.

> *I think the last project I did before I was like, "this is enough, I can't do it" was a 1,100 square metre building, so that's 10 times the size of an ordinary house for four people, indoor [and] outdoor swimming pools, helipad, other bits and bobs, and so I'd moved way out of this two up two down type thing and gone into this world, and it was all for their ability to talk to clients and friends about being eco.*

(EIP interview)

The EIP spoke of frustration when trying to find CE technology he could implement in the PH build through a trade fair, despite a large part of the fair being dedicated to CE. This demonstrates a lack of information in the industry around CE technology and tools, compared to information on the CE in general.

Institutional

As previously mentioned, the EIP is on the GMCA's strategy board for housing retrofits, and in that role has been looking at how CE models could be implemented on a city-wide basis. Particularly the economic side, and so far, they have not found any applicable elements due to complex regulation and implementation.

> *looking at it more from a strategic perspective, because again, one of the roles I play is at the GMCA from a strategy board perspective, I'm the technical lead on the retrofit side of things and we're looking at economic models for the circular economy to be*

> *built in a much larger scale for, let's say, the whole of GM, how could a region use*
> *circular economy to create this kind of loops, and it's remarkably complicated.*

(EIP interview)

This is despite CE being a major part of GMCAs remit to become carbon neutral by 2038 (E9).

Technological and Informational

Ecospheric is very much focused on what technology is out there to help it complete its aims, and in this area, it has found that the offerings fall short of what it is looking for.

> *there is very little of true value coming out of circular economy, when all I'm wanting*
> *to do is actually do something in real terms, real life, build it, test it, check it out, scale*
> *it up, show everybody how to do it – it's all about impact.*

(EIP interview)

There is less interest in product development, and more interest in implementing products that are already on the market, to test and improve upon their performance. This lack of technology is a major barrier to Ecospheric's CE adoption and can also be attributed to the narrow definition of CE it uses.

Supply Chain

In terms of zero waste, a goal it is trying to achieve with its FH, it is struggling with a lack of network support and partners. For Ecospheric, controlling what occurs on-site, in terms of waste, is much easier than monitoring what happens before it arrives and after it leaves the site. "*It's a boom-and-bust seasonal production in a food economy so that's one of the most difficult elements to consider*" (EIP interview). As waste is part of the supply chain, it is working on reducing what comes onto its site. This includes exploring lean transportation logistics and reduced or alternative packaging to retain or elongate a product's life span while keeping waste minimal. As also discussed in the 4Rs section.

Organisational

Organisational here refers to the industry that Ecospheric works in, namely the built environment. For the EIP, CE in the built environment is "*just too embryonic, it's too theoretical and it's too much overlapping with just common sense in the sense that it's not a new idea, reduce-reuse-recycle*". (EIP interview). Broadening the definition of CE reveals that "*in the built environment there's a high degree of reuse, [...but] do they do it regularly? Probably not, because it's almost always cheaper not to reuse*". (EIP interview). Demonstrating that there are financial restraints to reuse causing its industry to retain siloed thinking and linear ways of doing things.

Drivers

Ecospheric is driven by a desire to implement sustainable technologies in real-world situations. The EIP professes to have almost unlimited funds to carry out these experiments and is keen to share the

results across its industry and beyond. The EIP has influence within the Greater Manchester built environment industry and through work with GMCA. The roll-out of Ecospheric's methods, as a way to mitigate the impact of buildings on the environment, is also a key driver to working in CE and sustainability.

Environmental

One of the key drivers for Ecospheric, working in sustainability, is to prevent negative environmental impact. The PH project was designed to create zero waste during the build and aims for a zero-carbon footprint once the houses are lived in (E1, E4).

Economic

The work it does through its consultancy gives Ecospheric revenue to experiment in less cost-effective but more sustainable projects, as previously discussed. It sees sustainability as an area to collaborate on innovations to affect the built environment's impact on the climate crisis (E1, E2).

Institutional

Ecospheric has considerable support from the demand network through GMCA and its aims for a low-carbon and sustainable city. By working as a retrofit consultant, the EIP is putting themselves into the institutional apparatus, and creating a valuable institutional driver for Ecospheric in the CE (E1).

Technological and Informational

As previously stated, Ecospheric is more interested in providing a *real-world* test bed for circular products. The implementation of these products into its projects has come out in the analysis as a big driver of its explorations into the CE. The EIP has a background in integration engineering for oil companies, troubleshooting why products that worked well under lab conditions, failed when in use in the field. They have transferred these skills to the built environment after witnessing a need for the proper integration of sustainability products, such as heat pumps. As a result of this, the EIP experimented with different energy-saving products in their own home and became a member of the SuperHomes network to share their findings with others (E1, E4, E8).

Supply Chain

Through the FH, the Ecospheric aims to control many aspects of the supply chain. It sees problems along the supply chain with zero-waste, so has ambitions to start a farm to ensure the quality and environmental credentials of the food that is supplied to the FH. It wants to be able to control much of the gas production onsite through methane-capturing technology, from the food waste, and to generate energy (E1).

Organisational

Through Ecospheric's sustainability projects, its staff and contractors are developing skills for a circular and sustainable future and sharing them with their network. Ecospheric uses its network to constantly improve its understanding of sustainability demands and challenges, putting theory into practice through its projects to demonstrate alternative ways of working to others in its field, while reducing the environmental impact of its industry (E1).
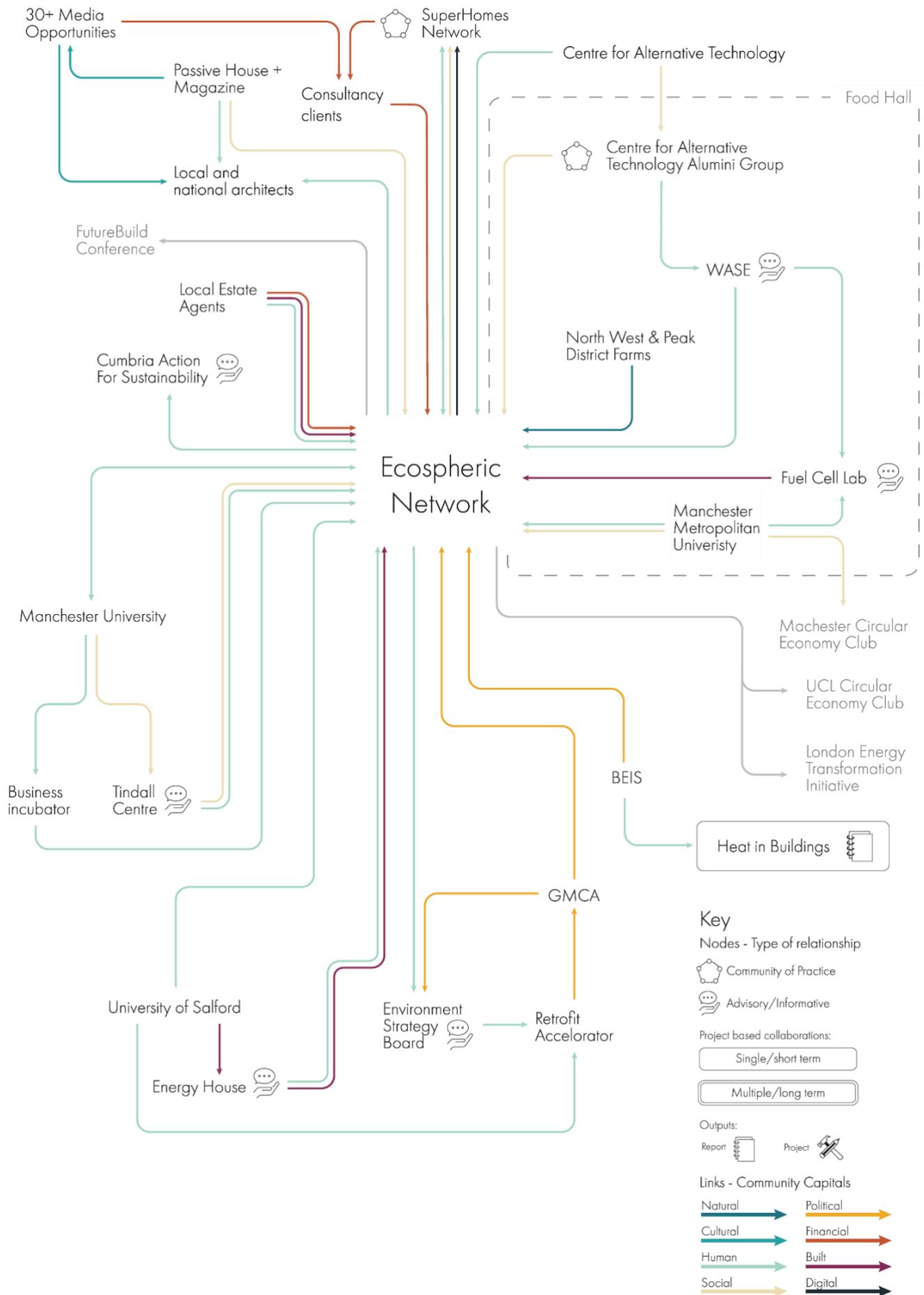
Figure 5-11: Ecospheric Social Network map with Community Capitals Framework applied.

5.5.4 Community and Social Network Analysis

This section of the case study explores the network connections utilised by Ecospheric in the development of its projects, as laid out in Figure 5-11. The section first explores the *nodes* on the map including those identified as CoPs and highlights any other key connections. The second section explores the relationships between Ecospheric and its network using the CCF lens, identified through the coloured *ties*.

Although the interview was face to face, the EIP declined to draw a map, as had been done in the other case studies, however, they did write out a list of different contacts and connections they have made. Using this list, and other connections revealed through the data, the SNA was developed following the interview, not during, as all the other case studies had been.

The majority of the connections shown are related to the Passive House+ project and other work Ecospheric has done. The upper right-hand side of the map within the grey dashed line indicates those connections it has made specifically to develop aspects of the FH project. The nodes in grey indicate now-inactive relationships that were discussed in the interview. They have been included in the map to demonstrate the research that the EIP put into making CE connections, even if they ultimately proved fruitless.

Nodes

Ecospheric's stakeholder map is not as extensive or wide-ranging as some of the other case studies, however, the connections represented are very important to the organisation. This section describes Ecospheric's interactions with the CoPs it is involved with. The second section looks at some of its key advisory relationships, as much of its network is made up of these relationships.

Communities of Practice

As with all of the SMEs featured in the case studies Ecospheric does not have any internal CoPs. The following section examines the two major CoPs that have influenced the EIP and developed Ecospheric as a business.

SuperHomes Network

EIP's interest in sustainability comes from a passion for learning about different technologies that can be implemented in real-world situations. They came to realise, through conversations, that there were many products on the market to reduce a home's carbon consumption, aimed at architects that weren't understood or being used properly (E1, E4). This spurred EIP to join the SuperHomes network, and to try to reduce the carbon emissions of their own home using various monitors and gadgets.

> *I decarbonised that building by 81%, which then meant it was above 60%, which means I could become a member of the SuperHomes Network and the idea behind that was*

> *that you decarbonise your building by 60% or more and then you open it up and show other people how to do it.*

(EIP interview)

The SuperHomes Network includes membership of almost 250 homeowners, around the UK, who have, or are in the process of, reducing their home's carbon emissions by 40% (E8). These homes are then required to be opened up to the public to encourage others to reduce their home's carbon emissions. This enables local links to be made, through demonstrations of technology, and discussions of best practice. The SuperHomes Network is based online, with advice, forums, and directories to guide homeowners in the right direction (E8).

CAT Food Manchester

The second CoP the EIP is a member of is an informal group of Manchester-based Centre for Alternative Technology alumni. This group is focused on sustainable food solutions, and Ecospheric have been connecting with members to discuss and develop ideas around the FH. This group is very informal, with the meetings centred around trying out new dining experiences around Manchester. It is run by a volunteer co-ordinator who keeps the members in touch with one another and organises the meetings (E6). The only significant connection made by Ecospheric is with a company called Wase

Community of Practice	Category description	SuperHomes Network	CAT Food Manchester
Size	small, a few expert individuals → very large	Large	Small - Medium
Lifespan	months and years → generations	Since 2007	Since 2016
Location	collocated or distributed	Distributed – Homes are across the country, enabling potential members to find a SuperHome owner nearby for advice	Collocated within Manchester
Make up	homogeneous (same discipline or expertise) or heterogeneous (across disciplines).	Homogeneous	Heterogeneous – different areas of sustainability but interested in food.
Level	Micro, meso, macro.	Macro	Meso
Formation	spontaneous or intentional.	Intentional	Spontaneous
Relationship to org.	Unrecognised Bootlegged Legitimised Supported Institutionalised	Legitimised by Ecospheric – its offices are based in the SuperHome that launched the company	Bootlegged – informal network of CAT alumni based in Manchester

Table 5-16: Communities of Practice participated in by Ecospheric.

who are developing a device that is designed to turn food waste into methane, which can then be used in a fuel cell, the EIP wants to implement this technology into the FH (E1).

Advisory Relationship Nodes

Many of the nodes represent advisory relationships, either with Ecospheric as the advisor or the advisee. This part of the analysis looks at the most important advisory nodes, starting in the FH section and working around clockwise.

Food Hall

In the Food Hall section, the important nodes are Wase and MMU's Fuel Cell Lab, both of which are important collaborations for the FH ambitions. Wase lab are developing technology to get the maximum amount of energy and resources from food waste (E7). Whereas the Fuel Cell Lab are working on ways to use other gases such as methane to power vehicles (E10). The FH project would connect these two processes by using the methane given off by the Wase process to power its vehicles' fuel cells (E1).

Environment Strategy Board

The Environment Strategy Board is a key advisory relationship for GMCA, where Ecospheric can bring its experience to a wide and influential audience, this board is advised by the Retrofit Accelerator group, which it is also involved with (E9). The EIP states that 80% of current housing stock is inefficient in its energy use, and by being on this board they can spearhead local initiatives to change that through the introduction of its low-carbon retrofit methods.

Universities

The other two universities also play vital roles in Ecospheric's network. UoS has built an "Energy House", located inside a climate-controlled space, which can be used to lab test different energy-saving tools (E11). Ecospheric was able to trial and develop tools with the Energy House team for its PH project. A member of the Energy House team is also the lead on the retrofit accelerator, so advises on the built environment strategy for GMCA (E1, E11). The EIP cites a talk at the Tyndall Centre as being the catalyst for working in the built environment, and during the interview was keen to point out the influence of academics there on Ecospheric's approach to climate change. The Tindall Centre is a Climate Change Research Centre, the UoM branch is based in the School of Mechanical, Aerospace and Civil Engineering, and works with many businesses and different levels of government on climate change initiatives (E12). The Centre is now keen to learn from Ecospheric regarding sustainable architecture (E1).

Ties

This section uses the CCF to explore the ties between each of Ecospheric's relationships, attributing a capital to the different nodes demonstrates the value that they provide to Ecospheric. The incidences

Type	Incidences of Capital
Natural Capital	1
Cultural Capital	2
Human Capital	22
Social Capital	7
Political Capital	4
Financial Capital	4
Built Capital	4
Digital Capital	1

Table 5-17: Incidences of the different Community Capitals in Ecospheric's SNA

of each connection are then recorded in Table *5-17*, each of the capitals present in the SNA are explored in the following section, looking at the capital present in the most ties first.

Human Capital

This is the most present capital on the SNA, by far, many of Ecospheric's connections are through a desire to learn or to teach others about sustainability best practice. Key relationships in the Human Capital ties are those with the local universities, UoM, UoS and MMU. The universities provide different types of knowledge, much of which has led to other types of capital. For example, UoM provided the business incubator for the EIP when starting Ecospheric, as they are an alumnus. They also have Social Capital connections with individuals through the Tindall Centre, who have inspired the EIP to take the business in different directions. UoS on the other hand, provides a space to experiment through its Energy House (E1). CAT is also an important Human Capital connection as it is where the EIP first learned some of the methods applied to the PH project, the alumni group has also connected Ecospheric to new technologies to apply to the FH project, in turn, creating another link to a local university, MMU(E1, E6).

Social Capital

The Social Capital relationships that Ecospheric have, tend to be paired with Human Capital relationships in some way. For example, its relationship with the Tindall Centre is primarily through links it has with individuals there, but it has learned from them and increased the Human Capital of its staff. Its relationship with Passive House + magazine has introduced Ecospheric to many architects, and seen its work featured across the media, see Figure 5-12. It has been able to demonstrate its passive house retrofit methods and improve the Human Capital of these architect groups, this is also the case with the SuperHomes Network, although the learning through this connection goes in both directions (E1).
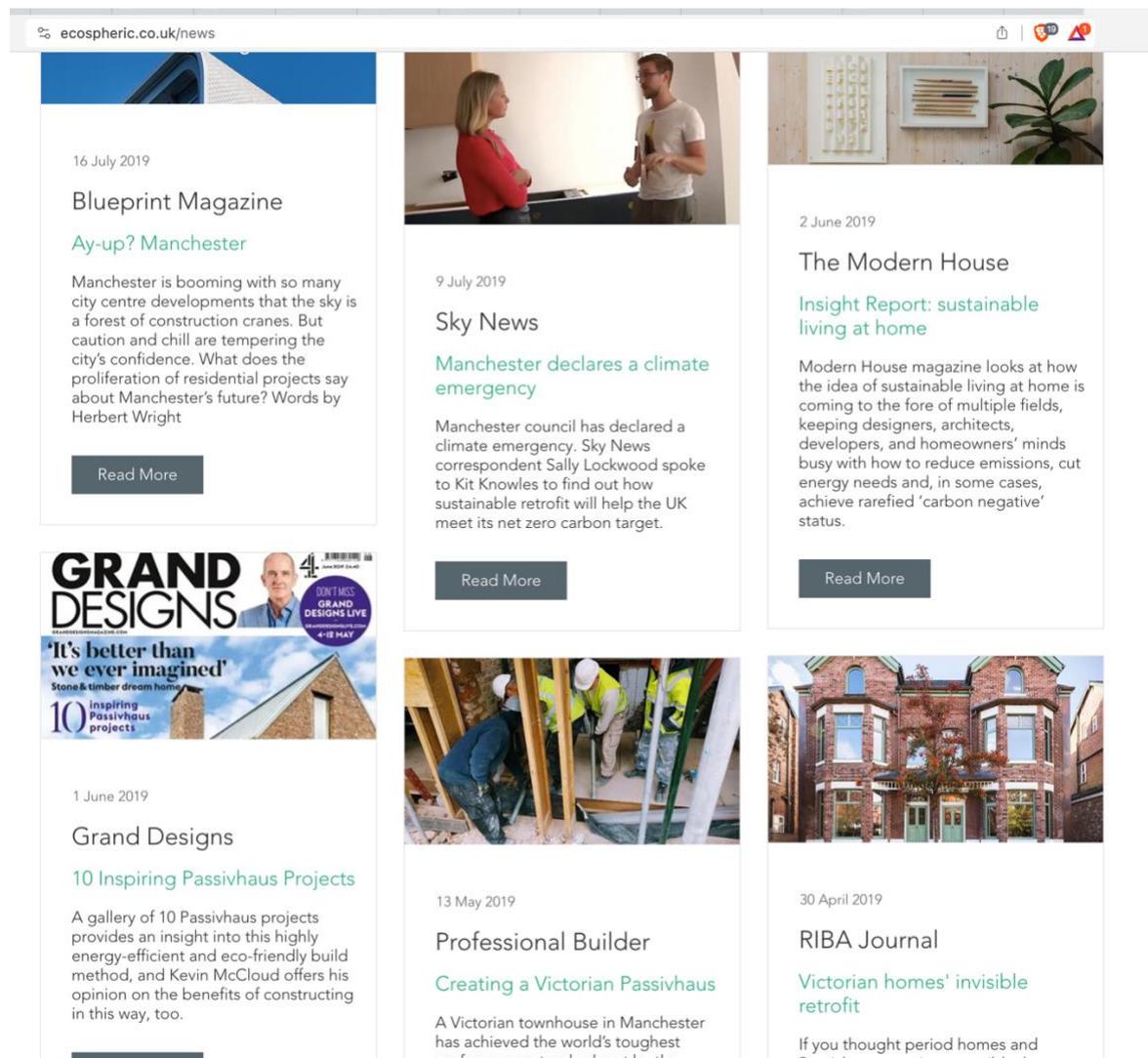
Figure 5-12: Screenshot of Ecospheric website showing news and articles written about the Passive House + project.

Political Capital

The majority of Ecospheric's Political Capital comes through links with GMCA, which it advises on low-carbon retrofits for the city, and, as previously stated, the EIP sits on the Environment Strategy Board (E1).

Financial Capital

Ecospheric was set up as an eco-home consultancy, based on the work the EIP did on their original SuperHome. This opened them up to a lot of potential clients and provided the Financial Capital to grow a more conceptual arm of the business, with the freedom to experiment with low-carbon technology that could develop the PH and FH (E1).

Built Capital

For Ecospheric, Built Capital includes spaces where it can experiment outside of its own buildings. These relationships are developed with universities: UoS has built the Energy House inside a lab, where

weather conditions can be simulated, allowing building materials and equipment to be stress tested in different environments (E11); Built Capital can also be provided by MMU and its Fuel Cell lab who Ecospheric is working with for its FH (E1).

A key Built Capital connection is that with the local estate agents, with whom Ecospheric developed a close relationship during the purchase and development stages of the PH. It utilised the estate agent's knowledge of the neighbourhood, and local housing market, to budget the project and ensure there was sufficient interest within the area for such ambitious passive housing, also giving Ecospheric much-needed local advice and promotion (E1).

Cultural Capital

Cultural Capital can be explained here as Ecospheric's work with media organisations, who act as cultural gatekeepers, revealing and promoting interest in the zeitgeist. The Cultural Capital gained from these interactions provided endorsements for Ecospheric and allowed it to position itself as an expert in its field. This provided an amount of trustworthiness when promoting its work to other experts or potential clients (E1, E4, E5).

Digital Capital

Ecospheric's Digital Capital tie is based on its relationship with the SuperHomes Network which is based online and was an important starting point for Ecospheric, as mentioned previously (E8).

Natural Capital

The Natural Capital link is supported by Ecospheric's connection with the farms that will provide the food for the FH. It plans to work closely with farmers to source food that is as sustainable as possible (E1).

5.5.5 Summary

This case study has examined an organisation that deliberately rejects the CE as it define it. However, the frameworks employed by the analysis show that many of its activities are aligned with CE principles. Ecospheric make use of an extensive local network to experiment and influence, with strong links to Greater Manchester universities and the Combined Authority. It positions itself as a consumer of sustainability or CE tools, not developing any of its own but providing spaces for others to develop their products, these collaborations are developed through its network (E1).

The following chapter details the final case study, Arup, a global built environment specialist with strong links to the EMF.

5.6 Arup

5.6.1 Introduction

This chapter closes the case studies with an exploration of the second multinational in the research. Arup works across the built environment sector and at the time of the interview was EMF's Built Environment Knowledge Partner. Its approach to the CE is shaped by this relationship, which is discussed in section 0. The interview discussed CE in the context of before and after the partnership, however, most of the organisation's CE knowledge and approaches were developed after. As Arup is such a large multinational, the research used in section 5.6.4 focuses primarily on the CE connections discussed in the interview. The data sources section below shows the multiple resources that were available to the research through the website and discusses the use of these sources.

Insights

The case study shows that Arup has a very strong idea of what the CE is and how it can influence its sector and beyond. Its connections extend across its sector to governments at local, national, and international levels, which provides the potential to influence the international agenda on CE. For Arup, the role of the communities discussed at interview relates solely to the CoPs it is involved in. These are spaces where it can collaborate and experiment with new ideas and projects, such as the CE100. It also uses its CoPs to influence business policy and develop best practice to influence business agendas and government.

Its approach to CE covers many areas, and the analysis shows that it has overcome some difficult organisational barriers, with the help of external partners, to drive a CE agenda across the organisation. However, the primary data source is just one person's perspective, from their position in the organisation working to promote the CE, so whether it has priority in other areas cannot be assessed. This research cannot know how much of the advisory work Arup has produced will become standard practice in the future, and whether its definition of CE will expand to include aspects that are currently less of a priority: SE and promoting a reduction of new building projects.

Background

- Multinational corporation with headquarters in London, and offices in Liverpool and Manchester.
- It is a built environment specialist, working across design, engineering architecture and business consulting.

- Developed projects across the UK, including the North West – including the Liverpool Canal Link[5], Etihad Stadium[6], and a transport body for the North of England[7].
- Since 2016, it has been the Built Environment Knowledge Partner for the Ellen MacArthur Foundation (EMF).

Data Sources

A1. First person interview conducted with CE and climate change consultant, hereby known as AIP (Arup interview participant).

A2. https://www.arup.com/ Arup website.

Reports published by Arup referred to in the interview, available online [8]:

A3. *The Circular Economy in the Build Environment* (Zimmann *et al.*, 2016);

A4. *From Principles to Practices: First Steps Towards a Circular Built Environment* (Acharya *et al.*, 2018);

A5. *The Circular Economy Opportunity for Urban & Industrial Innovation in China* (Ellen MacArthur Foundation and Arup, 2018);

A6. *The Future of Urban Consumption in a 1.5°C World* (C40 Cities *et al.*, 2019);

A7. *Circular Economy in Cities* (Ellen MacArthur Foundation and Arup, 2019);

A8. *Blockchain and the Built Environment* (Nguyen *et al.*, 2019);

A9. *From Principles to Practices: Realising the Value of Circular Economy in Real Estate* (Acharya *et al.*, 2020).

Other relevant data sources:

A10. https://www.cityresilienceindex.org/#/ and https://www.arup.com/perspectives/publications/research/section/city-resilience-index Resilient Cities Index Website and Arup page

A11. https://www.ellenmacarthurfoundation.org/ EMF website

A12. https://www.bitc.org.uk/leadership-teams/circular-ecomomy-taskforce/ BITC CE taskforce webpage

A13. https://research.arup.com/ Research pages at Arup

Overview

This case study uses a number of resources to explore the themes laid out in the Research Design. Primarily focusing on the testimony of the AIP, the additional sources are used to elaborate on the interview data. This approach gives the analysis more of an overview of Arup's approach to CE and allows for analysis to expand beyond the AIP's area of employment.

A pivotal moment in Arup's CE journey has been its collaboration with the EMF. It was approached by EMF in 2014 to become part of the CE100 network, a group of influential businesses who were brought

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[5] https://www.arup.com/projects/liverpool-canal-link

[6] https://www.arup.com/projects/etihad-stadium

[7] https://www.arup.com/projects/transport-for-the-north

[8] https://www.arup.com/search?query=circular+economy&facet=Publication

together to collaborate on CE projects and work through problems and issues. In 2016 Arup became the Built Environment Knowledge Partner for EMF, so much of its understanding of CE is influenced by this collaboration. The analysis write-up assumes that all examples are taken from after the collaboration unless stated.

5.6.2 Circular Economy Interpretation

The EMF strongly influences Arup's interpretation of the CE, demonstrated by its attitudes towards the different frameworks used in this research. The barriers and drivers are based around before and after the EMF partnership, many of the barriers discussed in section 0 were faced by the interviewee before the EMF partnership.

Arup's CE interpretation is very much shaped by its partnership with EMF, namely "*designing out waste and pollution; keeping products and materials in use; regenerating natural systems*" (Acharya *et al.*, 2018). The analysis focuses on CE themes that move beyond these principles. As the organisation works across the built environment, it incorporates these principles differently depending on the area being reported on (A1, A4).

Beyond the interpretations laid out in the Research Design Chapter, there is a sense of duty conveyed by the AIP, that, as the Built Environment Knowledge Partner, Arup is there to educate its collaboration partners and industry. It feels it has a bigger role to play as it has "*invested a lot of time and effort and money trying to upskill ourselves and trying to educate ourselves on this*" (AIP interview).

4Rs

Arup's approach to the 4Rs focuses on the reduction and reuse end. Its reports don't go into too much detail about how this could be applicable in the built environment except in the value potential of building material reuse.

Reduce	• Collaborative project to calculate the volume of consumption reduction needed to stay within 1.5°C warming.
Reuse	• Mentioned in project to identify value of CE in built environment
Recycle	• Not discussed beyond a description on CE in reports
Recover	• Not discussed using the 4Rs definition of energy-from-waste recovery
Dispose	• Not discussed

Table 5-18: Summary of Arup's engagement with the 4Rs.

Reduce

Its approach to this area is very much aligned with EMF's principle, "*design out waste and pollution*". There were no specific examples given in the interview about where it might be reducing the demand,

however, within the reports, there was much more of a focus on reuse and recycling building materials where possible – but little evidence of an effort to build less (A3, A9).

Reuse

The reports focus on the design of products to be more durable, highlighting the need to maintain materials and components at its highest standard, to minimise waste of resources, and to keep these resources in use for as long as possible (A3, A7, A9). Within the reports, reuse is paired with increased longevity of resources, including: premature demolition; depreciated materials; and underperforming components. The solutions proposed looked at: reuse of the building through changing its purpose to suit needs; realising the value of recoverable materials and maintaining that value through the use of contracts; and developing subscription-based services for components that have a shorter lifespan than the use of the building, the ownership being retained by the manufacturer, which promotes higher quality products (A9).

Recycle & Recover

Recycling and recovering waste from energy are not aspects of the 4Rs that are discussed in depth in Arup's reports except when describing the CE in general (A3), or the applications for blockchain in the built environment (A8).

Systems Perspective

Arup focuses on the meso and macro level systems perspective. Much of its theoretical research uses cities as microcosms to apply CE principles to, positioning itself as an expert for leaders who wish to introduce CE to their cities. As the built environment experts, it also takes a macro, or industry-wide view on CE, developing knowledge that can be applied throughout the built environment industry; its research also considers country-wide case studies.

Micro

The *micro* or product level perspective is the least focused on by Arup. In Report A9 there is discussion of the micro perspective on CE, but as Arup is not manufacturers, this is advisory, and focuses on the reuse of materials that are already in circulation.

Meso

As the EMF built environment experts, a significant focus of the systems perspective is at the *meso* or city level. It has written a number of reports looking at city-level CE implementation, including 3 examined for this research (A5, A6, A7). Through its work with EMF, it has created resources for city leaders who want to develop a CE for their cities. It has also collaborated with the Rockefeller Foundation's 100 Resilient Cities programme, to develop a City Resilience Index, which was used to measure the resilience of cities around the world (A10).

Macro

Arup's main focus for the CE systems perspective is on the macro or country/industry-wide implementation. It focuses much of its CE work on the construction industry and built environment sector, with the reports examined highlighting circular opportunities in Real Estate and Built Environment, and country focuses such as China. It primarily views its role with EMF as an opportunity to use its expertise and research experience to educate different parts of its network.

> *Represents one of the most advanced and sophisticated attempts to date to consider what applying circular economy business models to real estate might mean in practice. It has identified which actors in the real estate value chain are best placed to instigate a transition to circular practices in this sector, and it has explored new real estate business models, which enable those actors to add value at all stages of an asset's life cycle.*

(Acharya *et al.*, 2020)

Within Arup, as an organisation, "*Circular economy isn't really a service […] per se, it should be [seen] as a design philosophy or general approach to be ingrained in everything that we do*" (AIP interview). Taking a philosophical approach rather than a service approach to CE allows Arup to focus on the big picture of CE implantation, providing influence through the private sector and higher education.

Aims of the Circular Economy

Of the three aims for CE laid out in the thematic analysis, EP and EQ are the two that feature most prominently throughout the data. However, SE was discussed as something personally important to the AIP.

Economic Prosperity

Arup sees its role in the CE as primarily being one of education, the AIP explained that as many of its clients do not see the business benefit of the CE, much of its work is focused on demonstrating the potential economic opportunities, this is reflected in its reports. Of the documents included in the analysis, the economic opportunity of the CE is prominently highlighted in reports A3, A4, A5, and A9. A key takeaway in these reports is that of the financial opportunity open to adopters of CE in the built environment. Report A9 explored five models for the application of CE principles, and states:

> *a conservative approach is taken for the feasibility studies, and on real projects where open and direct conversations are possible, there will be opportunities for greater value capture and benefit sharing.*

(Acharya *et al.*, 2020)

This report acknowledges that the CE will not be successful without the enthusiastic support from the investment industry and construction sector, and is designed to demonstrate the benefits by describing the advantages of adopting CE principles and demonstrating how this can be done (A9).

Environmental Quality

During the interview, the AIP talked about their passion for the environment as a reason why they started working to promote CE within Arup. They spoke with enthusiasm about the C40 Cities Consumption project, which encourages people living in cities to dramatically reduce their consumption (A6).

Arup recognises that "*minimising negative externalities is a core aim of the CE. In the built environment these include climate change, water, soil, noise and air pollution.*" (Zimmann *et al.*, 2016). However, there is less of a focus on this in the reports, beyond the EMF approach that the CE will "*regenerate natural systems*", which appears in all the reports in different levels of detail. Much of the work that Arup has done is theoretical, this is due to the nature of its collaborations with EMF. The first phase, from 2016 – 2019, was focused on researching the applications, stakeholders, and benefits of CE in the built environment. The second phase, which started in 2019, is focused on collaborations that result in 'circular' buildings and practical solutions. Within Report A9, written at the end of the first phase of its EMF collaboration, government targets around emissions and climate change are used to frame the reasons for keys stakeholders to adopt the CE in the built environment.

Social Equity

During the interview and through the report examination, there is little explicit reference to SE as defined in the Research Design chapter (Kirchherr *et al.*, 2017). During the interview the AIP talks enthusiastically about the potential for CE to change the global economy and leave a better planet for future generations, but they do not seem to link this to the work that Arup is doing with EMF.

A few of the reports mention societal benefits (A3, A5, A7) but don't go into detail. Report A5, however, discusses the opportunity for CE in China to improve economic stability and access to the middle class, by lowering *"the cost of access to goods and services.* […] *A circular economy approach would also reduce the environmental impacts of this lifestyle."* (Ellen MacArthur Foundation and Arup, 2018, p. 10). The report talks of the potential to reduce pollution through changes to car ownership and culture and devotes a section to discussing the potential for circular food systems to improve the health of the population. The report also showcases examples of affordable housing projects around China, but only mentions how CE could improve access to this.

Consumer Focus

For Arup, the consumer refers to construction clients, and other supply chain stakeholders. The two reports titled *From Principles to Practice* (A4, A9) identify investors and construction clients as the main clients and stakeholders of CE in the built environment. The first report identifies these two groups as being essential to the success of CE in the built environment. As discussed previously, the AIP explains that clients, although they understand the qualitative benefits of CE, do not see the business or quantitative benefits of CE. Its projects must be built around demonstrating the financial benefits for the primary stakeholders. There are long supply chains within the built environment, even if Arup has a close relationship with the client in terms of the design, the consumer focus for the return or repair of the goods would fall to someone else (A1).

5.6.3 Circular Economy Implementation

This section explores the barriers and drivers faced by Arup when moving towards CE business models. As the publications focus on reporting its own research findings these sources are only used to highlight points made by the AIP, and it is made clear when this is the case. Table 5-19 highlights which aspects of the categories developed in the Research Design Arup has faced when developing its approach to the CE and encouraging adoption among its stakeholders.

Barriers

The barriers discussed below include those faced by the AIP when introducing CE as a concept to Arup as a whole, and those faced when convincing its stakeholders of the benefits of CE. The descriptions below point to barriers that existed before and after the EMF collaboration, and where it is clear, this difference has been highlighted.

Economic

The main economic barrier that exists for Arup's clients, in adopting the CE, is the cost of implementation, and ambiguity around the value of it.

> *One of the biggest barriers is that we still largely operate in a linear economy so to make the business case is super difficult, because when we're doing say the discounted cash flows we're using discounted rates, we're using depreciation rate which people have to use in order to get sign off from their commercial team*

(AIP interview)

It is focused on conducting research that emphasises the qualitative benefits of CE to convince its clients of its viability. As a part of a much larger whole, Arup's CE ambitions will fall short if its clients and supply chain are not also working towards a CE.

Social

Arup has found that language can cause a barrier to clients' adoption of CE business models, and client awareness of the overall issues. "*We've kind of also figured out that circular economy can be quite intimidating as a word and some people disregard it because they think it's a buzzword*" (AIP interview). Its research has also pointed to a lack of information being an issue as "*stakeholders throughout the value chain remain insufficiently familiar with how circular economy principles do or could operate in the built environment*." (Acharya *et al.*, 2018).

Category	Barriers – emphasis areas	Drivers – emphasis areas
Environmental	• Lacking a company environmental culture beyond mandated policy.	✓ Preventing negative environmental impact. ✓ Company environmental culture. • Resource constraints.
Economic	✓ High costs of implementation. • Lack of capital. • Limited funding.	✓ Business development, innovation, and new synergies. • Cost efficiency improvements. • New revenue streams.
Social	✓ Lack of social awareness. ✓ Lack of information. ✓ Lack of market mechanisms for recovery. ✓ Lack of clear incentives.	✓ Increased internationalisation and global awareness of sustainability needs. ✓ Potential to increase workplaces and vitality.
Institutional	• Complex regulation. • Lack of gov. support. • Lack of CE know-how among policy makers.	✓ Support from the demand network. • Regulation and standards requirements. • Supportive funds, favourable taxation, and subsidy policies.
Technological and informational	✓ Lack of information and knowledge. • Lack of technologies and technical skills.	✓ Potential for improving existing operations. ✓ New technologies. ✓ Increased knowledge sharing and networking.
Supply chain	✓ Lack of network support and partners. ✓ Strong industrial focus on linear models. ✓ Lack of collaboration and resources. ✓ Lack of standardisation. • Low virgin material costs.	✓ Management of reverse networks. ✓ Open collaboration and communication. • Potential for reducing supply dependence, avoiding high and volatile prices. • Increased availability of resources and capabilities.
Organisational	✓ Lack of compatibility with linear operations and targets. ✓ Conflicts within existing culture and lack of cooperation. ✓ Lack of management support and strong organisational hierarchy. ✓ Lack of CE knowledge and skills. • Siloed thinking and fear of risk taking.	✓ Potential to strengthen company brand and differentiate from rivals. ✓ Increased understanding of sustainability demands. ✓ Circularity ingrained in company strategy and goals. ✓ Development of skills and capabilities for a circular future.

Table 5-19: Barriers and drivers to CE implementation at Arup.

Institutional

Arup do not seem to face any institutional barriers, but it is worth mentioning why. Firstly, at the time of the interview it was researching CE from a purely theoretical standpoint (A9); and secondly, it is an international organisation so can conduct research in countries with favourable CE policies and implement the results of this research elsewhere (A2).

Technology and Informational

Before the EMF collaboration, there was a lack of knowledge in Arup around CE and its potential, with CE being consigned to the resources and waste management team. However, this barrier was removed once Arup became EMF knowledge partners and CE became integrated into the whole organisation with its own advisory team (A1).

Supply Chain

Arup is one part of a long supply chain within the built environment, this leads to challenges around getting suppliers and clients on board with CE principles.

> *It's a notoriously fragmented industry, more so than any other industry, and so Arup is one part of the value chain overall, and so how do we get our construction clients [onboard]? How to we talk to our suppliers to ensure that, in terms of project delivery, we are delivering circular economy?*

(AIP interview).

Organisational

Prior to the collaboration with EMF, the CE was one of many competing agendas within Arup, making it hard for the AIP to get heard and prioritised by important decision makers. *"Circular economy is one of many agendas, we are 14,000 people and everyone has a new exciting idea"* (AIP interview). This became easier once the collaboration with EMF started. Since then, Arup found that bringing the right people together to make sure all the CE elements are covered for a client can be difficult, especially if there is an area of expertise needed that is not covered by an internal employee, for example, property tax specialists or insurers. This can lead to difficulties making the business case for CE with external stakeholders, as the economy still operates in a linear fashion, which can affect the cost calculations and predictions (A1).

Drivers

The overarching driver for Arup working towards a CE is its collaboration with the EMF. This collaboration has contributed to a number of the categories explored in this analysis. The following section of the analysis highlights where the drivers are solely influenced by EMF or have come about through a different influence.

Environmental

The EMF partnership brought CE to the forefront of Arup's environmental culture; however, it was already working in other areas to reduce the impact of the built environment on climate change. The partnership moved the focus of CE from waste to tying it in with climate change mitigation and resilience to meet the Paris COP21 targets (A1).

Economic

For Arup, the key economic focus for CE for themselves, has been aims of business development, innovation, and new synergies, this is demonstrated through its EMF partnership and other collaborations developed through reports and projects. Arup is keen to discuss how CE can be of economic benefit to its clients and stakeholders (A3, A9). During the interview, a project example was highlighted that showed a reduction on capital expenditure for the client once CE principles on material flows were introduced (A1).

Social

Within the organisation there is a desire to learn about the CE, adding to the potential to increase workplace vitality. The AIP developed an e-learning module, which they have been informally told is the most participated in voluntary e-learning module so there is clearly an appetite for CE understanding among the workforce in general (A1). Arup conducted research with cities across the world on introducing circular concepts for the built environment, and as an international business, it is aware of global sustainability needs.

Institutional

Arup is supported by its network to research and educate on best practices around the CE and built environment. It works with several cities internationally to develop climate action plans but has seen an increased demand for circular strategies and approaches to city planning, and the built environment (A1). Its research also covers individual buildings and materials, so its research results are demanded by all parts of its network (A3).

Technological and Informational

The various partnerships Arup is involved with, and the reports it produces, contribute to an increase of knowledge sharing within the industry and beyond. For example, it is developing research that looks at the use of blockchain to help create material circularity within the built environment. This technology can be used to create material 'passports', which can trace a material throughout its lifecycle of use and reuse (A8).

Supply Chain

Arup is working on projects with parts of its supply chain to make the CE a higher priority through the development of new business models and exploring financial opportunities. As previously stated, the construction industry is notoriously fragmented, so this is important to gain more control over the supply chain and reverse logistics (A1).

Organisational

A speech by EMF at Arup's AGM in 2014 inspired the corporate leadership to think seriously about incorporating a CE agenda into the organisation's policy, by increasing the awareness of sustainability demands, and with a view to strengthen the organisation's brand. Following its membership of the CE100, top-level support for CE led to Arup becoming the Built Environment Knowledge Partner. This showed a sustained commitment to CE across the whole org and indicated a change in attitude to CE. Since then, circularity has become ingrained in organisation strategy and goals, the AIP's team has developed new internal training modules to give staff skills for a circular future (A1).
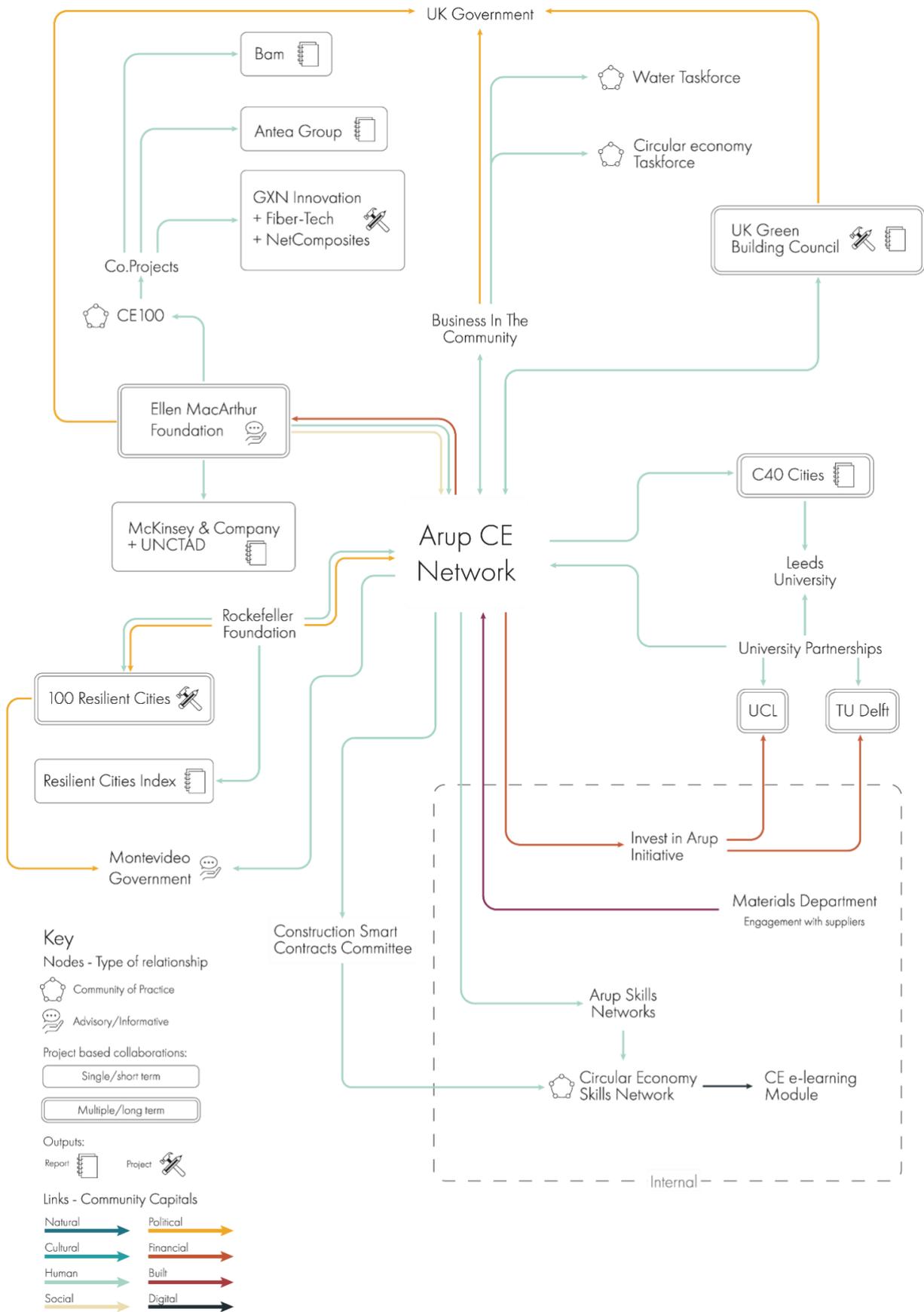
Figure 5-13: Arup Social Network map with Community Capitals Framework applied.

5.6.4 Community and Social Network Analysis

Analysing the nodes in Figure 5-13 reveals just three internal and external Communities of Practice, discussed by the AIP. However, there are many other connections that fall outside the CoP model but are important connections in advancing Arup's CE work and understanding. The ties in Figure 5-13 show a strong preference for Human and Political Capital relationships, this is reflective of Arup's CE remit at the time, which was focused on researching how CE could be implemented in the built environment. The nodes and ties are discussed further below.

Nodes

Community of Practice		Internal CE skills network	CE100	BITC CE Taskforce
Size	small, a few expert individuals → very large	Medium	Large	Small
Lifespan	months and years → generations	Few years old	Since 2013	BITC created around 40 years ago
Location	collocated or distributed	Distributed (global)	Distributed (global)	Distributed (UK)
Make up	homogeneous (same discipline or expertise) or heterogeneous (across disciplines)	Heterogeneous	Heterogeneous	Fairly homogeneous - members have similar job roles within different companies
Level	Micro, meso, macro.	Meso	Macro (across businesses and countries)	Meso
Formation	spontaneous or intentional	Intentional	Intentional	Intentional
Relationship to org.	Unrecognised Bootlegged Legitimised Supported Institutionalised	Institutionalised	Institutionalised	Legitimised

Table 5-20: CoPs participated in by Arup.

The SNA explores relationships that were mentioned in the interview and some that have been revealed through the document analysis. The research has been careful to focus just on these areas so as not to get overwhelmed by the data.

This section first looks at the different CoPs Arup is involved with, internal and external, before highlighting a few other key relationships.

Communities of Practice

Table 5-20 shows the main internal and external CoPs that Arup and the AIP are involved in. Arup is involved with other external CoPs, identified and explored through the SNA, however, not enough detail about these groups was revealed during the interview or subsequent data analysis to be included here. The three CoPs listed here are central to Arup's approach to CE, and the work of the AIP (A1).

Internal

CE Skills Network functions across internal teams, based around either topics or specific skills. The AIP set up the CE skills network to develop CE as a general design philosophy approach.

> *[S]o we formed an internal network that people from across different services and teams can actually discuss circular economy, but also share best practice, share pains and successes on projects.*

(AIP interview)

Arup has created a strong network of people across the globe who are engaged with CE in different capacities and have created a strong environment for learning and sharing best practice.

External

CE100 is the key external CoP, set up by EMF to bring together different organisations to work on projects with a CE focus. This CoP uses its members' wide range of expertise and experience to create shared solutions to global problems. The EMF holds acceleration workshops for all its CE100 members twice a year, these workshops consist of general presentations but also "*working sessions and thematic, in-depth insight knowledge sharing sessions*" (AIP interview). During these sessions, organisations can pitch ideas and tout for collaborators for *co.projects,* see Figure 5-14. Through these sessions, Arup has collaborated on work that has led to the development of a white paper[9], a report[10] and a prototype[11]A1. In the time since the work on these CE100 outputs was completed, it is hard to see whether anything else CE related has come of the collaborations.

Business In The Community Circular Economy Taskforce (BITC) brings together *"CEOs and other senior executives committed to delivering a high impact programme to bring the circular economy to life."* (Business in the Community, n.d.). Arup is involved in a number of BITC's Leadership Boards and

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[9] https://acrplus.org/en/epr/water-and-circular-economy-white-paper

[10] https://www.arup.com/news-and-events/new-report-reveals-the-benefits-of-circular-business-models-for-the-built-environment

[11] https://www.archdaily.com/605300/arup-and-gxn-innovation-s-biocomposite-facade-wins-jec-innovation-award

Taskforces. The AIP has attended some of these groups and has found that CE is often discussed in the different groups but rarely are these discussions linked back to the CE taskforce, which can result in fragmentation of ideas. The *Water Taskforce* is an example of this, which necessitates its inclusion in Figure 5-13: (A1).
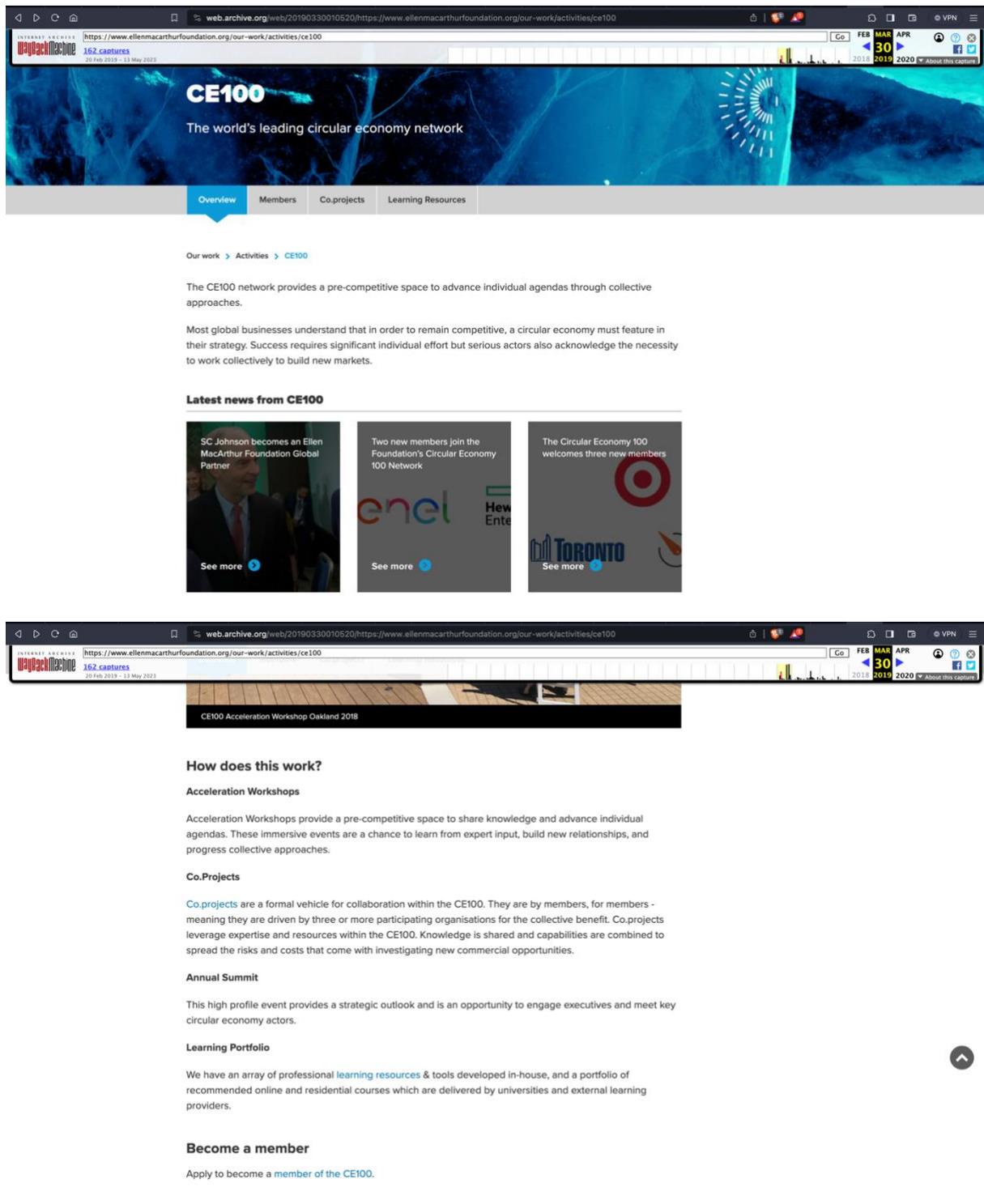
Figure 5-14: Screenshots of the CE100 webpage, explaining the purpose of the group. Webpage now deleted.

Other Key Nodes

Arup's CE network is made up of a reasonably small number of strong links to other organisations primarily through long term collaborative partnerships, demonstrated through multiple projects. The analysis works around the map in a clockwise direction from the EMF.

Ellen MacArthur Foundation

The EMF is a key link and the collaboration has led to a number of projects and reports, either through the CE100 group or as an independent collaboration, as demonstrated by the McKinsey and Company with United Nations Conference on Trade and Development (UNCTAD) collaboration, which led to Report A5. Online document analysis revealed that overall Arup has led on three CE100 co.projects, which have resulted in two reports and a prototype project.[12]

Universities

The university partnerships are a key point on the map demonstrating that the connections here are cyclical in nature, and beneficial to all parties. UCL and TU Delft are highlighted here as they are specifically identified by the AIP as providing important research collaborations for CE projects funded by *Invest in Arup* (A1).

Rockefeller Foundation

As previously mentioned, the Rockefeller Foundation collaboration was a long-term project that produced the Resilient Cities Index and the 100 Resilient Cities Project. It is included in the SNA to demonstrate Arup's international collaborations and as it was highlighted in the interview as an important project leading to CE partnerships outside of the EMF relationship (A1, A10).

Internal Nodes

Within the internal connections section of the map, there are a couple of important areas. The materials department was identified by the AIP as a key stakeholder within the organisation for CE projects through its engagement with suppliers. The CE Skills Network produced the CE learning module for internal colleagues and have also engaged the Construction SMART Contracts Committee to develop an understanding of how these initiatives could be implemented.

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[12] https://us.anteagroup.com/en-us/blog/applying-circular-economy-principles-sustainable-water-system-management Antea group collaboration.

https://www.arup.com/perspectives/publications/research/section/circular-business-models-for-the-built-environment BAM collaboration.

https://www.asce.org/magazine/20150317-self-supporting-biological-composite-facade-unveiled/ GNX Innovation, Fibre-Tech and NetComposites collaboration.

Ties

Type	Incidences of Capital
Natural Capital	0
Cultural Capital	0
Human Capital	24
Social Capital	1
Political Capital	6
Financial Capital	4
Built Capital	1
Digital Capital	1

Table 5-21: Incidences of the different Community Capitals in Arup's SNA

This section uses the CCF to explore the value of each of Arup's ties detailed on the stakeholder map. The incidences of each connection are then recorded in Table 5-21, each of the capitals present in the SNA are explored in the following section, looking at the most frequently identified capital first.

Human Capital

As Arup's role within the EMF is one of developing and researching theoretical applications for the CE it is not surprising that its most frequent tie is that of Human Capital (A1). Many of the ties identify that Arup's staff are learning and developing Human Capital as much as teaching and enhancing the Human Capital of others in their network. Many of the outcomes of its collaborations are report-based, so it is developing Human Capital and knowledge beyond its networks too (A13).

Political Capital

EMF, BITC, the UK Green Building Council and the Rockefeller Foundation all provide Arup with links to the UK and other national governments. This gives Arup access to policymakers and the chance to shape the advice on CE in the built environment, on national and international levels. This can be seen directly through its work advising the Government of Montevideo on CE strategies, to help them meet their resilience targets (A10).

Financial Capital

Arup utilises its Financial Capital to add to its knowledge base and improve Human Capital throughout the organisation. It does this through *Invest in Arup*, a programme that encourages employees to apply for funding to develop research alongside universities, expanding its influence and scope of the research (A1). These projects can take place internally or with external partners; through this programme, the AIP has run CE projects with TU Delft and UCL (A13). Arup also makes a substantial financial contribution to EMF to be the Built Environment Knowledge Partner (A1). This gives EMF access to further research funding and access to the built environment sector through trusted experts.

Social Capital

There are only a couple of Social Capital connections identified in the SNA: most notably, the connection with EMF, which was only established once Ellen MacArthur spoke at Arup's AGM and consulted with the directors personally (A1).

Built Capital

The Built Capital ties relate to those connections that provide physical infrastructure to Arup. In the examples explored in the analysis this is the AIP's tie with the materials department. This department creates a link with the suppliers and provides the opportunity to engage CE further up the supply chain through physical resources.

Digital Capital

Digital Capital can be demonstrated through the e-module created by the AIP, this has become a popular voluntary course for Arup employees and has led to an increase in CE awareness across the organisation (A1).

Natural and Cultural Capital

The connections explored do not demonstrate any value added through Natural or Cultural Capital. However, it can be argued that through reducing carbon emissions in its buildings by encouraging structural and façade changes like green roofs and walls Arup is contributing to Natural Capital, but as none of these projects were explicitly mentioned in the interview, only in the reports, they have not been included in the stakeholder map.

5.6.5 Summary

Through this case study, the research explored the attitudes of a large multinational that became the public face of the CE in the built environment through its collaboration with the EMF. The data gave an overview of the agendas that have created its attitude to CE and explored the community capitals that are engaged through its CE network. Arup is heavily focused on Human Capital improvements through its collaborations, either for internal staff or to educate its sector and beyond. This is reflected in its position as the EMF Knowledge Partner.

The next section brings all the case studies together in the cross-case analysis, revealing the key patterns and highlighting interesting differences.

Chapter 6 Discussion and Responding to the Research Questions

The case studies explored have provided the research with comparisons across the attitudes and approaches of different business models, as well as organisations of different sizes and industries. Insights have been gathered into a large organisation with CE principles embedded in their business model over many years, which has meant that they can now focus on other aspects of the CE. Two recently established organisations are closing loops in their areas and industries, but face challenges around implementation; a large multinational organisation who were also exploring the CE, and how it could be implemented in their sector; and finally, an organisation using CE principles without acknowledging their involvement and viewing the CE as solely enhanced recycling.

6.1 Introduction

This chapter starts with the cross-case analysis, which considers in detail the data explored in the previous sections, to find patterns and commonalities across the case study organisations. It follows the research design framework, and explores in detail each of the research questions, using the data discussed in the individual case studies to answer them and comparing this data to the literature discussed in Chapter 2. The chapter then goes on to detail this thesis' unique contribution to knowledge, describing a framework that developed through the analysis and discussing feedback to the framework.

The previous chapters explored and synthesised the data from each of the case study organisations (CSOs), employing methods developed in the Research Design chapter. This chapter interprets and analyses the data across the CSOs, focusing on patterns that appear important and relevant to all the CSOs. It also discusses overarching themes that have emerged through the data and provides answers to the research questions, using the questions to form the structure of the chapter.

RQ 1: How do organisations approach the circular economy?

RQ 2: How important are Communities of Practice to an organisations circular journey?

RQ 3: Which capital flows are the most important to an organisations network?

RQ 4: How do organisations engage with and use their communities to further their circular economy ambitions?

These propositions are approached as individual units. The first follows a cross-case synthesis technique (Yin, 2009), which allows analysis across the uniform framework developed through the individual case studies in the previous chapters. Through the data displayed, it highlights whether there is a community influence on the CE aspect being scrutinised. The first section uses the themes previously laid out in the Research Design chapter and followed through the individual case study chapters to explore similarities and differences between the case studies. It follows the same structure as the individual chapters, firstly looking at the CE interpretation through the CSOs engagement with the 4Rs; their systems perspective; their positions on the aims of the CE; and whether there is a consumer focus. This section also identifies where the CSOs community or network ties have had an

influence on their CE interpretation. The second part of this section examines the cross-case study patterns revealed through the barriers and drivers to CE themes explored in the individual case study section. The second proposition utilises the quantitative data provided by the social network analyses and community capitals framework to draw out the role of community. Following the SNA and CCF ensures the research keeps to the mixed method approach outlined in the Research Design chapter. The first and second sections are focused primarily on comparing the data with themes developed through the literature review and laid out in the Research Design. The third section focuses on analysing where these two sections overlap and interact, developing and exploring the emergent themes from the previous two sections and the individual case studies.
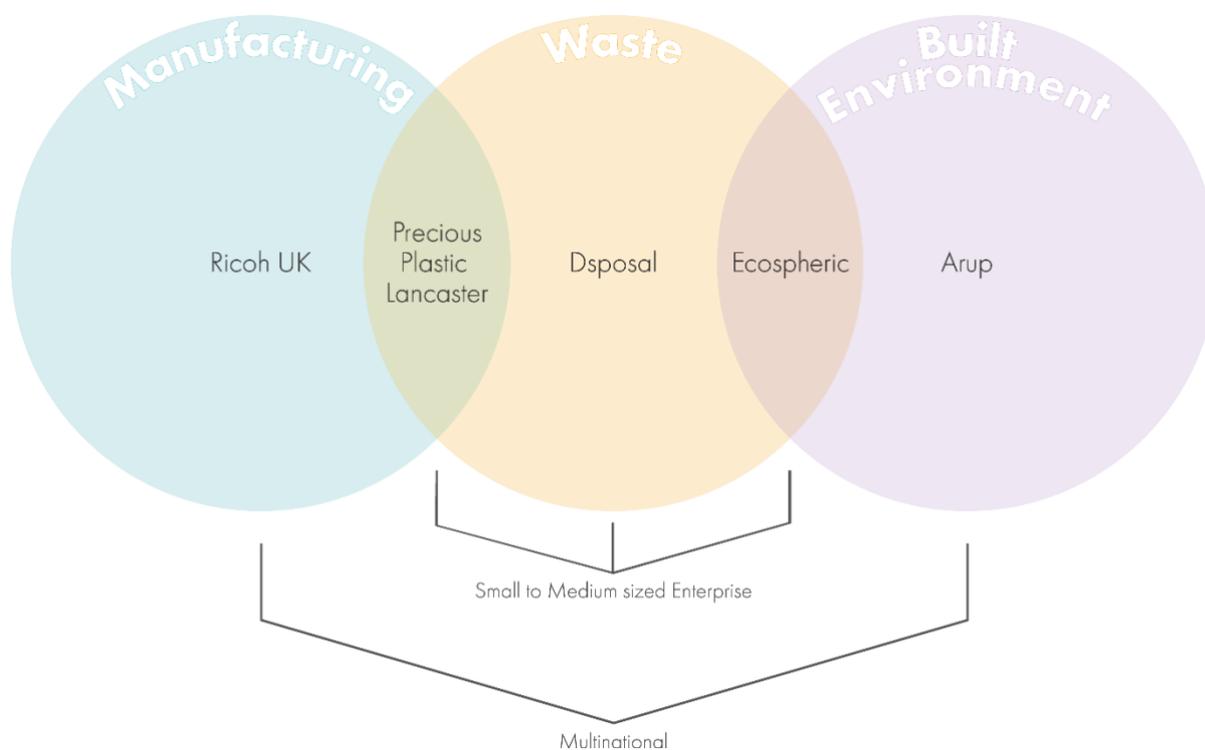
Figure 6-1: Case studies ordered by category.

Each section starts with a summary of the findings before describing the analysis methods used to draw these conclusions. The analysis focuses on the similarities between the case study organisations (CSOs) and whether these similarities cross all the CSOs or apply across the categories defined in the introduction, as shown in Figure 6-1.

The different themes explored through the analysis were not explicitly interrogated during the interviews but deduced from the interview and document data. This was due to a desire to allow the themes to develop more naturally and reveal more about what the interview participant deemed important, rather than being pushed in a certain direction. There was also a desire to not confuse or

interrupt the flow of the interview with terms that might have been unfamiliar to the interview participants.

6.2 Overview

Through the exploration of the CSOs' engagement with the CE, the network connections, and communities they are involved with, this chapter develops three overarching themes that can be applied to the connections of circular organisations: knowledge exchange; experimentation through collaboration; and power and influence. The development of these themes has arisen through the identification of similarities between the networks of each of the CSOs, these subthemes fall under the categories of local community involvement; the Ellen MacArthur Foundation (EMF); university funding and research; local government influence; and UK government influence. Each of the case study organisations have connections to at least three of these areas.

The cross-case analysis of the CE interpretations and themes looked at whether there is an influence of the CSOs communities in those areas. Through the analysis, it was revealed that communities have a much bigger influence on every aspect of the CE interpretation. In the CE themes section, there were a number of drivers identified by all the CSOs that were influenced by the organisations' communities and networks. Despite the different sizes and industries of the CSOs there were many similarities between the organisations examined. This was particularly highlighted by the similarities between the barriers and drivers found by the organisations when implementing circular strategies.

The Community Capitals Framework (CCF) emphasised the importance of Human Capital connections through the SNA and ascertained the significance of social and Political Capital within the CSOs networks. There was also an acknowledgement of the importance of Natural Capital within the CE models proposed by EMF that is lacking from most of the CSOs network.

The different areas examined in this analysis have identified where organisations wanting or preparing to work in a circular future should focus when establishing different connections. It also highlights the need to establish connections at all different levels from grassroots communities to professional networks.

6.3 RQ 1: How Do Organisations Approach the Circular Economy?

6.3.1 Summary

The analysis shows that there are many similarities between the case study organisations, despite the distinctions in size and industry, particularly in how they approach and understand the CE. There are similarities based on industry: for example, the manufacturers place a higher value on recycling than the built environment organisations, who are more focused on long-term reuse of building parts. Surprisingly, all of the CSOs are involved in the CE at all levels of the systems perspective; there was an assumption, at the beginning of the research, that the smaller organisations wouldn't have the capacity to engage at every level. During the initial review of the data, engagement across the systems perspective was only seen within the larger organisations, however, a detailed examination of the data revealed that every organisation, regardless of size, had some sort of involvement with the CE at the micro, meso, and macro levels. The different organisations were also similar in their aims for the CE, predominantly putting environmental quality (EQ) over the other aims stated. For the multinationals, the interview participant was employed to promote or work on this area within their organisation so this data should be taken in context. There was also importance placed on social equity (SE) by some of the CSOs, that, according to the literature (see section 2.2.2), was not to be expected. PPL and Dsposal were actively developing strategies to improve SE, and the Arup interview participant spoke about their personal feelings towards ensuring the CE transition was just and equitable.

If this research were to just examine each of the CE framework elements as individual indicators of CE, most of the CSOs would show a weak sustainability perspective (Lazarevic and Brandão, 2020). Either through the R framework or the systems perspective. However, when the individual frameworks are examined alongside one another the results are more mixed. The strongest sustainability perspectives shown through the CE work are from PPL and Dsposal, who balance people, planet, and profit through their work. Ecospheric positions itself as sustainable but its lack of focus on society reduces its legitimacy. This is also the case with the two multinationals who may have a Consumer Focus but their work towards SE, while it exists for Ricoh UK, is lacking in fullness. The work that Arup does is very report based, and it is difficult to see where these reports have led to concrete actions from Arup or institutional changes. The strongest position of the weak – strong sustainability perspective advocates for degrowth of the economy (Hobson, 2013), this is not a position taken by any of the CSOs.

The barriers to implementing a CE were different across the case studies, this was to be expected, as all the case study organisations were at different stages in their circular journey and the size of the organisation would affect certain emphasis areas within the categories. More surprisingly, several drivers could be applied across the case study organisations. These are: preventing negative environmental impact; business development, innovation, and new synergies; new technologies; increased knowledge sharing and networking; open collaboration and communication; and development of skills and capabilities for a circular future. They show an unspoken consensus among organisations interested in CE and may go some way to explaining the similarities that were observed through the CE interpretation.

Through the interviews, *communication* was revealed to be a significant barrier for the CSOs. This was not featured in the original barrier and driver framework used to examine the data but was expressly stated in the interviews as a problem for the CSOs in communicating the CE to their clients, supply chains and communities. Due to CE's lack of standard definition, as discussed in section 2.2.8, there was concern expressed that the CE could be seen as a buzzword or corporate greenwashing.

6.3.2 Circular Economy Interpretation

This section explores the CSOs' interpretations of the CE. Where appropriate, the following sections have been numerically codified to indicate priority of a method or interpretation, where 1 = highest priority and x = lowest, depending on the scale of what is being measured, for example, in the 4 Rs section the scale is 1 to 4 as there are 4 Rs being measured. 0 = a lack of data, so this point is discounted. To assess the priority the frequency of mentions in the interview and subsequent document analysis was tallied in NVivo, the higher the number of paragraphs that mention the subject, the higher the priority. Where there is no numeric codifying, it was not clear from the data whether there was a priority.

Each section starts with a table showing the codification of that section, whether numeric or not before a detailed synthesis of that section is explored. Within the tables, an asterisk is used to identify if there is a community or network link to that element of the analysis. This is explored further in section 6.6, and builds the response to Research Question 4.

4Rs

As discussed in section 2.2.4, the 4R framework was used to examine the data over the newer 10R framework which kept the examination concise. The 4Rs allowed for an examination that was comparable across each CSO as not all of them were manufacturers, which is what the 10R framework generally refers to (Liu *et al.*, 2022). When examining CE organisations, it is becoming increasingly important to consider the industry in which that organisation operates. Although CE started with a

focus on manufacturing, there are now organisations that engage and operate within CE beyond the production of goods. Using the R framework as a guide across CE-engaged organisations helps to prevent greenwashing by examining an organisation's actions (Kirchherr, Reike and Hekkert, 2017). Despite not being a producing organisation, the work that Dsposal does can be seen to cover all the Rs. This demonstrates the need to include the R framework when examining CE organisations across different industries.

Across the CSOs recycling and reuse are cited as the most important of the 4Rs. Recycling is very much seen by the manufacturer CSOs (Ricoh UK and PPL) as a key way of engaging with the CE, they have both developed recycling processes as a source of income, in PPL's case it is their primary source of income, and for Ricoh UK to save money on virgin resources. On the waste hierarchy, recycling is placed at the lower end as it is the most energy intensive of all the processes and materials can lose properties and functionality the more they are recycled. Due to this, if an organisation was just focusing on recycling and/or recovery as part of its CE engagement, it would fall under the *reformist* framing discussed in section 2.1, however, when examining the CSOs wholistically the research shows

	Reduce	*Reuse*	*Recycle*	*Recover*
Ricoh UK	3 – reduction of waste, esp. plastic pellet waste. *	2 – employees encouraged and supported to reuse packaging. Remanufacture office machinery.	1 – develop waste streams as source of income. Use reverse logistics to recycle their products. *	4 – their definition of Zero Waste includes waste-to-energy recovery which is used in some circumstances.
PPL	2 – educate on plastic reduction through outreach programmes. *	3 – create more reusable products out of "single use" plastics.	1 – manufacturers of products by recycling waste plastic material - primary source of income. *	4 – Advocate against recovery.
Dsposal	1 – reduction in waste through system. *	1 – encourage reuse by linking waste producers with reusers. *	1 – encourage recycling by linking waste producers with recyclers. *	1 – could contribute to recovery. *
Ecospheric	2 – working with suppliers to reduce demand for packaging coming onto FH site. *	1 – provided instructions to reuse all brick and timber within PH project	4 - don't see recycling as part of CE.	0 – recovery is not discussed.
Arup	2 – exploring how to reduce consumption in construction. No commitments to reduce own production. *	1 – focus on reuse of buildings and reuse of materials in construction. *	3 – focus on recycling building materials, and tracking resources with blockchain. *	0 – recovery is not discussed.

Table 6-1: 4Rs rated by importance to each of the CSOs.

that where the CSOs fall short on the waste hierarchy they are more engaged in other areas. The R-hierarchy is seen as a fundamental part of the CE, but this does not consider other actions organisations are taking to engage with the CE either within their business models or through their wider community engagement.

Regarding recovery, only the manufacturers speak about this end of the 4R spectrum. Ricoh UK freely admits that its remit is "no waste to landfill", which would allow for energy-from-waste recovery, but due to the UK's limited capacity at the time of implementation, they had to look to other solutions. This does mean that some of their waste goes to energy-from-waste recovery facilities but not as much as could. The PPLIP on the other hand, was very conscious of where their work fell on the 4R hierarchy, and that although recycling is not the ideal place to be positioned, it is right for PPL as it provides a platform to actively advocate against energy-from-waste recovery, viewed as destroying resources that could be recycled into something new.

As Dsposal are a tech platform engaged in industrial symbiosis, linking waste producers with waste consumers, they do not show any preference to any of the 4Rs. Their clients could be engaged in any of them, but it is not for Dsposal to dictate how the waste is used. This is the case because their primary business falls outside of the more traditional view of the CE, as focused solely on manufacturers or producers.

Reduction is regarded as an important part of the CE. It can be interpreted as an overall reduction in production of commodities or a reduction in waste or use of a resource, for example using less of a resource to produce the same thing. The CSOs are all committed to reducing waste through incentives and processes, which are discussed in the individual case study chapters, however, as all of the CSOs are businesses within a capitalist system, there is not much appetite to reduce the amount that they sell. This is a fundamental flaw in the adoption of the CE, as it is greatly constrained by the current economic set up, and there is very little appetite to break out of this deeply embedded system. This is covered in further detail in Chapter 8.1, as it is an important aspect of the CE that is not always considered.

Systems Perspective

Examining the CSOs through a systems perspective revealed that they are all engaged in the CE at every level. The meso level is where each of the CSOs are most engaged, and where the analysis initially identified the influence of community and networks. This section of the analysis did not rate each of the perspectives numerically, as the data gave a more general overview of each, and for each of the CSOs there was one level that could be regarded as the most important, but the other levels are rated equally. The influence of community is discussed at the meso level of implementation in this

section rather than the following, as this level is very much focused on networks. The other incidences of community engagement through the systems perspective are discussed further in the chapter.

Each of the CSOs takes a system approach that crosses all three systemic levels. At the micro level, only Arup does not actively engage in the product level, however, it still takes an advisory view across its supply chains regarding products that can be implemented in their buildings. Ecospheric, focuses much of its systems approach on the product level, developing its projects as a test bed for products that can help them implement sustainable circular systems. The CSOs that primarily work at a micro level are Ricoh UK and PPL through their primary businesses as manufacturers, and Dsposal through its tech platform. However, as has been detailed in their individual case study write-ups, they are all involved in the other levels through other aspects of their businesses.

The meso level of CE implementation is where the analysis starts to reveal the importance of communities and networks to the CSOs. Within this research, this level of systems perspective primarily focuses on networks and engagement outside of the organisation. This builds on the literature discussed in section 2.2, demonstrating how localised implementation could take place from the ground up, contrasting the specifically designed eco-parks (Mathews *et al.*, 2018), through engagement with local institutions, and other key local stakeholders. This paragraph highlights the university connections which exist for each of the CSOs. Through these links they develop courses or research, which furthers their CE and sustainability agendas. This engagement with universities shows that each of the CSOs is looking to a wider implementation of CE through their area of expertise.

	Micro	*Meso*	*Macro*
Ricoh UK	Manufacturers – CE at product level	Local best practice networks. University collaborations *	Global corporation with org. wide CE implementation
PPL	Manufacturing from local plastic waste *	Engagement with local university, community, and businesses *	Member of global PP community *
Dsposal	Individual material or waste stream tracked through tech platform	Regional and country wide connections between waste producers and processors *	Research collabs. with universities, regional and national governments *
Ecospheric	Focus on applicable CE tech or tools *	Inform and educate through showcase projects. University collabs *	Industry level influence through media & conferences *
Arup	Advisory view as not manufacturers	Research into city level CE implementation *	Focus on research and educating built environment and construction industries *

Table 6-2: Summary of each CSOs systems perspective

Engagement at the meso level, through education and research, demonstrates a systems perspective that goes beyond the day-to-day of their work and shows a priority for future conversations around CE. It also develops Human Capital for themselves and their staff and for others outside their organisations who learn from the collaborations.

At the macro level Ricoh UK, Ecospheric, and Arup all use their experience and exposure to influence their industries, however, it is not clear from the data whether this influence has any impact on their wider industries. This could be an opportunity for further research. The literature in this area mostly discusses speculative implementation, as there are currently very few, if any, examples of successful macro-level CE implementation. PPL is the only SME to engage on an international level, through their membership of Precious Plastic. Taking a macro systems perspective through being part of this international network allows them to engage with others and create collaborations outside of what would normally be available to a small community interest company start-up. Positioning PPL's international engagement within a macro-perspective provides an example that demonstrates concrete actions being undertaken at an international grassroots level, possibly having a bigger real-world impact than the multinationals with industry and government influence.

Aims of the Circular Economy

This section examines the CSOs' aims for working towards a CE, based around the three dimensions of sustainability in business environmental quality, economic prosperity, and social equity (Geissdoerfer *et al.*, 2017). It is argued that these three elements need to be in balance for sustainable development (see section 2.2.2). Most of the CSOs prioritise one or two of the aims over the others, however, most do focus on all three in some way. This contrasts the observation made by Kirchherr *et. al.* that *SE* is largely overlooked by the CE concept, almost all the CSOs discussed it in some context during the interviews. However, Table 6-3 shows that it is only a specific focus for two of the CSOs. By not balancing their focus on all three of the tenets for sustainable development, the organisations could be failing to work towards a CE that takes a strong sustainability perspective. shows that it is only a priority aim for two of the CSOs.

Environmental Quality

All of the CSOs place EQ highly as an aim for working within and towards a CE. However, they all see this through different lenses: for example, PPL want to reduce waste plastic and therefore reduce pollution, whereas Ricoh UK, have biodiversity improvement as an overarching aim for its long-term goals, leaving the interpretation of how this is done to the individual plants. Dsposal discusses EQ as an aim through its founders' story. It pushes this ethos as a fundamental part of its identity as a company and sees its background as an important driver in its work. Ecospheric also express EQ as its primary aim to being more sustainable. However, its focus is through learning and testing new ways

of doing things, it sees its work as a test bed for innovation, the most interesting of which is happening in sustainability. The Ecospheric interview participant demonstrated that their interest in sustainability had developed through personal projects and learning from innovative sustainability centres such as CAT and Tindall Centre, Manchester. Arup is the only CSO that does not place their highest aim on EQ. There is a feeling throughout the interview and document analysis that "it goes without saying" that the environment is important, but it is not explicitly stated, beyond that which the EMF has set out.

Economic Prosperity

For Arup, EP is the primary aim of the CE. This is where it focuses its research, and the interview participant expressly stated that they need to be able to demonstrate where costs can be cut, and savings made, to demonstrate the benefits of a CE to the different parts of the supply chain. EP was also identified as an important aim for Ricoh UK and Ecospheric. For the RIP, they had to be able to demonstrate that the programmes that they were introducing to the company were worthwhile, which was ultimately measured through profit margins and savings. For the two large multinationals, it aligns with their corporate status that EP is a primary or secondary driver, as they are deeply embedded in the capitalist system that dictates profit over everything else, for them to develop ways

	Economic Prosperity	Environmental Quality	Social Equity
Ricoh UK	2 – develop cost cutting and income streams through CE implementation	1 – biodiversity regeneration is an overarching approach to sustainability for Ricoh UK *	3 – related to environmental quality around biodiversity benefiting the local farming communities *
PPL	2 – not an explicit priority beyond keeping the business afloat	1 – established to reduce plastic waste to improve EQ	1 – established as a community interest company to improve their community rather than shareholders *
Dsposal	3 – not an explicit priority beyond keeping the business afloat *	1 – strong ethos developed through previous work and experiences	2 – see the potential of CE to improve social equity but are not sure of the best way to work towards it.
Ecospheric	2 – not a priority aim as experience has shown that there is a high demand for their consultancy work *	1 – developed skills to improve EQ through collaborations *	0 – developing strategies with GMCA in regard to local housing but this is an aim of GMCA not Ecospheric *
Arup	1 – educating clients on the economic benefits of CE as their support is seen as key *	2 – Enthusiasm from IP but no tangible commitment to the environment other than what EMF have already set out.	3 – AIP is personally enthusiastic about social equity, but this is not demonstrated through Arup's work.

Table 6-3: Aims of the CE rated by importance for each Case Study Organisation.

out of this system is an interesting challenge. Ecospheric does not expressly state that EP is an aim of working sustainably, as it is in a fortunate position where its consultancy service is in such demand that it can afford to develop smaller, more experimental projects at a loss, such as the Passive House project. The EIP stated that when it needs money it just starts up the consultancy business for a while, which, although time consuming, brings in funding for experimentation.

Social Equity

During the discussions with the interview participants, it was clear that SE was an important issue for some of them, but most struggled to state how this goal would be achieved within their business frameworks. As well as being part of the three aspects of sustainability, the Research Design included SE as there needs to be "*discussion on how CE aims to protect, transform, strengthen and/or develop the society, human well-being and/or jobs*" (Kirchherr, Reike and Hekkert, 2017). Of the CSOs, PPL and Dsposal prioritise SE, and both were working on strategies to develop this area. During the UK COVID-19 lockdowns, Dsposal found there was an increased demand for their platform from householders unable to dispose of waste in traditional ways, this led to the development of a not-for-profit branch the organisation, which opened up their service for non-commercial recycling and reuse. This area of CE had been one that the DIP had discussed in the interview as being the hardest to implement without causing a big detriment to their income. PPL developed as a Community Interest Company (CIC) as they realised that there was a strong appetite for their services locally, but an important part of why they started was to engage their local community with plastic waste and recycling.

Consumer Focus

The summaries in Table 6-4 show whether the CSOs have a consumer focus. Of the five CSOs, Ricoh UK, PPL and Dsposal, have a clear consumer focus through their engagement with their communities, which helps them to develop new areas and new ideas. This moves the consumer away from a passive purchaser to someone with more influence over the goods and services they receive. This evidences some of the ideas discussed in section 2.2.5, encouraging consumers to "*behave in accordance with the* [sustainability] *goals*" (Daae *et al.*, 2018, p. 522). For PPL, consumer focus is clear through its registration as a CIC and the aim to engage the public with its work. This is not only because the public are its consumers, but that they also provide sources of plastic for the workshop and are able to bring their own ideas to the sessions. PPL are very open to what consumers might want, developing

Ricoh UK	*PPL*	*Dsposal*	*Ecospheric*	*Arup*
Have developed reverse logistics to ensure consumer is part of CE *	Clear focus through engagement with public *	In close contact with clients to improve service and develop platform *	Position themselves as consumers	Part of a long supply chain so don't deal with the final consumer

Table 6-4: Summary of the consumer focus for each CSO

collaborations with potential clients to understand new market opportunities. Dsposal is in close contact with its clients to improve its services, building the platform around the clients' needs. Potential new clients are engaged through its network by the development of collaborations and research.

6.3.3 Circular Economy Implementation

This section looks at an overview of the themes explored in the individual case studies. To explore the barriers and drivers, each of the categories are compared using the breakdowns developed in the individual case study chapters. Table 6-5 and Table 6-6 show where a barrier or driver is present across all the CSOs, highlighted in ==yellow==; where the barrier or driver effects all but one CSO, in **bold**; and where there is no impact on the CSOs, denoted by ~~strikethrough~~. The text below explores the most interesting or surprising of these and highlights any other categories of interest.

This section does not identify where the CSO networks or communities are influential as the categories are structured in a way that expressly identifies how networks can be barriers or drivers. However, some of the discussions focus on the community influence in the two sections that follow.

Category	Barriers – emphasis areas	Ricoh UK	PPL	Dsposal	Ecospheric	Arup
Environmental	☆ Lacking a company environmental culture	✓	-	-	-	-
Economic	- **High costs of implementation**	✓	✓	-	✓	✓
	- Lack of capital	-	✓	✓	-	-
	☆ Limited funding	-	✓	-	-	-
Social	- Lack of social awareness	✓	✓	✓	✓	✓
	- **Lack of information**	-	✓	✓	✓	✓
	- Lack of market mechanisms for recovery	✓	-	-	-	✓
	- Lack of clear incentives	-	✓	✓	-	✓
Institutional	- **Complex regulation**	✓	✓	✓	✓	-
	☆ ~~Lack of gov. support~~	-	-	-	-	-
	- Lack of CE know-how among policy makers	✓	-	✓	-	-
Technological & informational	☆ Lack of information and knowledge	-	-	-	-	✓
	☆ Lack of technologies and technical skills	✓	✓	-	✓	-
Supply chain	☆ **Lack of network support and partners**	-	✓	✓	✓	✓
	- **Strong industrial focus on linear models**	✓	-	✓	✓	✓
	- Lack of collaboration and resources	-	✓	✓	-	✓
	- ~~Low virgin material costs~~	-	-	-	-	-
	- **Lack of standardisation**	✓	-	✓	✓	✓
Organisational	- Lack of compatibility with linear ops. and targets	-	-	-	✓	✓
	- Siloed thinking and fear of risk taking	✓	-	✓	-	-
	- Conflicts within existing culture and lack of cooperation	✓	-	✓	-	✓
	- Lack of mgmt. support and strong org. hierarchy	-	-	-	-	✓
	- Lack of CE knowledge and skills	-	-	✓	✓	✓

Table 6-5: Comparing the barriers faced by the CSOs when implementing circular systems.

Barriers

The data reveals that a *lack of social awareness* is the only barrier that effects all five case studies. This relates to them all using their platforms to educate their networks and indicates a general recognition of the state of social awareness of CE and environmental issues. This reflects the literature examined in section 2.2.8, that discussed the difficulties with getting the public to engage with CE. In all of the CSOs, it would be easy to speculate that this has become a driver to engage their networks, by educating and sharing knowledge on their area of the CE, although there is no explicit evidence for this.

Lack of government support was not an explicit barrier faced by any of the CSOs. As this criterion was developed using a number of articles, some of which were published before the UK industrial strategy was developed, which lay out the government's commitment to CE; there was more awareness of CE among policy makers at the time of the interviews, and more freedom to implement circular systems than when the research cited was conducted. Only Ricoh UK and Dsposal found a lack of knowhow among policy makers as a barrier, and these two CSOs are the organisations working most closely with government departments on CE strategies. The other barrier not faced by any of the CSOs is *low virgin material costs*, which is due to the research not explicitly examining material costings and being conducted with businesses already working in CE, so with a commitment to reducing their impact.

A *lack of standardisation* was a barrier for all the CSOs except PPL, for whom it can be seen as a driver. Confusing plastic recycling messages from producers and government gives PPL a source of plastic to recycle that falls outside of "desirable" plastic waste, which is mainly PET, used to make drinks bottles.

Returning to the literature used to develop these categories, Rizos et al. (2016) examined barriers explicitly found to be faced by SMEs and start-ups. These were only partly reflected in the research as can be seen in Table 6-5, indicated by a star ☆. Of these "*lack of support in the supply and demand network*" (2016, p. 11), included in the table as *lack of network support and partners*, is the only one faced by all three of the SMEs. Since the paper was published in 2016, these results show a progression of acceptance of circular models making it easier for SMEs and start-ups wanting to focus their businesses on CE.

Arup was the only organisation to find barriers in every part of the social category, whereas PPL was the only organisation to find barriers in every part of the economic category. As PPL are a small start-up, run almost entirely by volunteers at the time of the interview, this explains why they faced so many economic barriers. The social barriers faced by Arup are indicative of their role with the EMF. Much of the work they were doing, at the time of the interview, was based around CE uptake so the

AIP would have been acutely aware of the social barriers they were facing in this area, which was backed up by the document analysis.

Communication as a Barrier

Looking beyond the categories stated in Table 6-5, the data suggests another category could be added to cover *communication*. Dsposal, Ecospheric and Arup all cited problems around the terminology of CE and sustainability becoming popular but meaningless buzzwords or being used for *greenwashing*. For Arup this meant that clients would disengage with projects that used too much sustainability jargon, until their collaboration with EMF gave them a clear definition to use. Ecospheric found that they were being employed by a small elite who wanted the greenest home "credentials" without reducing their consumption habits, which conflicted with Ecospheric's ethos to have the widest possible impact. Dsposal, during the interview, stated that they were concerned with the CE becoming a buzzword for enhanced recycling with the economy and social side of the model being pushed aside in favour of business-as-usual, but with better recycling.

Drivers

There are many more similarities found in the CE drivers across the CSOs than barriers, shown in Table 6-6. These drivers are broadly related to either: the environment; skills and technology development; or networking but are across the categories. Of these: (Economic) *business development, innovation, and new synergies;* (Technological & informational) *increased knowledge sharing and networking;* (Supply chain) *open collaboration and communication;* and (Organisational) *development of skills & capabilities for a circular future* connect directly to communities, networks, and the CCF developed in the Research Design, showing emerging links between CE and community. These links are explored further in the next section.

The **Technological and informational** section is the most populated of all the driver emphasis areas, demonstrating that it is the most important driver of CE for the CSOs. It is only PPL where *potential for improving existing operations* is not revealed in the data as a driver. This is due to the fact that they were founded shortly before the case study interview so did not have existing operations to improve, they were also not coming from within the industry like Dsposal, who had prior industry knowledge, which meant they knew what area to improve upon but were also a fairly new start up when interviewed. However, Precious Plastic did originally establish to improve the current system for plastic recycling globally. It is clear from Table 6-6, that as well as the technological and informational section, other key areas for driving a move towards the CE for the CSOs are **Supply chain** and **Organisational**. In the supply chain category, the data showed that for all the CSOs *open communication and collaboration* was a driver, and there were many examples of where these collaborations had been created and were successful. All the CSOs, except PPL, saw the CE as a way to

Category	Drivers – emphasis areas	Ricoh UK	PPL	Dsposal	Ecospheric	Arup
Environmental	- ~~Resource constraints~~	-	-	-	-	-
	- Preventing negative environmental impact	✓	✓	✓	✓	✓
	- Company environmental culture	✓	-	-	-	✓
Economic	- Cost efficiency improvements	✓	-	-	-	-
	- New revenue streams	✓	✓	-	✓	-
	- Business development, innovation and new synergies	✓	✓	✓	✓	✓
Social	- Increased internationalisation	✓	✓	-	-	✓
	- Potential to increase workplaces and vitality	-	✓	-	-	✓
Institutional	- Regulation and standards requirements	✓	-	✓	-	-
	- Support from the demand network	-	-	-	✓	✓
	- ~~Supportive funds, favourable tax & subsidy policies~~	-	-	-	-	-
Technological & informational	- **Potential for improving existing operations**	✓	-	✓	✓	✓
	- New technologies	✓	✓	✓	✓	✓
	- Increased knowledge sharing and networking	✓	✓	✓	✓	✓
Supply chain	- Potential for reducing supply dependence	-	-	-	✓	-
	- Open collaboration and communication	✓	✓	✓	✓	✓
	- Increased availability of resources and capabilities	✓	✓	✓	-	-
	- **Management of reverse networks**	✓	-	✓	✓	✓
Organisational	- Potential to strengthen company brand	✓	-	-	-	✓
	- **Increased understanding of sustainability demands**	✓	✓	-	✓	✓
	- Circularity ingrained in company strategy and goals	✓	-	✓	-	✓
	- Development of skills & capabilities for a circ. future	✓	✓	✓	✓	✓

Table 6-6: Comparing the drivers for the CSOs to move to a CE.

improve *management of reverse networks*, for PPL this wasn't a factor at time of the interview because their supply chains were very short, and they were still looking for more reliable supplies of plastic. Both Arup and Ricoh UK cited drivers in every emphasis area of the Organisational category. As the largest and most established of the CSOs, this is unsurprising. They are also the only CSOs that were established prior to environmental concerns being high on the agenda for most organisations, so have gone through change processes in their adoption of CE. All the CSOs demonstrated that *development of skills & capabilities for a circular future* were an important driver for working in the CE, although there was uncertainty about what that future might look like. This is covered in more detail in Chapter 8 Discussion and Conclusion.

The institutional driver is the least populated section, and includes *supportive funds, favourable tax & subsidy policies,* which wasn't a driver cited by any of the CSOs. Current UK green subsidies tend to be related to energy use and energy-efficient items[13], which wouldn't affect the CSOs enough to mention in interview or document analysis. There is an opportunity here for more favourable government support for CE organisations, to enable them to enhance their circularity and support innovation.

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[13] https://www.gov.uk/green-taxes-and-reliefs

6.4 RQ 2: How Important Are Communities of Practice to An Organisation's Circular Journey?

The literature examined in section 2.3, placed a lot of emphasis on CoPs and their potential role in a move to a CE; proposing their value as places to share best practice and upskill for a circular future. Throughout the data collection and analysis, it was clear that they played different roles for the organisations studied; providing skill and knowledge exchanges, but also opportunities, such as collaborations or access to structures of power that the CSOs wouldn't have had otherwise. Table 6-7 shows all the CoPs identified in the case studies, comparing the descriptors used in the literature, and explored in the individual case studies. The value of the CoPs to the CSOs is dependent on several factors, the stage of their circular journey, how specific the CoP subject area is, and the level of engagement from the organisation. These points are explored in more detail below, starting with an overview of the importance of CoPs to each of the CSOs.

		Ricoh EcoNinjas	Environmental Action Committee	Apprenticeships	BESST	Sustainability West Midlands	IEMA	Precious Plastic	Precious Plastic UK	Collaboration with Plastic Tactics	Collaboration with Re:Centre	Waste Compliance Taskforce	SuperHomes Network	CAT Food Manchester	Internal CE skills network	CE100	BITC CE Taskforce
Size	small → very large	S	S	L	S	M	L	VL	M	S	S	S	L	S/M	M	L	S
Lifespan	date estabilshed	2009	1996	1990	2001	2002	1998	2014	2018	2018	2019	2018	2007	2016	+/- 3	2013	40yo
Location	collocated or distributed	C	C	C	C	D	D	D	D	D	C	D	D	C	D	D	D
Make up	homogeneous / heterogeneous	Hom	Het	Het	Het	Het	Het	Hom	Hom	Hom	Het	Het	Hom	Het	Het	Het	Hom
Level	micro, meso, macro.	Mi	Me	Mi	Me	Me	Ma	Ma	Ma	Me	Me	Ma	Ma	Me	Me	Ma	Me
Formation	spontaneous / intentional	Sp	Int	Int	Int	Int	Int	Int	Sp	Sp	Sp	Int	Int	Sp	Int	Int	Int
Relationship to org.	Unrecognised / Bootlegged / Legitimised / Supported / Institutionalised	Su	In	In	Le	Le	Le	In	Su	Le	Le	Le	Le	Bo	In	Int	Le

Table 6-7: Characteristics of all CoPs explored through the case studies.

Ricoh

The CoPs Ricoh UK is involved in are very important to its circular journey: BESST provided clarity and understanding when the first sustainability directives came from the headquarters in Japan, and IEMA offered a platform for engaging with government departments on CE issues that affect industry legislation. These CoPs are connected through the RIP, and others, and share information across CoPS,

as shown in Figure 5-3 in Chapter 5. The RIP has time allocated through their role to create and develop these connections. In section 2.3.3, Sytch and Tatarynowicz (2014) and Hislop (2004) both argue that connections between CoPs can be a problem, with information remaining in homogenous groups rather than being shared. To respond to this discussion, the evidence shown in the Ricoh UK case study demonstrates that these difficulties can be overcome through a supportive employment culture and proactive employees.

PPL

The level of importance that PPL places on its CoPs has changed over time. Precious Plastic was important when PPL were starting out giving it an identity, expertise and contacts to establish itself. The PPLIP stated that the forums were not that helpful and it had found smaller, UK and Lancaster based CoPs to be more important since setting up, as the expertise and connections are more relevant and localised.

Dsposal

The sole CoP that Dsposal is involved with, the Waste Compliance Taskforce, is important as a space to create rules for the industry and provide connections with influential organisations such as the Environment Agency. Clarifying waste categories and creating rules for this industry is very important for the circular economy in general, as well as for Dsposal.

Ecospheric

The SuperHomes network gave the EIP's work decarbonising their home legitimacy. This led to an audience and client base for the EIP to establish Ecospheric's eco homes consultancy. Since they have been established, however, and despite attempts to engage in CoPs, the EIP has not found them to be useful and it can be argued that they have had a detrimental effect on Ecospheric's circular journey. This is discussed further on the following page.

Arup

CoPs played an important role for Arup when establishing itself as an expert in built environment CE. Its internal groups have helped staff members understand CE and enabled the furthering of the CE agenda. The CE100 group was promoted by Arap and EMF as being an important place for collaborations, however, the projects that Arap have undertaken through this group do not appear to have resulted in long-term changes, new standards, or concrete actions.

Significantly, the group left off Table 6-7 and the discussion around CoPs, is the CE Club, despite featuring in two of the CSOs' networks and being stated in the literature as an example of CE CoPs. Ecospheric joined CE Clubs in Manchester and London and stated that neither provided useful connections for furthering its sustainability ambitions. The EIP's attendance at these CE Clubs

undermined their confidence in the CE as a useful tool for the sustainable development of projects and contributed to their suspicion of the model. Dsposal was also a member of the Manchester CE Club, which provided a contributor to the podcast and a potential partner for a project that didn't materialise, but beyond these connections, the DIP stated that they didn't get much out of CE Club membership. These groups were set up as CoPs to provide local networking for CE-focused companies, however, their purpose beyond networking is not clearly defined. This could be down to the individual groups or the CE Club model itself. Based on this finding, examining what makes a CE Club work for its members and whether this model can be replicated is an avenue for further research.

From the summary above, CoPs are important to the CSOs' circular journeys, but at different stages of that journey. They play an essential part in setting up a circular or sustainable business or adopting CE business models. Whether CoPs remain important once the business is established depends on the needs of the business and the areas of learning and exchange that the CoP focuses on. This demonstrates that CoPs designed with a clearly defined purpose that engages in a specific area, are more important for organisations looking to become more circular. A vague purpose or broad remit can, at best, provide an organisation with a connection or two, but at worst can cause an organisation to reject the CE as a model.

6.4.1 Engagement is Key

This section reflects on the framework used to examine the CoPs, taken from Wenger *et. al..* (2002). The level of engagement in the CoPs differed across the CSOs, this related to the discussion in 2.3.3 that examines participation in CoPs. For future work using the framework shown in Table 6-7, an extra category of *degree of participation* should be added to explore whether an organisation is a *peripheral member*, an *active member* or as a *key member* (see Figure 2-2: Participation in a community of practice.). The SNA maps demonstrated that CSOs that participated in CoPs as key members had multiple significant connections through these groups. In contrast, where a CSO was a peripheral member of a group, there were considerably fewer or no connections. Figure 6-2 shows snapshots of the SNA maps, demonstrating the CSOs' different levels of engagement. There was a direct correlation between participation level and connections, demonstrating how important the CoPs are to the CSOs' networks, and for providing opportunities for collaboration.

The case studies and maps are a snapshot of the CSOs' relationships at the time of the interviews, demonstrating a brief period in the CSOs' circular journeys. As discussed in section 2.3.3, membership of a CoP changes over time as the group evolves and the needs of the members change, the analysis has shown this to be the case for all the CSOs. Long-term participation occurs when the group changes and evolves with the members, whereas most of the CSOs are briefly involved in CoPs, contributing to

their selective agenda. From the analysis, two key factors have emerged that describe the importance of a CoP to a CE organisation. The first is the specificity of the CoP, those set up to deal with a specific challenge or focused purpose are more useful than those that are just there for networking. Secondly, engagement, the more engaged CSOs had more connections through the CoPs and more opportunities for collaboration to further their CE agendas.
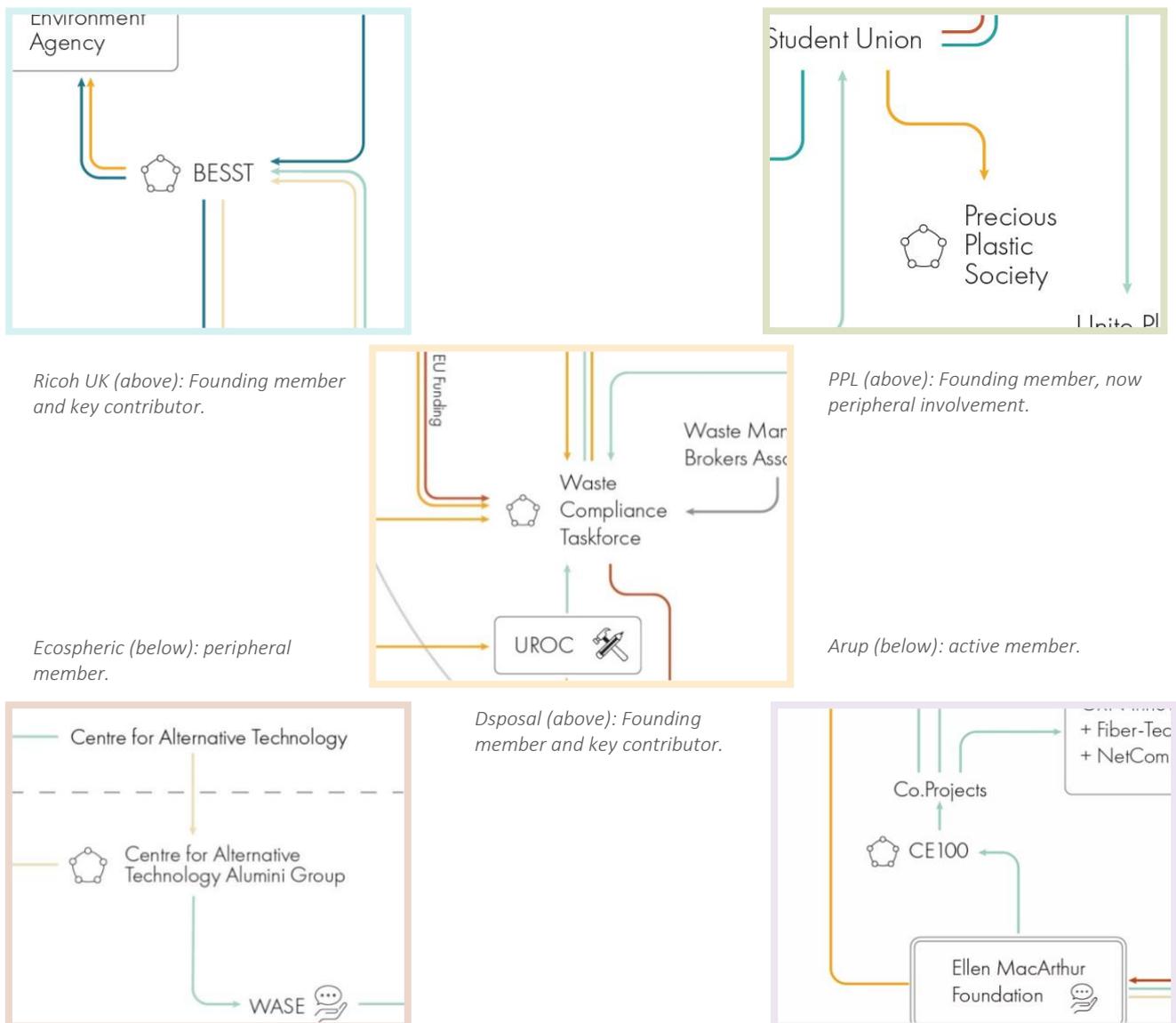
Ricoh UK (above): Founding member and key contributor.

Ecospheric (below): peripheral member.

PPL (above): Founding member, now peripheral involvement.

Arup (below): active member.

Dsposal (above): Founding member and key contributor.

Figure 6-2: Details from each of the stakeholder maps demonstrating the membership status of each of the CSOs within a selected CoP.

6.5 RQ 3: Which Capital Flows Are the Most Important to an Organisation's Network?

This section addresses RQ3, which was answered through the application of the Community Capitals Framework to the SNA maps. It synthesises the results and highlights the capitals that are the most prominent and have the biggest impact on the CSOs. Figure 6-3 shows the percentage frequency of each capital in each of the CSOs social networks taken from the Ties Section of each case study chapter.
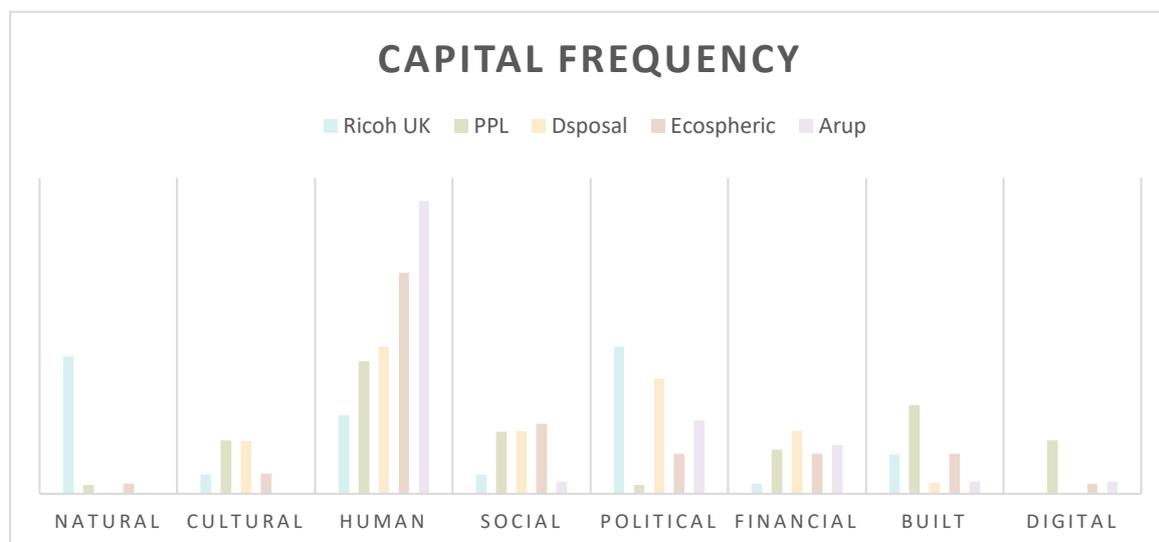
Figure 6-3: Graph to show Community Capitals demonstrated through Social Network Analysis.

6.5.1 Summary

By laying out the networks as a visual map it made it very clear to see where the different capitals exist in the networks, and which were the most dominant. Throughout all the CSOs, there were some capitals which played a much bigger role than others, and some that were hardly present in any of the CSOs ties, such as Cultural Capital. As the maps show connections that exist outside of the CSO's supply chains, the analysis can focus on the work that the organisations are doing outside of the primary business of making money. It is interesting that all the CSOs primarily focused their connections on developing skills and knowledge for their organisations, through Human Capital connections, over any other type of capital development.

This analysis has identified that Human, Social, and Political Capital are the most important to an organisation's network. Natural and Digital are also important to CE advancement, but these are either neglected by most of the CSOs (Natural Capital) or do not feature heavily in the stakeholder networks (Digital Capital), so appear to be less important to the organisations' networks. The following section

6.7 looks at how these different capital connections are used by the CSOs to realise their CE ambitions and starts to develop a framework from these capitals that can be applied to organisations wanting to further their circular ambitions.

6.5.2 Human Capital

As can be seen in the graph, Human Capital is the most frequent capital flow between the CSOs and their networks. This is demonstrated by the frequency of ties with universities, and the use of CoPs within the networks. The research reflects the argument in the literature that emphasises the importance of Human Capital in the advancement of skills and technology (see section 2.5.3 Human Capital). Despite the decade or so that the CE has been discussed, its implementation in business is relatively new. The organisations developing CE business models are pioneering within their industries, constantly evolving and altering their approaches as new technologies and legislation are developed, and more organisations adopt circularity. The emphasis on Human Capital connections shows that the CSOs are in a position to take advantage of, and contribute to, new developments in their areas.

6.5.3 Social and Political Capital

The three SMEs have more ties that act as social connectors for them, this is demonstrated through the higher Social Capital frequency than the multinationals. Social capital can be viewed through this analysis as more important for organisations that are just starting out, especially Social Capital connections that create bridges between different sectors, or links to organisations with more political or financial power (see section 2.5.3 Social Capital). The structures that make up Social Capital are important for organisations establishing themselves, building trusted networks, and learning the norms of their industries.

Large companies often wield political power, so it is no surprise to see a higher frequency of Political Capital for Ricoh UK and Arup, however, Dsposal is an SME that has forged connections with different government departments through projects and central involvement with trade associations, giving them a high level of Political Capital. Dsposal's high levels of Social and Political Capital build on the argument in the literature around *trust*, demonstrating that Social Capital connections can contribute to building trustful relationships which can lead to Political Capital connections. This gives Dsposal access to power that can influence policy and CE strategy for their industry, beyond the reach of many SMEs.

6.5.4 Natural Capital

A surprisingly absent capital in most of the CSOs networks is Natural Capital. The renewal of nature is a key part of EMFs messaging, requiring the CE to act as regenerative and restorative to natural

systems (Ellen MacArthur Foundation, 2013a). However, it is only Ricoh UK that emphasises Natural Capital as vital through its connections. The other CSOs neglect this area, which reflects the findings by Buchmann-Duck and Beazley, who question "*how strongly the circular economy concept aligns with biodiversity protection*" (2020, p. 2), as discussed in section 2.5.3 Natural Capital. Consequently, by overlooking this capital the other CSOs are not contributing to a key area of the CE, which is vitally important for its success as a model in the long term, and a core part of wider CE agendas (Ellen MacArthur Foundation, 2013a; BEIS, 2017). Further research will need to be conducted to determine why Natural Capital is being overlooked and what can be done to encourage its uptake among CE organisations.

6.5.5 Digital Capital

Another capital that was seen less than expected through the SNA, was Digital Capital. PPL was the only CSO to have significant levels of Digital Capital in its networks, which is demonstrated through its use of social media channels to connect with peers and audiences. Surprisingly, Dsposal doesn't demonstrate any Digital Capital connections despite being an entirely web-based service, this would suggest that Digital Capital is less prominent in network building and its communities, despite being present in its business models. As discussed in section 2.5.3, Digital Capital focuses on tools and infrastructure, so unless these tools are highlighted as being used to facilitate connections, as in the case of PPL, they are less likely to show up through a network and community analysis.

6.6 RQ 4: How Do Organisations Utilise and Engage with Their Communities to Further Their Circular Economy Ambitions?

As discussed in RQ 2, one of the ways that CSOs engage with their communities is through CoP participation. Engagement in these groups is used to further skills and knowledge around CE and sustainability in their industries, but also to build connections with other stakeholders and to develop collaborations. Looking beyond the CoPs, each of the CSOs engages with several communities and organisations to develop their circular ambition. Such as student or research communities at universities: engaging with specialist research teams as Ecospheric does with Salford University's Energy House; Ricoh UK develops teaching courses; PPL collaborates on student-led projects. The application of the CCF to the SNA maps revealed the key benefits the community connections bring to the CSOs. Predominantly, Human Capital in the form of skills development and opportunities to build and share knowledge. Community connections are also utilised to advance Political Capital for some of the CSOs. Their connections provide access to power structures, either within industry or at the

local, regional, or national government level. Through these connections, the CSOs can influence industry best practice or CE-based policy. Communities are also engaged with to further corporate agendas, in the case of Ricoh UK and the local Natural Capital enhancement activities it engages with, and Arup's report development and writing through its external collaborations.

6.6.1 Role of Community in Circular Economy Interpretations and Implementation

This section draws on the results explored in section 6.3, to reveal the role of community in the formation and execution of CE strategies for each of the CSOs. As shown in Tables 6-1 to 6-6 in the first part of this chapter, community and networks played a role in each interpretation and implementation framework for all the CSOs. Communities and networks help the CSOs engage and fulfil their **4R** commitments: PPL collect plastic waste from Lancaster residential and student communities to recycle; Ecospheric work with their supply chains to reduce the inflow of packaging to the Food Hall; Arup focus their research on how to advise their construction clients to reduce their material usage. All the CSOs engage their communities and networks in their reduction strategies, through reducing waste (Ecospheric, Dsposal, and Ricoh UK) and reduction of consumption advocacy (Arup and PPL). The CSOs who engage in recycling, PPL and Ricoh UK, also rely on their networks, this is not as prominent as their engagement with reduction, but both rely heavily on their networks to develop recycling strategies in response to market changes.

As discussed in section 0, operating above the micro-level **systems perspective** requires community and network involvement. In addition, PPL and Ecospheric both utilise community connections to develop micro-level systems engagement, bringing in collaborators to provide resources in the form of post-consumer waste and circular technologies, respectively.

Engagement with the **aims of the CE** is not universal across the CSOs, with some taking a weaker sustainability stance than others. As discussed in this chapter and the literature review, within the aims, SE is the most overlooked, Arup had no SE engagement and Ecospheric's only engagement was through their work with GMCA on retrofit housing strategies, although it was not clear from the data how much of this was social housing. The other three CSOs, engaged with the SE by working with communities to respond to their needs, examples of which can be seen in Table 6-3 and the case study chapters.

CE drivers were identified for all the CSOs that promote further or new engagement with communities and networks. The connections that the CSOs have help them to be dynamic and adaptable when moving to a CE. The analysis shows that the CSOs view their connections in a positive light; to help further their CE understanding and ambitions.

The following section moves on from the CE interpretation and implementation taken from the literature review, to explore themes that have emerged out of the analysis. It builds on the previously discussed results from the analysis to further answer to RQ 4 through the development of cross-case themes, taking a detailed look at prominent communities evident through all the CSOs networks.

6.7 Emergent Cross-Case Themes Overview

This section firstly briefly discusses the difference in language and action between the case studies revealed through the analysis, then looks at the stakeholder maps and explores the connections in detail; revealing where there are crossovers between the case studies and discussing the cross-case themes that have been uncovered through the SNA. It details where there are cross-overs between the CSOs and builds on these similarities to develop a framework that can be applied to other organisations going forward.

6.7.1 Language vs. Action

The analysis revealed a language-action mismatch within Arup's approach to CE leadership. While Arup claims to be a leader in CE, the findings suggest that the company is not actively reducing its construction outputs or material usage. Instead, Arup focuses its engagement with CE through education, primarily through reports, rather than changing its overall business strategy and taking action to actively implement CE across the board. This lack of action is at odds with Arup's claims to be a CE leader and could be identified as greenwashing on their part. In contrast, the other case studies are taking concrete actions to engage with CE, with some, such as Dsposal and Ricoh UK, also providing educational resources through reports.

6.7.2 Prominent Relationships

During the analysis of the individual case studies and the SNAs, several similar relationship types were identified from the data:

- local community involvement;
- links to EMF;
- connections to universities for funding and research;
- links to, and involvement with, local government
- and national governments.

The government connections are categorised separately due to the level of power each demonstrates, with influence at the UK government level having bigger implications for national policy and agenda, than local government connections. These similarities can be classified as themes that demonstrate

areas linking the CSOs and could be investigated by CE organisations to further their CE ambitions. Figure 6-4 shows the five categories that the subthemes broadly fall under and the relationship between each CSO and the subtheme.

The following section covers the subthemes in the order that they are described in Figure 6-4. They have no ranking and the ordering in the diagram was chosen aesthetically rather than to demonstrate any specific purpose. Not every CSO connects to every subtheme, this is due to differences in organisation size and how established the CSOs are. Each subtheme is explored through an overview of the general implications of the areas for the CSOs, and suggestions for other organisations that wish to work towards a CE are discussed. There follows a review of the importance of institutional connections for the CSOs, demonstrated through Figure 6-5, from which most of the themes developed. Following this, the higher-level themes are developed; they are framed in terms of this research and an overview of what can be learned from these themes is provided. Advice for other organisations is given through a new framework developed in section 7.1.
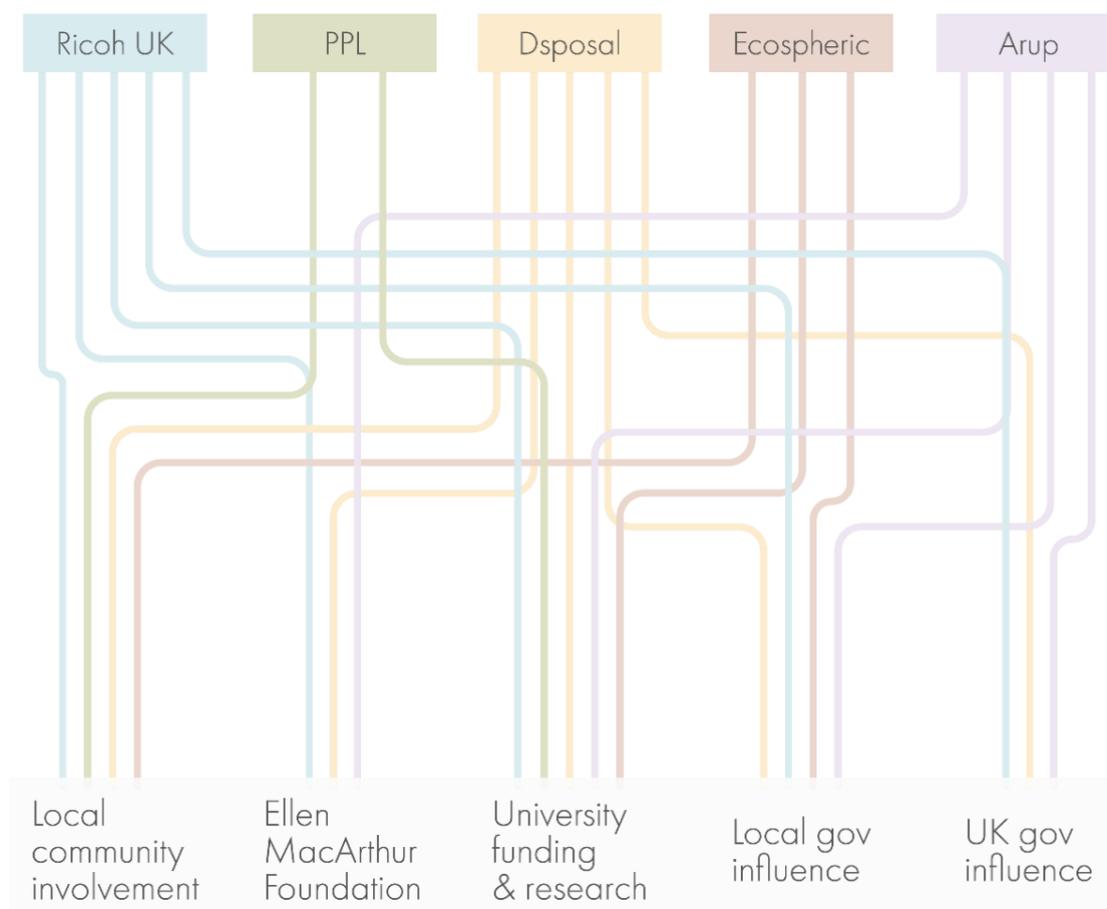
Figure 6-4: Relationships between the CSOs and the emergent cross-case subthemes.

6.7.3 Local Community Involvement

Throughout the case study analysis, local involvement is highlighted as incredibly important to most of the CSOs. By engaging their local communities, the CSOs bring them along on their CE journeys, gathering useful insights, and opening new avenues for collaboration and experimentation. Through these collaborations, they can build resilience by diversifying their outputs to reflect what is needed in their localities and establish themselves as key stakeholders in their local CE infrastructure. Each of the CSOs involved in their local communities had examples of where they were able to diversify their output in surprising ways: either through novel recycling collaborations; utilising a new platform to educate and inform; or influencing local spaces at a grassroots level.

6.7.4 Ellen MacArthur Foundation

The EMF plays an important role in international efforts to move to a CE, through publicising the issue and creating a set of understandings about CE that are now widely accepted (see section 2.2.3). However, for most of the CSOs their relationship with EMF is limited. Only Arup and Dsposal have a relationship with EMF where they, the CSOs, are the beneficiaries of the relationship, Ricoh UK's relationship was based on advice given when EMF was established. At the time of the interview, Dsposal were winding down their relationship with EMF.

The EMF is a good starting point for developing an understanding of CE. However, as shown through the CSOs' involvement, or lack of, with EMF, unless an organisation becomes a knowledge-partner, or works in an area that EMF is currently promoting research into (i.e., fashion) it does not appear to be a very useful connection. EMF, during the period of data gathering, was very focused on getting widely recognised brands involved in CE, which precluded many SMEs from much involvement. The endorsement of high-profile multinationals, as discussed, does seem to have led to some greenwashing (see also work by Kopnina, 2018, 2019). Recently, however, EMF has started to promote the work of start-ups through a Circular Start-up Index, which lists international organisations working in the CE. This would have been a useful tool when starting this PhD research, however, it opens opportunities for further research collaborations and knowledge exchanges beyond the PhD.

6.7.5 University Funding & Research

Of the themes, university connections are the most prevalent, for both research collaborations (all CSOs), as funding sources (PPL, Dsposal), or business advice (Dsposal, Ecospheric). Some of the CSOs also influence course programmes, including undergraduate modules (Ricoh UK) or developing master's level projects (PPL) and funding PhD research (Arup). Figure 6-5 shows how each CSO is connected to different universities.

Local universities are central to all the CSOs networks for funding, research collaborations, and advice.

The prevalence of this connection for the CSOs suggests that unless an organisation is able to make
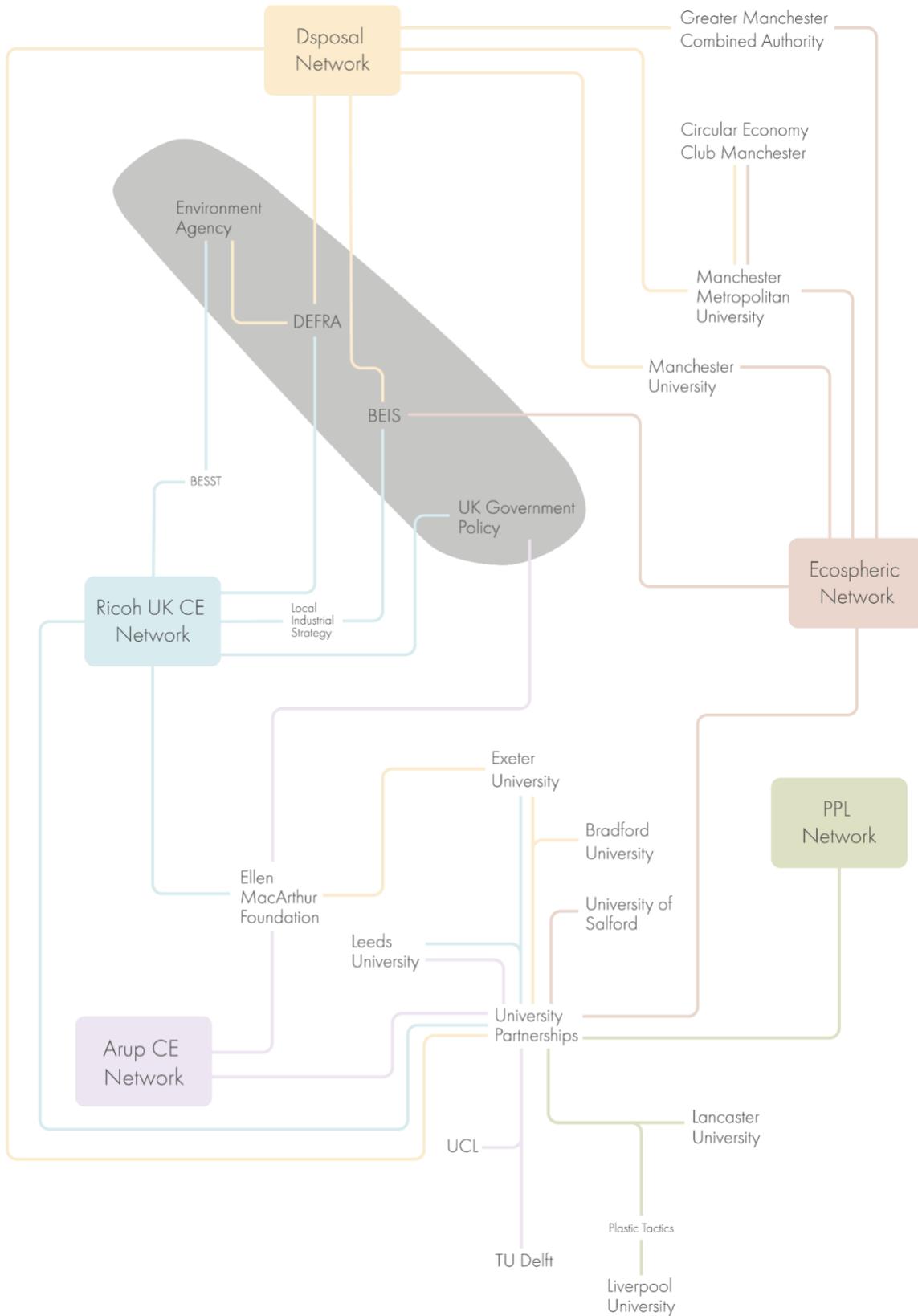
Figure 6-5: The case study organisations' connections to institutions.

and maintain these sorts of connections with academia, they will lose out on furthering their CE ambitions when it comes to knowledge exchange and experimentation. As CE research and application is still relatively new there are plenty of opportunities to engage with universities on research collaborations. This issue is explored further in section 6.7.9.

6.7.6 Local Government Influence

The CSOs connected to local governments influence strategies that directly affect where they live and operate, enabling them to potentially create favourable environments for operations through local influence. Local government influence can be useful for creating links to higher levels of government and other power structures in a local area, such as business or industry groups, but they are also useful for promoting and establishing local circular networks and structures. For a CE to be successful it is not enough to have national and international circular loops, there need to be circular loops at local levels to keep resources in use and reduce the carbon emissions associated with moving goods across large distances. By taking a local view through ties to local authority, services can be created that are specific to that area, enabling local circularity. Local government involvement allows organisations to influence local agendas that could boost the organisation's profile and provide access to hard-to-reach areas or communities. If there is not a local university to act as a connector to knowledge exchanges, a local government could provide those links. Through engagement with local officials such as councillors, organisations can take circular messages to communities that might not otherwise engage with sustainability issues.

6.7.7 UK Government Influence

Many organisations may think that the influence they can have on national government is limited. However, as demonstrated by the individual CSOs, this influence can be expressed through several avenues: involvement in trade bodies or associations; contributing to open calls for expertise in their area; through local government links; or ties to other organisations closer to government. Many of the CSOs have access to government through the relevant government departments for their industries, or through working with the UK's devolved governments. As CE is a relatively new area of research and policy, there is plenty of opportunity to influence from a position of expertise that organisations uniquely have. The danger of working with government, however, is losing sight of certain aspects of CE to appease the agenda of those in power. For example, the degrowth element of CE and the fundamental shift away from capitalist systems that it promotes could be seen as antithetical to a government's GDP targets and economic agenda.

6.7.8 Institutional Connections

A note on institutional connections overall, as they have been demonstrated to be incredibly important to the CSOs when following a CE agenda, with many of the themes developing out of these connections, as shown in Figure 6-5. By connecting to local and national institutions, organisations can access research funding and power structures that they wouldn't be able to influence otherwise. Even the smallest CSO studied takes advantage of local institutions to help access research and connections to further its understanding of CE. By connecting to government at different levels, and placing themselves as experts, organisations can influence the CE agenda to their advantage but also potentially guard against greenwashing from bigger players.

6.7.9 Higher Level Themes

Through the cross-case analysis, several similar relationships were identified between the CSOs and their connections in the SNA, the previous section grouped these relationships into five types. Within these five relationship types, three capitals dominated the networks: Human Capital, present in knowledge development and learning exchanges; Political Capital, used by the CSOs to access power structures; and Social Capital, which enhances areas of the other two capitals. Social and Human Capital work together to build trusting relationships, which can lead to experimental collaborations, Social and Political Capital combine to exert influence on industry and government policy, Social Capital can also play a role in accessing political power.

These themes are developed through the capitals that appear most prominently in the CSO networks. Natural and Digital Capital are also identified as important capitals to the CSOs' circular journeys, but their low presence in the networks excludes them from this section and from the framework developed. Throughout this thesis, the primary objective has been to identify how communities can be used by CE-focused organisations.

The areas that the capitals influence can be synthesised into three higher-level themes: knowledge exchange; experimentation through collaboration; and power and influence. Grouping the two sides of Political Capital acknowledges that these two themes were slightly less prominent in the CSO networks. Figure 6-6 demonstrates the pathways through the network that connect each CSO to the higher-level themes and which of their relationships have given them access to these higher-level themes.

Each of the CSOs utilised the relationship types in different ways. For example, Ecospheric, through university funding and research, has developed knowledge exchanges with UoM's Tindal Centre; they have worked with UoS on the Energy House Lab, which falls under experimentation through collaboration; and through UoS, they have links to GMCA, which falls under power and influence. As

mentioned in the previous section, the prevalence of university connections on the maps could indicate that an organisation would lose out on knowledge exchanges and experimental collaborations if they did not have access to higher education institutes. However, Figure 6-6, shows that although universities are well placed to create these kinds of relationships, they are not the only route. The local community involvement also gives access to these areas for many of the CSOs, demonstrating the importance of these links to organisations. PPL, for example, only has connections to two of the relationship types identified, providing access to knowledge exchanges and experimentation through collaboration on several levels, as PPL work very closely with both Lancaster University and their local communities. The remit for local community involvement is quite broad as it includes business communities as well as residential communities, the main stipulation for this relationship type is that the communities are *local* so the CSO involvement is timely and more likely face-to-face. Some of the relationship types are more important to one CSO than others, for example, EMF: for Dsposal and Ricoh UK this relationship provided knowledge exchange, however, Arup's involvement in EMF gives them access to knowledge exchanges, experimentation through collaboration, and power and influence.
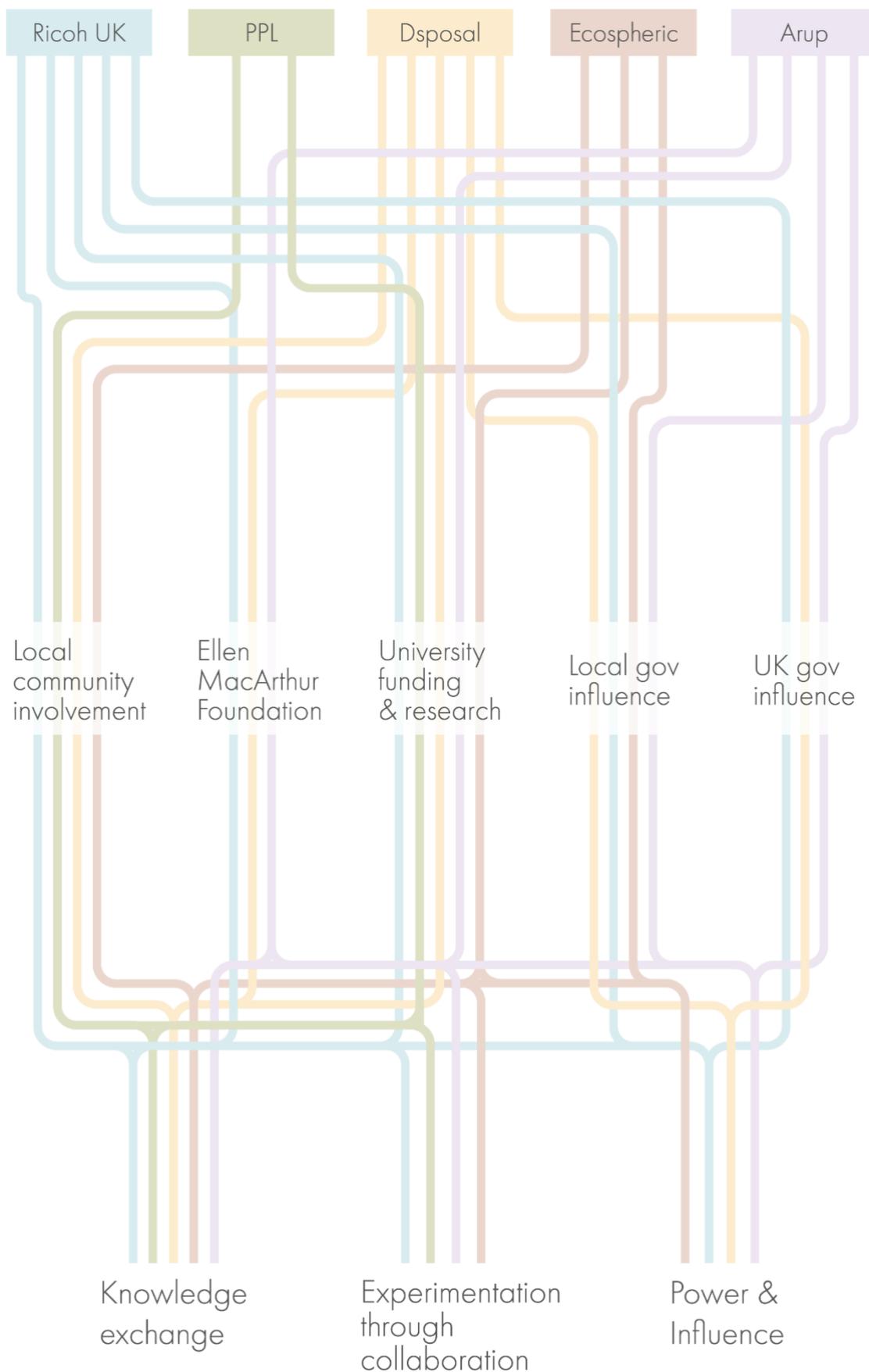
Figure 6-6: Themes map expanded to include the higher-level themes.

Knowledge Exchange

As shown by the prevalence of Human Capital links in the case study SNA maps, knowledge exchanges can happen through many different avenues, such as university courses and doctoral theses, or conversations with local people through maker fairs and markets. As the CE is a new concept for many people, organisations working in its implementation must have opportunities for conversation around the different areas of circularity, to share and develop their expertise, as CE adoption will affect everyone in how they consume and live. As has also been demonstrated, these knowledge exchanges give organisations opportunities to develop new avenues for collaboration, which can lead to experimentation or further opportunities to educate and grow. At this point in the development of circular systems, it is not only important for organisations to educate those around them about CE, but for the organisations themselves to continuously learn and improve on what they are offering. Organisations must take advantage of the latest developments in technology and engage with circular systems. It is important for organisations working towards a CE to remain relevant in a rapidly changing world, by continuing to develop their Human Capital connections for the benefit of their employees and their networks through knowledge exchanges and transfers.

Experimentation Through Collaboration

This theme highlights a key way that the CSOs use their networks. Many of the collaborations that are explored through the SNAs involve experimenting: to create new revenue streams; to deal with issues of complex waste disposal; providing a real-world test site for university lab-based experiments; or to develop new products and technologies for a circular future. The ability to experiment is key to continuous improvement of the CE. As discussed in the first case study, CE implementation is a continuous and cyclical process that needs constantly updating as new technologies and new capabilities are developed. By utilising their communities to develop experimental collaborations, organisations give themselves access to tools and equipment that they may not have been able to use or afford. In order to build these relationships that could lead to experimentation, a high degree of Social Capital is needed, which allows trust to develop between the parties. This trust is necessary, as experiments often involve the use of expensive equipment belonging to one of the parties, which means an experimental collaboration can involve significant financial or equipment-based risk. A strong degree of trust is needed, therefore, to reassure parties that the experiment is worth the risk.

It is important for the development of circular systems that experiments and collaborations are as open as possible, as monopolies on ideas do not lead to repetition or development of those ideas in new directions. Through experimentation, and the development of new circular systems at different levels, the *repeatability* of ideas is a key factor to enable a decentralised approach to manufacturing and product development. This will become increasingly important due to different localities

producing different resources. By positioning themselves at the forefront of circular systems and the CE, organisations developing circular strategies must utilise their Social Capital connections to forge collaborations that will lead to experimentation in their area

Power and Influence

The third overarching theme relates to power and influence, specifically, whether an organisation has access to power or influence over decisions at a local or national scale. All but one of the CSOs are connected to either local or national power structures or both. This gives them a level of influence over their sectors that would not be available to them otherwise. The CSOs engaged in this research are early adopters of CE, this gives them a level of expertise that other organisations in their industries might not have. As the CE moves from theoretical language to concrete action and new organisations are being created around Industry 4.0 technologies to enhance a circular future, it must remain on the agenda of governments. Organisations engaged in circular systems must continue to use their Political Capital to advise local and national policy. Power and influence, also relate to non-governmental forms of influence over local and national agendas, through industry groups or task forces, influential institutions, and others. This is explored further in the following chapter.

6.7.10 Conclusion

The cross-case analysis built upon many of the insights developed in the individual case study analyses, finding similarities across the frameworks used to analyse CE interpretation and many drivers for CE implementation. Insights were developed through an examination of the Community Capitals Framework, showing that all the case study organisations predominantly use their connections for Human Capital learning exchanges, also building their Social Capital and developing Political Capital links. This examination led to the development of three high-level themes within CE communities: knowledge exchange, experimentation through collaboration, and power and influence. It is clear through the research that an organisation does not need to cover all these themes to be able to operate within a CE. However, each of the areas allows for different aspects of the CE to be approached. Without establishing and maintaining their networks and taking an active role in their communities, the CSOs would not have been able to develop as circular organisations. As the CE is developing, responding to, and embracing technologies that open new avenues is crucial for CE organisations to remain relevant. By maintaining a good relationship with their network ties and communities, organisations can keep abreast of new developments and improve their circularity.

The following chapter develops the ideas discussed in this chapter to build a framework for organisations looking to become more circular to apply to their stakeholders. Through the newly developed framework this thesis' unique contribution to knowledge is also explored.

Chapter 7
Research Outcomes and Contribution to Knowledge

This chapter explores the outcomes of the research and describes this thesis' contribution to knowledge, the Knowledge exchange, Experimentation through collaboration, access to Power and Influence (KEPI) framework. It discusses the development of the framework that has arisen out of the cross-case analysis, for use with organisations wishing to develop circularity beyond their business remit. This chapter also includes the first stages of feedback of the framework, provided by some of the case study organisations.

7.1 Outcomes overview

The journey to circularity does not take place in a vacuum. Organisations looking to move towards a CE must embrace their networks and communities. They should look beyond their supply chains to create connections outside of their industry, and identify where they can make other circularity changes through engagement with the CE at all levels:

- Micro-level, through the development or use of circular products within their organisation, sharing these products and tools, and sharing best practice for their use at the
- meso-level, connecting to industry-wide circular initiatives or engaging with circularity within a specific location, such as identifying their organisation's role within their local circular ecosystem.
- Macro-level, exploring connections that could give them access to larger scale circular systems, such as city-wide CE implementation or developing their role within Industry 4.0.

By embracing their networks, organisations can become more dynamic and resilient to external shocks. This can be achieved through developing connections in areas that might seem outside of an organisation's industry or remit. These relationships can lead to connections that could provide surprising or unusual collaborations, moving the organisation in a new direction. Organisations should also not lose sight of the economy aspect of the CE that is against "growth by any means necessary", promoting degrowth and a fundamental shift away from the overconsumption of the current capitalist system. Committing to the ideal version of the CE, that looks at all aspects of an organisation, rather than a subverted version, that allows for greenwashing and minimal change.

Moving to a CE is a continuous, cyclical process affected by new technologies, industrial capabilities, and laws. To stay on top of these changes, the circular organisations featured in the research all look beyond their supply chains, and foster relationships with stakeholders who can keep them ahead of developments in their industries, or connect them with useful organisations locally, outside of their industries, depending on their needs. Throughout the case study interviews, it was clear that the interviewee was a strong driving factor in the types of relationships that were forged, and in the case of both the multinationals, a key reason for the advancement of circularity within the organisation. All the interview participants were proactive in creating links and connections outside of their industry, ensuring that their networks were broad and created benefits for their organisation. This included: creating and maintaining CoPs; forging projects with interesting partners outside the scope of their everyday business; or being open to unusual collaborations outside of their industry. This proactive attitude could also be why they contributed to the research.

The examination of the relationships that the CSOs have outside of their supply chains, through the analysis of the stakeholder maps and the application of the CCF, revealed two distinct relationship areas that should be focused on by organisations when developing circularity. This chapter details the areas revealed by the analysis, looking at the factors that led to this outcome, and describes a framework that can be applied to other organisations looking to become more circular by utilising their networks and communities.

The key relationship types that have emerged from the analysis can be viewed under the themes of *knowledge* and *power*. Aspects of these themes exist in almost all the relationships explored that are directly linked to the CSO. These themes have developed out of the examination of the stakeholder maps and the application of the CCF. The broad nature of the CCF made it a useful tool to explore the relationships between the CSOs and their stakeholders. However, as it was designed for the examination of location-based communities, some of the capitals had less relevance to the research than others. The framework developed through the research, synthesises the most prominent aspects of the CCF into its most relevant parts: knowledge and power. These two areas are then divided into six parts: *knowledge transfer*; *knowledge exchange*; *experimentation through collaboration; type of power*; *access to power*; and *influence,* which are clearer and more understandable for use with CSOs, who are less likely to have the references to understand the different capitals used in the CFF and may question the relevance of some of the capitals to their organisation.

The most prominent of the capitals within the networks of the CSOs, Human Capital – development of the individual, can be viewed as the foundation for the knowledge-based relationships. This is also highlighted in the prominence of university-based relationships that all of the CSOs have (see Figure 6-5: The case study organisations' connections to institutions.). The case study sub-themes explored in Figure 6-6: Themes map expanded to include the higher-level themes., demonstrates the overlap between the relationships held by the CSOs, when this is coupled with the CCF analysis, Social and Political Capital are highlighted as also being prominent actors in the CSOs relationships. These three capitals all contribute to the relationship themes of knowledge and power, the knowledge-based relationships are primarily based on Human Capital, whereas the power-based relationships are more Political, Social Capital is relevant to both, as this is the main capital being used in the development of relationships and gives the CSOs access to stakeholders. Figure 7-1 demonstrates how the three capitals work together.
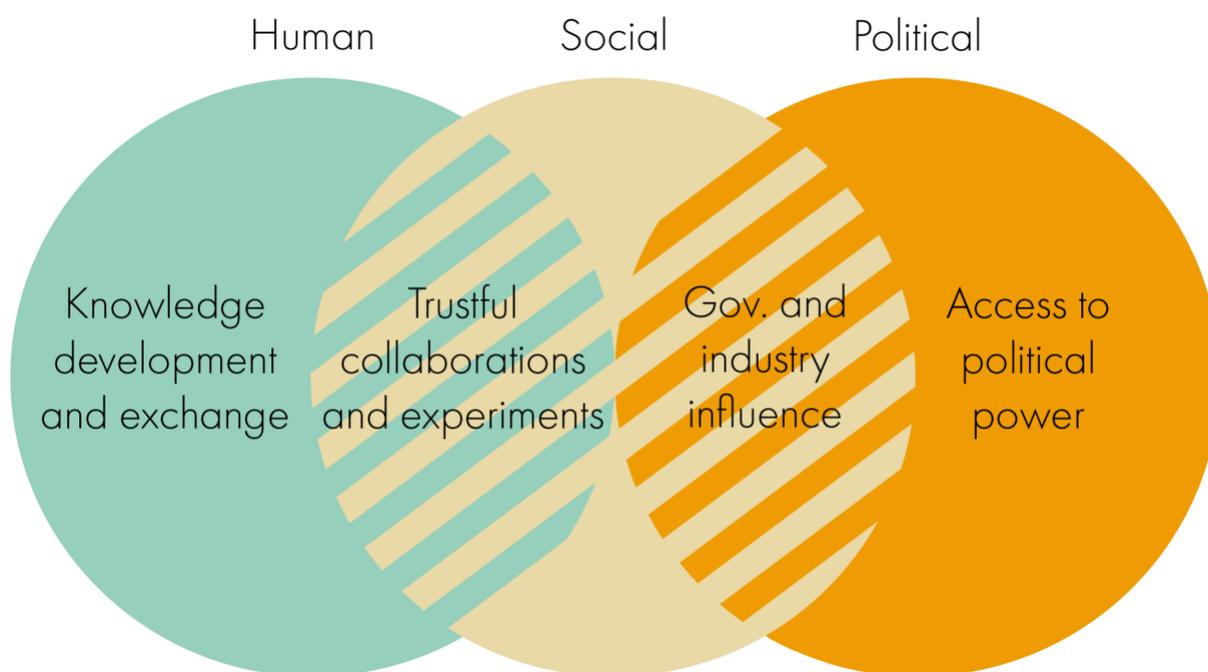
Figure 7-1: How the three capitals interact through the CSOs' relationships.

7.2 Components of the KEPI framework

The following section explores in detail the different components of the Knowledge exchange, Experimentation through collaboration, access to Power, and Influence (KEPI) framework. It describes the issues identified that have led to the development of the two themes, and how they are understood and explored through the development of the framework.

Until recently the CE has been primarily explored through a theoretical lens, as there have only been a few organisations with the consumer demand or financial incentive to work towards it in reality. As it gains traction as an idea, and more organisations develop circular business models, it is important that organisations identify the key relationships outside of their supply chains, to shape the future of circularity. Through the application of the KEPI framework, relationships can be identified that could influence local or national policy or be used to develop new strategies through knowledge exchanges and experimentation.

KEPI: KNOWLEDGE EXCHANGE, EXPERIMENTATION THROUGH COLLABORATION, ACCESS TO POWER, INFLUENCE

The key areas that make up the KEPI framework are knowledge-based connections and power-based connections. The knowledge-based connections are divided into *knowledge exchange*, and *experimentation through collaboration*, there is also the less important category of *knowledge transfer*. The power-based connections can be divided into *access to power* and *influence*, with an overarching area of *type of power*. The following sections explore these areas in more detail.

Through the development and detailing of this framework this chapter details this thesis' unique contribution to knowledge and lays out areas for further research.

7.2.1 Knowledge Ties

The main capital demonstrated through the stakeholder maps was Human Capital, through which knowledge-based connections are developed. The knowledge-based relationships fall into one of three categories:

- knowledge transfer;
- knowledge exchange;
- and experimentation through collaboration.

These can be viewed on a scale of reciprocity: with passive *knowledge transfer* at one end of the scale, which does not have to be reciprocal; to active and trusting collaborations that use a high degree of Social Capital and Financial Capital. These relationships can be classed as *experimentation through collaboration*; they involve a high level of reciprocity and trust, which can lead to experimentation-based collaborations. As discussed in section 2.5.3, trust is an iterative process built up through a series of small risk that get larger as trust is established (Lorenz, 1999). Along the scale is also *knowledge exchange*, which involves active participation from both actors, but there is less risk involved than experimentation through collaboration. Figure 7-2 visualises the knowledge ties scale, showing the degree of reciprocity and then the degree of risk that exist in these relationships.

Knowledge Transfer

Knowledge transfer is the "passive" transfer of knowledge in one direction, from the actor providing the knowledge to the actor receiving the knowledge. The actor receiving the knowledge may be actively learning, but the relationship is not reciprocal and can, therefore, be seen as passive. It is demonstrated in the relationships that involve the creation of courses for universities, or the attendance on courses by staff in the organisation. It can also be viewed through outcomes of other relationships, such as reports and podcasts. This is the weakest part of the knowledge-based connections and, although relationships of this nature are important and necessary, organisations should be wary of having an abundance of knowledge transfer connections over other types of

Figure 7-2: Knowledge ties scale.

connection and should look at whether the relationship can be built on to become a knowledge exchange or experimentation, which will be more valuable to their organisation.

Knowledge Exchange

Relationships that involve two or more stakeholders coming together, to share best practice or develop learning partnerships, are the basis of knowledge exchange relationships. These relationships can be very valuable to organisations and are important to cultivate. Knowledge exchanges can include CoPs; sponsoring or supporting academic research; or relationships that have been created to develop sector reports. These relationships are more active than knowledge transfer as they require active participation and reciprocation from all parties involved, with knowledge and Human Capital development on the part of both or all of the stakeholders.

Experimentation Through Collaboration

There are relationships explored through the research between the organisations and their networks that go beyond the remit of knowledge exchange. Experimentation through collaboration relationships involve both Human and Social Capital, where one of the stakeholders involved offers use of their physical resources to develop circular solutions or new product avenues for the other party or parties in the relationship. These relationships involve a high degree of trust and reciprocity, as the use of physical infrastructure comes with a degree of risk for the owner of the resource. It must be clear to the owner that the value in the collaboration is greater than the risk to their equipment or finances.

7.2.2 Power Ties

The power-based relationships operate through the organisation's access to, and ability to influence, structures of power. These structures, in the context of this research, are defined as local and national government and policy centres; industry; and wider impact. The relationships reflect the ability of an organisation to change local and national policy; industry practice; and attitudes towards CE, within and outside their industry. There are three key aspects to the power-based ties: the *type of power* structure that an organisation is connected to; the amount of *influence* an organisation has to enact change; and the level of *access to power* an organisation has within these structures. Depending on the size, authority, and level of expertise within the organisation, they can be the ones with the power to influence, usually within their sector but also beyond.

Type of Power

Looking at the types of power an organisation has access to, allows the framework to show the areas where an organisation might be able to influence within their industry and beyond. The type of power structure can be at a local or national level, including government departments, where the

organisation can influence policy or decision making; business groups that can influence enterprise partnerships or professional attitudes; other types of institutions like universities that hold sway over their local areas; or influence over public opinion. The size of the power structure doesn't seem to matter, if the influence the organisation has within that structure can change outcomes related to policy and practice, or affect how they operate, it is valuable. Considering the type of power structure an organisation has access to is important, as this reflects their position within their community and where their energy should be directed. Low level power structures should not be overlooked as they could be useful to influence local community decisions or give access to higher levels of power.

Access to Power

Access to power relationships are key to examining how an organisation can affect and develop power-based ties. By identifying where an organisation has access to power, the KEPI framework can highlight key relationships that need to be improved or maintained, and where influence can be developed. Access plays a crucial role in the level of influence the organisations have over the types of power structures they are tied to. Some of their relationships give them direct access to power, but often it is through a prominent stakeholder who acts as a gatekeeper for an organisation to influence power, change policy, and industry practice. The stakeholders that provide access to power are often in positions of power themselves, their power may be less to do with changing policy and practice but more to do with the connections and access they provide to the organisations that are associated with them. The CSOs can provide access to power to other organisations within their network, as well as using their connections to leverage access to more powerful institutions.

Influence

The level and amount of influence the organisation has within structures of power is also a key aspect of the power theme. Within these relationships it is crucial to identify whether the organisation has the influence to create external change and how much the organisation can affect this change. Influence over the power relationships exists on a scale, similar to the Knowledge ties. For example, within the case studies, one of the CSOs had answered a call from a government department to contribute to a report. These calls are open to several experts in their field, so it is difficult to measure how much influence one respondent has over the outcomes of the report and whether that report ultimately influences policy. At the national level, it is quite difficult to identify how much influence an organisation can have, unless they are directly working on a project with a government department that has a specific outcome. On a lower level, influence can be seen through connections where an organisation has the opportunity to affect change. This can be demonstrated through one of the CSO's connections with their local university where a Student Union society was created around their organisation, this has had an influence on Student Union policy.

As shown through the research, organisations can have more influence at a local level, contributing more to local institutions, that could affect regional policy and practices. Exerting influence within their industry is something that each of the CSOs take part in through different relationships, either through their advisory roles or direct membership of industry level organisations. Within industry, influence is important for organisations wishing to change practice and attitudes, but organisations should also aim to have influence beyond their industry, which has been shown to give organisations the connections to further expand their networks and create new opportunities.

Within the framework it is important to identify access and degree of influence as separate entities within the power theme. This can aid an organisation in identifying where they need to build on their relationships and extend their influence. The CE consists of many loops of different sizes, and as the research shows, most organisations are working across the micro, meso, and macro levels. Therefore, it is crucial that every organisation working in and towards the CE finds ways to influence at any level they can, among any and all types of power structure. As organisations already working towards a CE, they are best placed to advise others in their industry and beyond and help to shape the CE at all levels. Working towards circularity is a continuous cycle of learning and practice, these lessons should be shared and made open to others; by exercising their influence, organisations can ensure that circularity and circular loops are implemented from the lowest to the highest level.

7.3 Applying the KEPI framework

The KEPI framework has been developed as a tool for organisations looking to become more circular to apply to their stakeholders. It assesses the benefits of a network connection for organisations working in the CE or wanting to improve their circularity. Through the use of the KEPI framework, an organisation can assess where their relationships lie in the knowledge/power dichotomy and understand how to utilise these relationships to their advantage. For organisations working towards a CE, the framework can be applied by following the steps listed below. This would ideally be conducted as part of a stakeholder mapping exercise, that explores relationships beyond consumers and the supply chain, but could also be used to just examine one or two relationships in detail. Through the application of this framework to a stakeholder map, an organisation can see what benefits their connections bring them and identify any areas that might need improving. By categorising relationships as knowledge transfer, knowledge exchange, experimentation through collaboration, access to power, or influence, and identifying the type of power involved in the relationship, organisations can see whether they are lacking connections in one area or where a tie might no longer benefit them.

Chapter 7: Research Outcomes

This framework will be useful while the CE is being established as an economic model. Further research will need to be done to establish the framework as a working tool, a plan for this research is discussed in section 7.4, based on initial feedback of the tool from some of the CSOs discussed in this section.

The following explains how to apply the KEPI framework to an organisation's stakeholders.

Map an organisation's stakeholders and highlight which connections could benefit the organisation.

1. Identify whether each stakeholder is a knowledge-based connection or a power-based connection and use the flowchart to determine the type of relationship. Ask:
   a. "Is this relationship predominantly based on learning for either party?" If yes, this is a knowledge-based connection.
   b. "Could this relationship create change for industry, policy or attitudes in general?" If yes, this is a power-based connection.

For the knowledge-based ties, ask:

- Is this a mostly reciprocal relationship?
  o If no, this is a *knowledge transfer* relationship.
  o If yes, this could be either a knowledge exchange or experimentation through collaboration relationship, the next question determines this.
- Are either of the parties involved sharing physical assets?
  o If no, this is a *knowledge exchange* relationship.
  o If yes, this is *experimentation through collaboration*.

For the power-based ties, ask:

- Does this relationship provide a link, or links, to more powerful organisations?
  o If yes, this is an *access to power* relationship.
- Could this relationship *directly* create change at a local, regional, national or industry level?
  o If yes, this is an *influence*-based relationship.

*It is important to note that a relationship can be both knowledge-based and power-based.

Once the types of relationships have been established, there are questions that can be explored for a deeper insight into the connections:

- Could any of the knowledge-based connections move up the scale from either knowledge transfer to knowledge exchange, or knowledge exchange to experimentation through collaboration?
  o Which relationships would benefit the most from moving up the scale?
  o What would need to happen to cause this to take place?
- Identify the types of power in each of the power-based relationships:
  o How much influence can be exerted over industry practice or local/regional/national policy, either directly or indirectly?
  o Are there points of access to other types of power?

This framework should be applied to organisations working in the CE, to reveal where they could be strengthening their relationships, and pushing a circular agenda. The questions listed above can be used to identify what type of tie is present in each stakeholder relationship that an organisation has. Application of the framework to a relationship doesn't have to be restricted to an either/or dichotomy. A connection can provide both knowledge and power, but it is important to identify which type of knowledge, and which type of power it provides, to help the organisation reveal where there are gaps, and to understand their position within in the circular ecosystem. Equally, a tie could provide neither knowledge nor power to the organisation, but it is important to identify what value the ties provide to the organisation, to ensure that energy put into this connection is not wasted.

Through the application of this framework organisations can see what hidden benefits exist within their networks and identify any areas that need to be improved. Working towards a CE is a continuous cycle of learning and practice. The development of new knowledge and new practices should be shared, among an organisation's peers but also beyond, to ensure that best practice benefits everyone.

The following pages, based on the information in this section, show the framework as it could be presented to organisations wishing to apply it to their networks.

Using your connections to improve circularity

Are you ready to tap into the circular economy but struggling to make the change? Your relationships could be the key to your organisation becoming more circular. Follow the KEPI framework to realise the value in your connections and make the right changes for a circular future.

KEPI: KNOWLEDGE, EXPERIMENTATION, ACCESS TO POWER, INFLUENCE

The KEPI framework focuses on the untapped resources found in your connections that could provide you with knowledge or power to make changes to benefit your organisation and the planet.

Knowledge-based connections

Your knowledge-based connections provide flows of knowledge, either into the organisation or out of it. They exist on a scale from **knowledge transfer**, *to* **knowledge exchange**, *and* **experimentation through collaboration**.

Knowledge transfer	Knowledge exchange	Experimentation (through collaboration)
This is the "passive" transfer of knowledge, from the party providing the knowledge to the party receiving it. e.g., courses provided by or for the organisation. Knowledge and learning flow in one direction.	Relationships that involve two or more parties who share best practice or develop learning partnerships. These are active relationships that require participation and reciprocation from all parties. Knowledge flows both ways.	These relationships are based on knowledge exchange where there is a willingness to share equipment and resources, in order to create new products and solutions. Knowledge flows both ways & includes a high degree of trust

Knowledge Transfer — Knowledge Exchange — Experimentation (through collaboration)

Degree of reciprocity ———→ Degree of risk ———→

Power-based connections

Your power-based connections operate through your links to structures of influence. Through these relationships you can change local and national policy, industry practice, or attitudes towards circular economy and sustainability. They are divided into **type of power**, **access to power** *and* **influence**.

Type of power	
This can be at a local or national level, including: government or council departments; business groups that influence enterprise; or other institutions like universities that have influence over their local areas. The type of power is useful to identify as the circular economy operates at many different levels.	
Access	**Influence**
Identifying where you have access to power is crucial for your organisation's ability to create change. Some relationships give direct access to power, but often there is party that can act as a stepping stone to a high level of power.	This is the level and amount of authority your organisation has to create change in your region or industry. Influence exists on a scale; it could be a small advisory contribution to national policy or being a key member of an industry association.

Figure 7-3: Page 1 of KEPI framework document for use by organisations.

To apply the KEPI framework:

1. *Identify your organisation's stakeholders, beyond clients, that could effect your circularity. This could be all the stakeholders or just a handful of important connections.*
2. *Draw a map of the stakeholders and identify any connections that they have that could benefit you.*
3. *As you draw your map for each relationship ask*:*

"Is this relationship mostly based on learning for either parties?" Mostly yes, it's:

Knowledge–based

- Is this a mostly reciprocal relationship? — No → **Knowledge transfer**
- Yes ↓
- Are either party willing to share physical assets? — No → **Knowledge exchange**
- Yes ↓
- **Experimentation through collaboration**
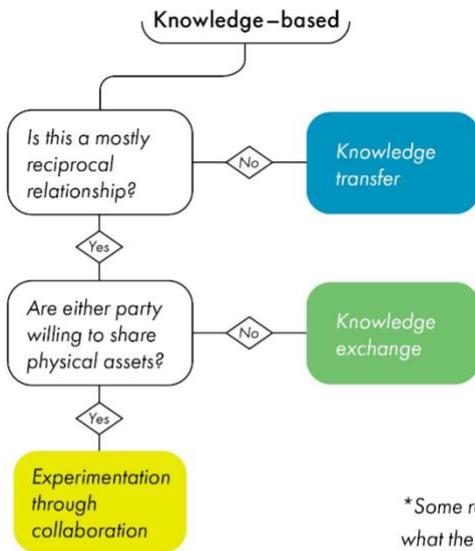
"Could this relationship create change for industry or policy?" Mostly yes, it's:

Power–based

- Could this relationship *directly* create change? — No → It is a link to a more powerful organisation
- Yes ↓ **Influence**
- Yes ↓ **Access to power**
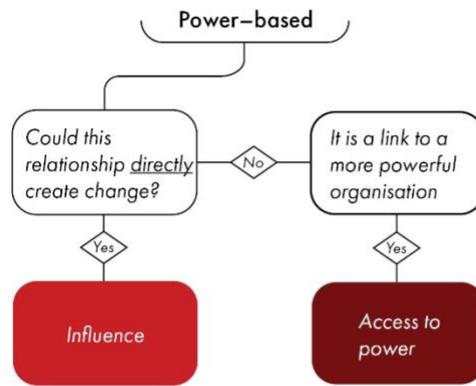
**Some relationships might exist outside of knowledge and power: work out what the benefit of this relationship is, and whether you should continue it.*

Follow–up questions to explore

- Could or should any of your knowledge–based relationships move up the scale?
- What do you need to do to make this happen?

- How much influence can you exert over industry practice or local/regional/national policy either directly or indirectly?
- How can you get access to other areas of power?

Case study: *Andy's headquarters wanted to implement circular systems long before the ideas behind them were commonplace. Andy found he was at the receiving end of* **knowledge transfer**, *and it was difficult to put into place the changes that needed to be made. He set up a business group in his local area where different companies could come together to share best practice, creating a* **knowledge exchange**. *Over time, a high level of trust has built up through the group and members have come together,* **experimenting through collaboration** *to solve waste processing issues.*

Case study: *Sophie co-founded a tech start up in an industry famous for being slow moving. She knew her organisation was well placed to bring her industry into the 21st Century but faced backlash from established players. Sophie volunteered to be the secretary of her trade association, which has introduced her to representatives from government bodies keen to learn from her and introduce policy that would digitalise her industry. This voluntary role has given Sophie* **access to power** *and a level of influence in national governments.*

Through applying this framework to your stakeholders, you can see what benefits the relationship brings and identify any areas that might need to be improved. Working towards a circular economy is a continuous cycle of learning and practice. These are lessons that should be shared and made open and as the leaders in organisations working towards a circular economy, you are the people best placed to advise others in your industry and beyond; helping to shape the circular economy at all levels.

Figure 7-4: Page 2 of KEPI framework document for use by organisations.

7.4 KEPI Framework Feedback

Manzini said that design needs to *"make things visible and tangible"* (2015, p. 121) to expose and reveal elements that might have previously been hidden. This thesis uses design tools to create illustrative maps and diagrams that explain the concepts explored and developed through this work. Culminating in the KEPI framework that categorises the relationships between the CSOs and their stakeholders. Once the framework had been developed, all the interview participants were approached to give them an opportunity to provide feedback. By using relationships that had already been established, the feedback was received in a timely manner and the framework could be applied to the stakeholder maps already developed for the research. Three of the interview participants replied within the timeframe, and brief interviews were conducted with them (see Appendix 6). The framework was applied to the previously developed stakeholder maps shown in Chapter 5 (Figure 7-5,
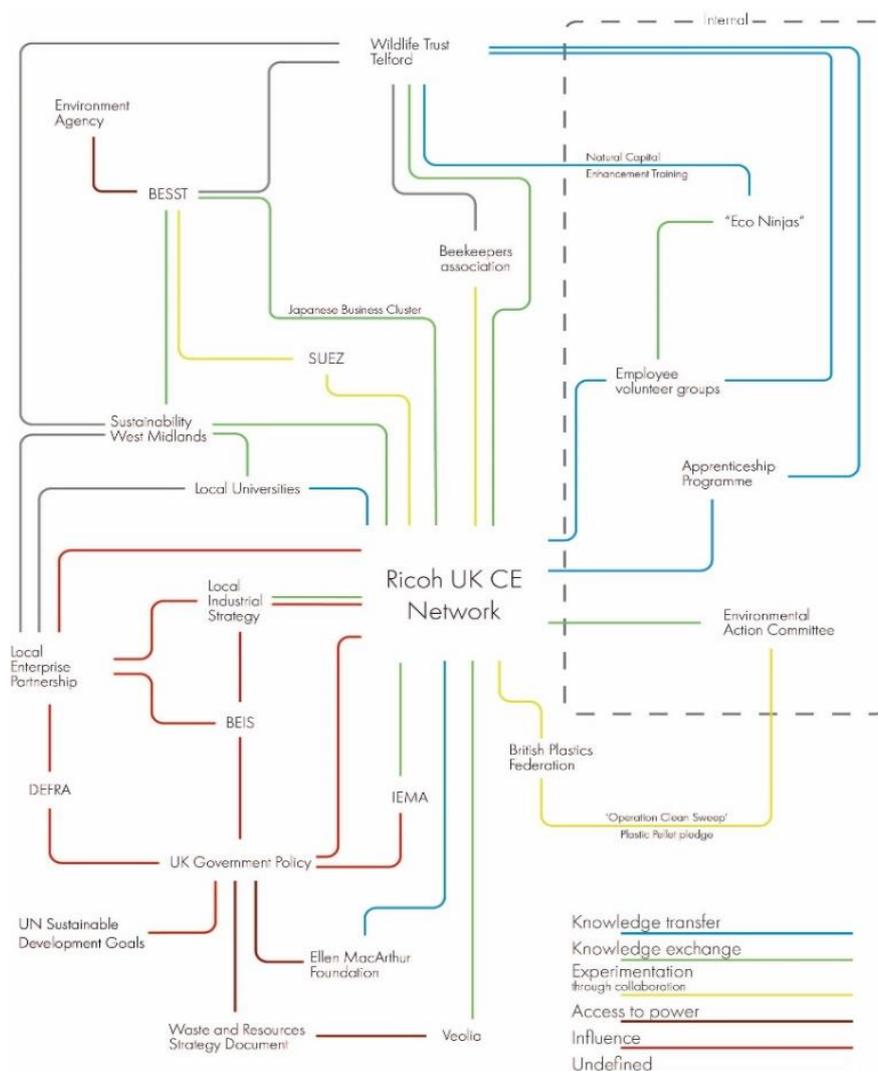
Figure 7-5: Ricoh UK stakeholder map with KEPI framework applied.

Figure 7-6, and Figure 7-7). These were sent to the interview participant (IP) along with a copy of the framework (Figure 7-3 and Figure 7-4).

The feedback on the framework has been overwhelmingly positive, all the IPs wanted to reapply it to their current networks, and one of the IPs is planning to use the framework at an upcoming stakeholder mapping exercise they are running with a business group. The interviewees stated that, through the visualisation, they are able to clearly see the values in their connections and can use the map to demonstrate this to others. As the maps provide a snapshot of the organisation at the time of the interview there was a fair amount of discussion based on the changes that have happened since they were created. All of the IPs expressed how they would want to see an updated map, with their current connections and relationships.
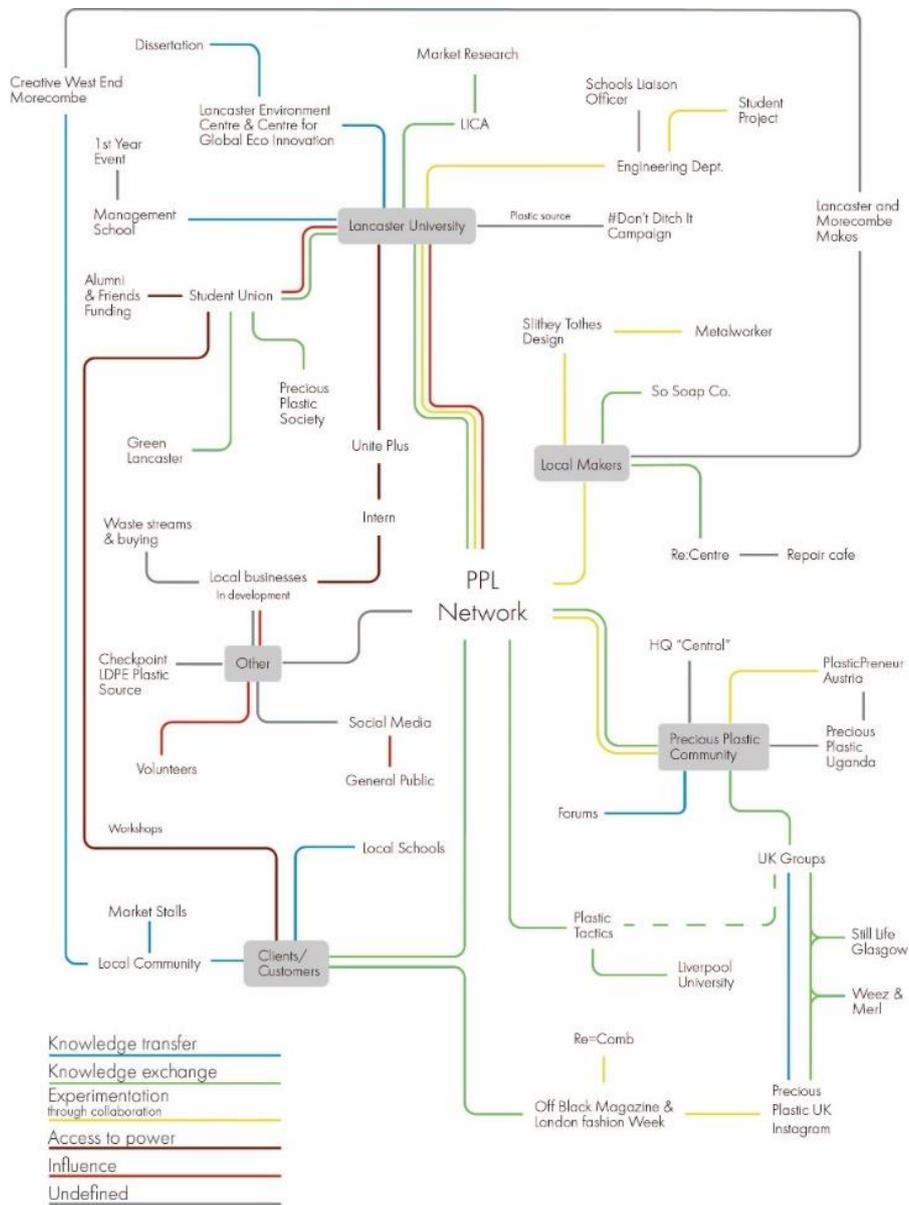
Figure 7-6: PPL stakeholder map with KEPI framework applied.

One of the interviewees discussed how the category of influence could be misleading. They talked of their organisation's experience of being invited to participate in the local government's strategy for their industry, but they did not feel that the advice that they give through this group was necessarily listened to. Funding restrictions on the council have meant that this group has been outsourced to a much larger industry player; as a result, they feel that their contribution is quite often overlooked, and despite having a seat at the table, their influence is limited. Further research would be needed to develop a way to reflect on and demonstrate the true level of influence that an organisation has within structures of power. On the next pages are some of the quotes that came from the feedback, loosely coded.
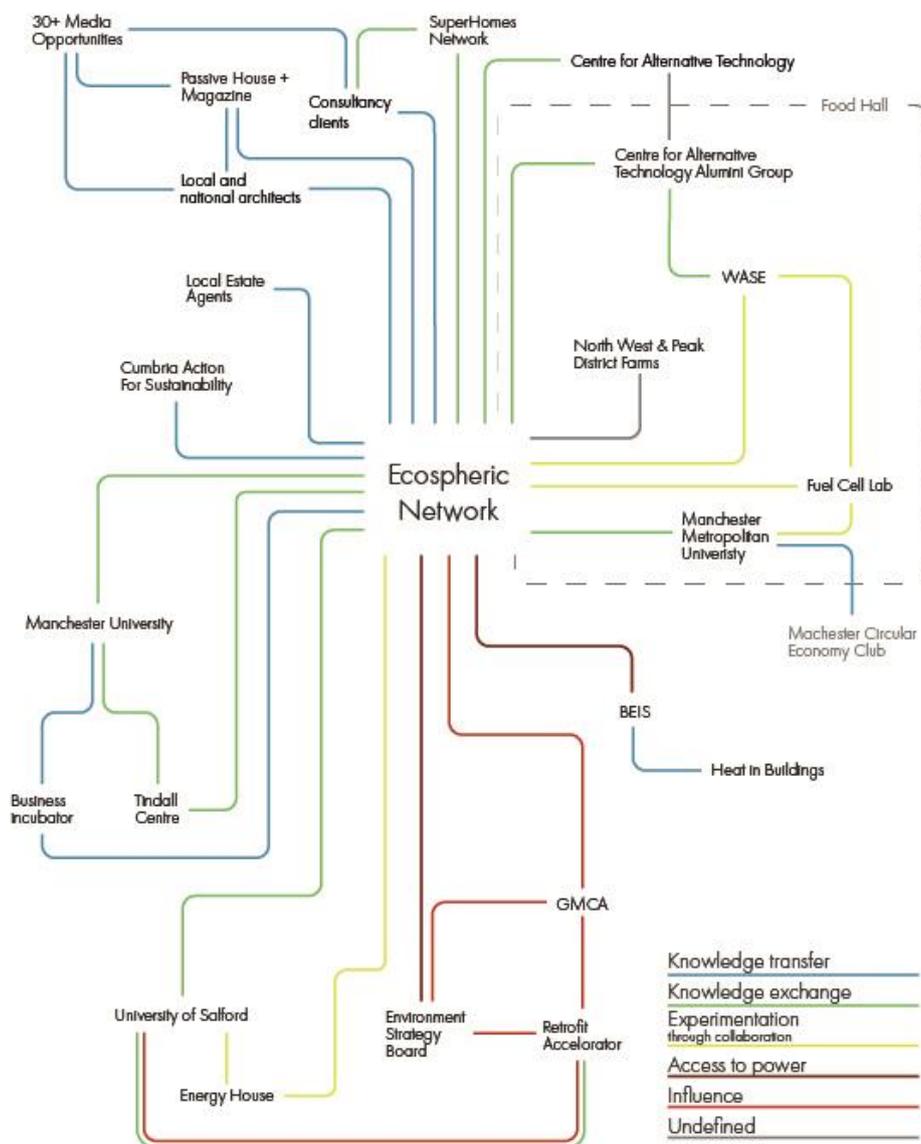
Figure 7-7: Ecospheric stakeholder map with KEPI framework applied.

Chapter 7: Research Outcomes

Using the maps as a visual tool:
For their own benefit and to demonstrate the value of their connections to others.

> *"…I think it's really useful, the colour coding is brilliant to be honest because it's all there, isn't it? I don't need to look at it and work out what's what. It's like, oh there, there's a knowledge transfer, there's the value in that relationship."* (IP2)

> *"…to have everything on one page is really interesting to look at, because a lot of the time it's in your head, but it's not clear when you're trying to explain to other people. For example, I might be talking to them about this person or this connection, or where we get plastic from, or this is the person we worked with before. You can start trying to build it in your head but on a very basic level, it's really nice just to have everything one page, because that's not something we have otherwise. And then of course you know the framework that you've done is another level to that."* (IP1)

> *"…sustainability professionals will go out and they will do, do, do, do action, do action, do action, and when you come back to the boardroom and somebody says, well, that's several hours of your time, where's the value in that? And to be able to throw that [stakeholder map] up and say that's it. That would be brilliant. I wish it had been a tool that I could have used in the past."* (IP2)

> *"…from the very basic level you see everything on page and then you know the next level of how specifically those connections are important. And even without the final purpose of improving circularity I can see how the different connections are important in different ways."* (IP1)

How the map could be updated to reflect new and changed connections:
Adopting the language of the framework to describe new connections.

> *"…in terms of that knowledge exchange: we've expanded that area quite a bit, so we've got a PhD researcher who's doing an industry-based PhD from University of Liverpool, so he's working with us on building up those knowledge exchange connections and expanding on that a bit more."* (IP3)

Suggestions for further development:
Ideas that were proposed by the IPs during the interviews.

"… I'd love it if I could just sit down, look at all my connections, write a list of those people on Excel or something. I have a column for who the person is and then you have a column for whether it's knowledge transfer, knowledge exchange, experimentation, access to power, et cetera. And then the programme could then just take those two columns of data and assign the colour line that links to them and then there'll be some sort of easy script or programme that would spatially put them on for a page like that" (IP1)

"…I put mine [KEPI map] in the Prezi with someone else's [KEPI map] in The Prezi and you could zoom around them and have them open up and then if you wanted to click on someone else's connections, you could go out to that person." (IP2)

"…it's a good management tool. It's a good way of showing stakeholder mapping, but it's also a good individual personal development tool. I could see being used in one-to-ones. I can see my manager now saying well, what is the local enterprise partnership? What's the value? And then you could explain it." (IP2)

"…I guess there is there a weight to certain types of stakeholders or connections trying to determine if one type of connection is more influential or has more impact on your organization." (IP3)

"…that's all quite interesting because I guess it's made me think about the quality of those connections as well. Like in terms of our work with the GMCA, sometimes I think the feeling is that we're included in the room, but they're not necessarily always taking in that feedback or acting on it in any meaningful way." (IP3)

This feedback will form the basis of further research, to be conducted following the completion of the PhD, which is discussed in section 0.

The next section considers the research as a whole; discusses CSO feedback from the initial application of the KEPI framework; and explores what next steps could be taken to further the research started in this thesis. It also describes the challenges and limitations of the research and develops some conclusions.

Chapter 8
Discussion and Conclusion

This chapter starts with a discussion of the limitations of the research. Followed by situating the research within the wider CE debate through an examination of the changing landscape of CE research over the duration of the PhD; and a discussion of the issues raised by the interviews that did not fit within the research framework. The second half of the chapter returns the focus to the research and answers the research questions. There follows a reflection on the study itself and a discussion of further avenues of study that this research could lead to.

8.1 Situating the Research within the Circular Economy

Throughout the PhD, the CE has become a more discussed and publicised paradigm, with international organisations, such as Ikea, adopting the principles and changing their practices; and an increased interest from businesses across industries and consultancy firms (Nobre and Tavares, 2021). Despite publicity around this and other corporate initiatives, there is still a lack of knowledge about the CE and consumer understanding remains low, in part due to the lack of a solid definition of CE, see section 2.2.2. However, many consumers are engaging with grassroots aspects of the CE, through repair cafes and distributed recycling initiatives (Spekkink *et al.*, 2022); and the rise of clothing resale apps, for example. Within manufacturing, there is an increased understanding of circularity for products, which is a key focus of research in Industry 4.0 technologies, furthering the literature discussed in section 2.2.6 Digitalisation.

Prior to the pandemic, the Ellen MacArthur Foundation announced some very big collaborations, including with some of the world's biggest plastic polluters such as Coca-Cola. This led this researcher to ask if the systemic aims of the CE, to fundamentally change the way the economy and the capitalist system functions as a whole, are being lost to the 10Rs paradigm: focusing mostly on product life cycles, or the circular side to the CE; without a focus to change the economic structures that uphold the current take-make-dispose paradigm. This means that the current direction of the CE is taking a weak sustainability perspective, as discussed in section 2.2.8, and these collaborations show the real risk that the CE could be subverted by high-profile advocates who allow their message to be diluted by multinationals looking for "green" credentials without having to examine their role in climate change and have the difficult conversations that uninhibited growth is causing real harm to the planet. Engaging with the favourable elements of CE alone will do nothing to affect climate change, there needs to be a considerable restructuring of the global economic system. The planet is reaching the point of no return and a recent World Meteorological Organization (2022) report says that the effects of climate change are accelerating in Europe, which makes it even more pressing to acknowledge and understand that embracing the CE means massive changes in the current economic system. High-profile CE advocates should be pushing degrowth higher up the political agenda, to create a transition that is just and equitable for all.

The economy side of the CE was a point of discussion for some of the CSOs who could see the need for a shift away from current economic systems but couldn't necessarily envisage how it would happen. There was a discussion around the potential risks of CE uptake, where one large organisation monopolises a certain type of resource, for example, aluminium, holding and controlling its use and access. This could mean that smaller organisations would be unable to affordably access this resource,

concentrating the earth's most valuable resources into the hands of a few very powerful organisations. To ensure that this eventuality does not happen, it is important to support local programmes that engage with the R paradigm, such as remanufacturing and reuse, and local CE initiatives are developed that keep important resources within locales for use by organisations with short supply chains. The SME CSOs demonstrate some initiatives that support these measures, as does the literature in section 2.2.7 The Sharing Economy. Despite some discussions around the nature of the economy side, this aspect of CE was less clearly defined across the different organisations studied. More research needs to be conducted into how to approach the need for a shift in mindsets, exploring avenues and appetites for degrowth; away from weak-sustainability capitalist models that ultimately place the burden of waste on the consumer and allow for business as usual with better recycling. As the CE has become more popular as a marker of green credentials, it is important for organisations who want to engage with the CE to understand what it entails: committing to more than the 4 or 10 Rs, and advocating for a complete change to economic systems, including a renewal of nature and putting society before profit.

8.2 Research Questions

The challenge set at the beginning of the PhD, to base the research on an aspect of the Industrial Strategy, sent the research in an unexpected direction. It pushed a need to develop an understanding across many aspects of sustainability and business, to get a wholistic understanding of the areas being explored. Despite the Industrial Strategy being shelved by subsequent governments, the development of research in the emerging area of CE, and the intersection of that with community, gives this thesis value beyond the stipulations of the initial research challenge.

The starting point for this research was to explore "*What role does community play in a circular economy?*" Through a comprehensive review of the literature, this question was broken down into four parts:

- how do organisations approach the CE?
- how important are communities of practice to an organisation's circular journey?
- which capital flows are the most important to an organisation's network?
- how do organisations engage with and use their communities to further their CE ambitions?

The research showed that community engagement on different levels was important to all of the organisations on their circular journeys, consisting of active participation in communities of practice; creating links with others to develop solutions to unusual circularity problems; and developing collaborations to further circular outputs. Many aspects of the different approaches to CE analysed in this research involved community elements, and establishing strong networks allowed the

organisations to engage their users and customers as partners within the design process of their products and services, as discussed in section 2.2.5 Design and the Circular Economy. Sharing best practice around CE was also a key element of community building for the CSOs, in the use of CoPs and creating research partnerships with universities.

The range of industries and size of organisations studied had little effect on how they approached the CE, engaging with the different aspects in many of the same ways. Each of the organisations studied had different levels of understanding of the CE when the interviews were conducted. However, all of the CSOs engaged with the categories laid out by the research; for example, all of the organisations studied had a clear view of waste in their industries and how to engage with it in terms of the different Rs. Each of the organisations studied had CE focus at the product or material level; the regional level; and the countrywide or industry level. Approaching CE from these different levels allows organisations to engage with CE principles across their networks and regions. Having an approach that encompasses all levels (see section 6.3.3 Circular Economy Implementation), allows an organisation to stay ahead of technological and policy developments around CE, it also allows them to exert an influence over CE in that area. The drivers shared by the organisations involved: preventing further damage to the environment; collaboration opportunities; and business improvements. The influence of community is apparent in the answer to the first question, *"how do organisations approach the CE?"*, as all of the organisations studied used their communities in their approaches to circularity, especially related to sharing best practice relevant to their industries. For organisations moving towards a CE there is an opportunity to connect with others to share knowledge and support one another. None of the organisations studied were approaching CE, or sustainability initiatives, without the support of others.

All the organisations engaged with different types of communities: communities of practice, or location-based communities. There was no clear correlation between the different organisations and the number, or level, of involvement within the different types of community. Focusing on deliberately designed CoPs, the second question asked: *"how important are communities of practice to an organisation circular journey?"*. Each of the organisations studied engaged with CoPs, but as shown in the literature (section 2.3.3 Deliberately Formed Communities) the importance and relevance of a CoP changes over time, with each CSO having a different level of engagement with the CoPs depending on how much they needed that group. The organisations that were active members of a CoP were able to create collaborations that could further their businesses; take them in new directions; or help them to problem solve and create innovative solutions. The CoP research revealed that for a CoP to be useful in providing connections to others, an organisation must actively engage with that CoP, and that the CoP must be specific and focused on industry or place, if the CoP is too generic then it may not be relevant to an organisation. The organisations that engaged most heavily with their CoPs found the

most use for them, in terms of their networks. For organisations just starting on their circular journey, this research recommends that they join or set up a CoP specific to their industry or region, and proactively use the connections and networks created through this to further their CE thinking and activities, with the view to developing interesting collaborations.

The social network maps were a valuable tool for the research, as they showed who each of the organisations were connected to, and how those connections had benefited them. By applying the CCF, the analysis was able to reveal *"which of the capital flows are the most important to an organisation's network?".* Across the CSOs, it was clear that the most important capitals within the network are Human, Social, and Political. These capitals gave the organisations access and connections to knowledge exchanges, experimentation, power, and influence, forming the basis for the KEPI framework. For the organisation with the most established CE business model, Natural Capital connections were also very important. This could be down to the fact that the other organisations were still establishing their circular methods and could not consider Natural Capital, or that it was only discussed in the context of their connections so could have been overlooked. Returning to the Industrial Strategy document, Natural Capital is one of the reasons for supporting the CE:

> *We are committed to moving towards a more circular economy – to raising productivity by using resources more efficiently, to increasing resilience by contributing to a healthier environment, and to supporting long-term growth by regenerating our* **Natural Capital***.*

(BEIS, 2017, p.148)

Further research will need to be done to determine whether Natural Capital is something of importance to organisations working in the CE, or whether there is a failing of the message that the regeneration of natural systems is vitally important to the overall CE.

By overlooking the replenishment of Natural Capital, it can be argued that the CSOs are engaging in a weaker form of sustainability, however as Natural Capital was discussed in terms of the CCF which was only used in the context of the SNA there could be overlooked areas. That being said, there is a dissonance evident in the results showing that all the organisations take a weak sustainability approach, demonstrating ways that technology can improve waste management and efficiency (see sections 2.2.4 and 2.2.8 for a literature discussion on this). It can be argued that there is a scale from weakest to strongest within the results, although none of the CSOs advocate for the strongest form of sustainability that places degrowth, social equity and Natural Capital replenishment at the top of the agenda (Hobson, 2013). Of the CSOs, PPL and Dsposal are the only two to focus on social equity, which places them higher up the scale towards a strong sustainability approach. As Ricoh UK have a Natural Capital agenda, they are also further up the scale but are still fully embedded in the capitalist system

and only focus on resource efficiency through technological advancement. Ecospheric and Arup both advocate for the use of technology to be more sustainable and seem to ignore the need for social equity in sustainability which places them closer to the weaker end of the scale. Further research will need to be conducted into whether or not the CE can ever demonstrate a strong sustainability perspective or if it has become an embedded tool of capitalism to demonstrate easier and more popular weak sustainability perspective.

The final question, *"how do organisations utilise and engage with their communities to further their CE ambitions?"*, explored the benefits of community engagement on an organisation's circular ambition. As discussed in section 2.3, communities are identified as being social, providing a sense of belonging, communicative, and networked. Within the research, the communities discussed are mostly, communities of practice or location-based, digital tools were used to create links and communication between the CSOs and others, but most interactions occurred face-to-face, building on the literature in section 2.2.6 that digitalisation is a tool primarily for communication. The organisations' engagement with CoPs is explored above, the benefits of which were predominantly around network development, in contrast to the literature which states that CoPs are mainly for sharing of skills and best practice (see section 2.3.3); the location-based communities were used in a variety of ways by the different organisations. To develop a truly circular society, organisations need to be aware of and engaged with, what is going on in their locales, to know how best they can close existing loops in their area. For the SMEs studied, this appeared to be easier as they had a stronger focus on where they were based. However, it was clear from the analysis that Ricoh UK also had a strong local focus in its community networks, with many projects and CoPs designed around its location. The other multinational, Arup, was not as focused on its local communities, but much of its CE work was discussed on a macro level, building influence across its industry. Answering the final question led to the development of the KEPI framework: explicitly demonstrating that CE organisations use their communities and networks for knowledge exchanges, experimental collaborations, access to power, and the ability to influence at a political or industrial level.

The development of the KEPI framework has informed the view that there is an importance to understanding the relationships an organisation has. These relationships can help an organisation to develop strategies to navigate the new economic paradigm: through the sharing of best practice; understanding new policy; and even understanding where their expertise could inform initiatives within their regions. The KEPI framework categorises these relationships to highlight how an organisation could best make use of them. It needs further testing and refinement to identify the best application for it within an organisation, and to explore the significance of the relationships that fall outside of the KEPI categories. A plan for further research is laid out in section 0, below.

8.3 Reflections on the Research

The five case studies analysed by this thesis show a variety of disciplines and sizes. At the time of scoping for research partners, fewer organisations were working explicitly in the CE, and many that were did not have the capacity to be interviewed. These restrictions lead to the case studies that are shown here and explain why there is such a variety of sizes and industries within them. This has ultimately been a strength of the research, allowing for conclusions to be drawn across a spectrum of case studies. The restrictions on the research by the availability of case studies, and their different levels of understanding and acceptance of the CE has been reflective of the wider challenges around CE comprehension and adoption and provided the research with interesting points of tension during the data collection, which led to a much richer analysis than if all the organisations had been following the same CE business model.

The interviewees for the two multinationals both followed a pre-rehearsed script (in the case of Ricoh this included a PowerPoint) that detailed their relationship quite explicitly with the CE. These interviewees were less familiar with the barriers to CE implementation that have occurred outside of their own job roles, and where their organisation was failing to meet its own targets. The SME interviews, on the other hand, were all conducted with the founders who had an intimate knowledge of where their organisation had struggled with CE. As the SMEs were smaller, with a lot less person power than the multinationals, they did not have as much written data to analyse, however, as the interviewees had a more intimate knowledge of the organisation's journey, they were able to give a more honest account of that journey, which made up for the difference when it came to the analysis. The larger multinationals could refer to reports and publications that detailed their successes, which reinforced the message given in the interview, these tended to follow the corporate agenda and show the organisation in the best possible light. By interviewing the founders of the SMEs, the struggles were shown, and a more messy but honest collection of data was made.

8.3.1 Limitations
Organisational
As discussed in sections 1.3 and 4.2, one of the main challenges faced by the research was recruitment of organisations. Stipulations put on the research by the funders meant that the focus had to be in the North West of England which led to difficulty in finding organisations working towards a CE, as the main uptake of the model was in London at the time, and there was a lack of understanding of the CE among organisations approached. The lack of organisations to provide data led to limitations to the methodology which could have been mitigated with more interviews, however the COVID pandemic began during a crucial point of the data analysis, which meant that

further data collection through interviews with existing participants could not be conducted, due to the stress and uncertainty faced by the key stakeholders. This also meant that an alternative view of the relationships formed through most of the CoPs were not sought out as contacting people during this period of furlough was difficult. This limited the data used to examine the relationships and networks to a single interpretation, in the case of most of the CSOs networks, which was provided by the interview participant.

Data Gathering

Due to the limitations in finding organisations to work with, there was a bias in the selection of data recommended by the interview participants and the interview data. The interview participants were all interested in positively self-reporting the data to paint their organisations' sustainability efforts in a positive light. As previously discussed, the CSOs all work within the capitalist system so they are ultimately interested in maintaining their businesses for profit.

Other limitations at the data gathering stage centred around the mapping exercise. The multinationals were interviewed online, and at the time the interviewer was not familiar with collaborative online drawing tools, so the maps were drawn by the interviewer with input and discussion from the interviewees. Of the SMEs, two enthusiastically created a detailed map of their connections, enjoying the opportunity to visually explore their connections. One of the interviews proved to be a struggle to get direct answers to the questions and the map drawing exercise fell flat; the interviewee just wrote a list of people the interviewer might want to talk to. Their map had to be developed after the interview, using the interview data to establish connections, and through follow up conversations with key stakeholders mentioned. This ultimately led to a rich dataset, which enhanced the analysis for this particular case study.

Use and Development of Frameworks

The KEPI framework was developed near the end of the thesis writing period and has not been contextualised against other similar frameworks. The plan to develop this framework through a further project (discussed in section 8.4) includes investigating similar frameworks to ensure the robustness of KEPI and provide a clear distinction between it and others.

The 4Rs framework was selected over a larger more nuanced one, such as the 10Rs, as this was not the primary focus of the research and the different types of Rs used in the literature is not consistent, as discussed in section 2.2.4. Since the main objective of the research was to examine the relationship between CE, community, and networks, ecological assessments of the CSOs were not conducted. However, where comments have been made in this area it is important to note that any interpretation should be made with careful consideration.

The CCF provided interesting insights to the SNA and the research as a whole. However, only applying it to the SNA meant that some capitals important for CE, such as natural and digital, were overlooked due to their use outside of the networks. There are also limits to using a location-based community framework on business communities and networks as this framework places equal importance on each of the capitals but as discussed previously, in terms of the CE, some capitals are more important than others as businesses usually have a profit driven agenda, whereas location-based communities are often driven by other factors.

8.4 Further Research

There is still more research to be done to ensure a just and sustainable transition to a CE takes place. This thesis contributes to filling the gap between organisational adoption of the CE and consumer understanding, highlighting where organisations can make use of their connections to make positive changes to the CE, within their areas and industries. Moving to a CE requires a fundamental paradigm shift in growing, manufacturing, and consumption practices. While organisations must lead the way, they need to understand how they can develop their own practices and bring the rest of their communities along with them.

A key part of any further research, to move it on to new avenues, would be the development of tools for creating stakeholder maps, for use with the KEPI framework. *"The visualisation process is […] directly, a tool for community building"* (Manzini, 2015, p. 122), this thesis research stops short of community building, however, through development and refinement of the KEPI framework this could be a future possibility. In order to build upon the research explored in this thesis, a project will be developed that investigates the impact of data visualisation on sustainability outcomes for organisations. Visual tools that make CE and sustainability initiatives visible and tangible is a key way to drive the change to make more sustainable choices and decisions. The project will be focused on the development of the KEPI framework. It will use a collaborative approach to develop a data visualisation tool that could be used by organisations looking to maximise their circularity outputs through their connections. The research would advance the framework through co-designing with organisations that have circular and sustainability ambitions. It would be developed through an iterative process, conducted through in-person workshops based around stakeholder mapping exercises, which could then have the framework applied. Each of the KEPI categories will be developed in detail, ensuring they are defined and used in the most suitable way for general use. The main project outcome would be the creation of a piece of web-based software, as suggested in the initial framework feedback, that could be used by organisations to create a live visual map of their network,

that the KEPI framework could then be applied to. This would then form a live page for each of the organisations that they could use to explain their work and motivations to others. The collaborators would co-design the software, which would enable them to shape the tool to maximise their connections and circular outputs and aid their circular journey. Any further research conducted into CE organisations would include exploring the organisations circularity in relation to the 10Rs rather than just 4. There would also be a focus on communication tools, as communicating the CE as a viable alternative, not just another capitalist buzzword, is incredibly important for its uptake. The organisations at the forefront of the drive for a CE must be able to communicate circularity clearly, to ensure its enthusiastic adoption by the consumer.

Glossary of Abbreviations

AGM	*Annual General Meeting*
AHRC	*Arts and Humanities Research Council*
AI	*Artificial Intelligence*
AIP	*Arup Interview Participant*
BEIS	*Department for Business, Energy, and Industrial Strategy*
BESST	*Business Environmental Support Scheme Telford*
BITC	*Business in the Community*
BSI	*British Standards Institute*
CAT	*Centre for Alternative Technology*
CCF	*Community Capitals Framework*
CE	*Circular Economy*
CEC	*Circular Economy Club*
CEO	*Chief Executive Officer*
CIC	*Community Interest Company*
CIWM	*Chartered Institute for Waste Management*
CoP/s	*Community/ies of Practice*
CSO	*Case Study Organisation*
DEFRA	*Department for Environment, Food and Rural Affairs*
DIP	*Dsposal Interview Participant*
EA	*Environment Agency*
EIP	*Ecospheric Interview Participant*
EP	*Economic Prosperity*
EQ	*Environmental Quality*
ESI	*Entrepreneurial Social Infrastructure*
EMF	*Ellen MacArthur Foundation*
FH	*Food Hall (project)*
GDP	*Gross Domestic Product*
GMCA	*Greater Manchester Combined Authority*
IEMA	*Institute of Environmental Management and Assessment*
IoT	*Internet of Things*
IP	*Interview Participant*
ISO	*International Organisation for Standardisation*
KEPI	*Knowledge exchange, Experimentation through collaboration, access to Power and Influence*
LEP	*Local Enterprise Partnership*
MMR	*Mixed Methods Research*
MMU	*Manchester Metropolitan University*
NRW	*Natural Resources Wales*
OECD	*Organisation for Economic Co-operation and Development*
ONS	*Office of National Statistics*
PET	*Polyethylene Terephthalate*

Glossary of abbreviations

PETFR	*Polyethylene Terephthalate with Fire Retardants*
PH	*Passive House (project)*
PLM	*Product Lifecycle Management*
PPL	*Precious Plastic Lancaster*
PPLIP	*Precious Plastic Lancaster Interview Participant*
PSS	*Product-Service-Systems*
QUAL	*Qualitative*
QUAN	*Quantitative*
RFID	*Radio-Frequency Identification*
RIP	*Ricoh UK Interview Participant*
RQ	*Research Question*
SE	*Social Equity*
SEPA	*Scottish Environmental Protection Agency*
SME	*Small to Medium sized Enterprise*
SNA	*Social Network Analysis*
TNW	*Transformation North West*
UCL	*University College London*
UNCTAD	*United Nations Conference on Trade and Development*
UoM	*University of Manchester*
UoS	*University of Salford*
WACT	*Waste Compliance Taskforce*
WEEE	*Waste Electrical and Electronic Equipment*

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Appendix 1 – Pre-Project

Participant Information sheet

Mapping Circular Economy Organisations

I am a PhD student at Lancaster University, and I would like to invite you to take part in a research study examining the role of networks and communities in organisations engaged with the Circular Economy.
Please take time to read the following information carefully before you decide whether or not you wish to take part.

What is the study about?
This study aims to work with organisations who are committed to Circular Economy principles, in order to examine the role that different networks and communities, both internal and external, play in helping these organisations achieve their environmental and productivity goals.

Why have I been invited?
I have approached you because I would like to develop a case study with your organisation and delve into the networks you use.

I would be very grateful if you would agree to take part in this study.

What will I be asked to do if I take part?
If you decided to take part, this would involve the following:

An initial in-depth interview to establish a background to your organisation and its relationship with the Circular Economy, and an exploration of the networks you are part of. This will be audio recorded and will probably take an hour.

From this we will establish what other information would be useful for my research and can decide on further steps for collaboration.

What are the possible benefits from taking part?
Taking part in this study will contribute to our understanding of how your organisation is engaged in its networks and will give me data to produce a detailed map of your organisation's networks which will be shared with your organisation. The data I gather through working with your organisation will be shared with you in the form of a report.

Do I have to take part?
No. It's completely up to you to decide whether or not you take part. Your participation is voluntary. If you decide not to take part in this study, this will not affect your position in the company and your relations with your employer.

What if I change my mind?
If you change your mind, you are free to withdraw at any time during your participation in this study. If you want to withdraw, please let me know, and I will extract any ideas or information (data) you contributed to the study and destroy them. However, it is difficult and often impossible to take out data from one specific participant when this has already been anonymised or pooled together with other people's data. Therefore, you can only withdraw up to 6 weeks after taking part in the study.

Appendix

What are the possible disadvantages and risks of taking part?
I do not foresee any disadvantages to taking part, however you will need to invest 60-90 minutes of your time in order to take part in the interview process, and if you share any documentation with me, it will be important you have permission to share it.

Will my data be identifiable?
After the interview, only I, the researcher conducting this study and my supervisors, will have access to the ideas you share with me.

I will keep all personal information about you (e.g., your name and other information about you that can identify you) confidential, that is I will not share it with others. I will remove any personal information from the written record of your contribution.

How will we use the information you have shared with us and what will happen to the results of the research study?
I will use the information you have shared with me only in the following ways:
I will use it for research purposes only. This will include: my PhD thesis and other publications, for example journal articles. I may also present the results of my study at academic or professional conferences.

When writing up the findings from this study, I would like to reproduce some of the views and ideas you shared with me. I will only use anonymised quotes (e.g., from my interview with you), so that although I will use your exact words, you cannot be identified in our publications.

How my data will be stored

Your data will be stored in encrypted files (that is no-one other than me, the researcher will be able to access them) and on password-protected computers. I will store hard copies of any data securely in locked cabinets in my office. I will keep data that can identify you separately from non-personal information (e.g., your views on a specific topic). In accordance with University guidelines, I will keep the data securely for a minimum of ten years. For further information about how Lancaster University processes personal data for research purposes and your data rights please visit our webpage: www.lancaster.ac.uk/research/data-protection

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What if I have a question or concern?
If you have any queries or if you are unhappy with anything that happens concerning your participation in the study, please contact myself Jess Robins: j.robins@lancaster.ac.uk, Transformation North West project manager (on behalf of the supervisors): Claire Coulton – c.coulton@lancaster.ac.uk tel: +44 (0) 1524 510873, address: ImaginationLancaster, LICA Building, Lancaster University, Bailrigg, Lancaster. LA1 4YW

If you have any concerns or complaints that you wish to discuss with a person who is not directly involved in the research, you can also contact:
Judith Mottram: **judith.mottram@lancaster.ac.uk** tel: +44 (0)1524 594395, address: Lancaster Institute for the Contemporary Arts, LICA Building, Lancaster University, Bailrigg, Lancaster. LA1 4YW

This study has been reviewed and approved by the Faculty of Arts and Social Sciences and Lancaster Management School's Research Ethics Committee.

Thank you for considering your participation in this project.

Appendix 2 – Pilot projects

Pilot Project and rejected survey

Images of the annotated interview text conducted with Sawmill.

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Case Study 1 interview 4th April

1 Case Study 1 interview 4th April
2 INTERVIEWER: Do you have any questions about what you read in the
3 participant information sheet that I sent over?
4 CS1: Don't think so, no
5 INTERVIEWER: No, cool
6 CS1: I did read it [laughs] I did read it.
7 INTERVIEWER: And you're fine with how all your data is going to be stored and
8 that sort of thing?
9 CS1: Yep yep
10 INTERVIEWER: Cool, so. Why did you start working in the circular economy?
11 Why did you start thinking about working in the circular economy?
12 CS1: [Breathes out loudly through lips] Err, ooh. I was a kitchen designer for a
13 national company, and this family has sort of been in scrap. So the uncle
14 enlisted my services to help sell his scrap and antiques and from there it
15 evolved as things do [JR agreement noise]. And then we sort of obviously
16 things evolve we made as best as we could, and then really, it's all, it's you
17 know yes we want to make money but you need to make money morally right
18 [? tone]. If that makes sense?
19 INTERVIEWER: Agreement noise
20 CS1: Erm, so yeah, its more a case of trying to make money whilst being
21 morally right. In that aspect. No-one's ever gonna be completely morally right
22 but you can try to be and you can try your bit essentially.
23 INTERVIEWER: Cool, yeah, that's good. Erm and since you started doing the
24 erm... Should we focus on the wood? Pallet reclaiming
25 CS1: So, a bit of a... let me elaborate on that a bit. So, I mean, we started
26 mainly antiques but the antiques market is dead, there's no such thing as an
27 antiques market anymore. So then from there we... the main thing we started
28 doing was... well, what set it up basically, there was 22 terraced housing in
29 Salford that got knocked down, and we bought all the timber from the

2 | Page

30 demolition guys. We must have filled five forty-foot containers, with nothing
31 but thick reclaimed four-inch floor joists and inch and a half / 2inch
32 floorboards. And then from there we started using old cast iron bases and,
33 making tops to order. So, that was the start of it really, and from there that's
34 sort of evolved to... we still did that quite a lot. We now basically advertise
35 online... with what we've got in stock and then make tops to order to
36 whatever size anyone wants. So, that's how it started, and from there we've
37 obviously got the showroom, we did a wood wall in the showroom and then
38 put pictures of that online and from there the pallet wood's just grown and
39 grown and grown. It wasn't even like we intended to sell pallet wood, it was
40 just, it grew and grew and grew and can't even keep up with it now so... That's
41 how it's evolved into where it is.
42 INTERVIEWER: What have been the biggest challenges since you've started
43 doing the reclaiming side of things?
44 CS1: Money, time [laughs]..... Same as everything really. Well the first challenge
45 doing the antiques was realising that there wasn't a market in it. And moving
46 away before, you know... [laughs]. I mean that's a con anyway the antiques
47 market, you go to all these antiques fairs up and down the country and it's full
48 of pensioners collecting their pension while going, selling antiques, making a
49 bit on the side and then, they're not paying VAT, they're not paying tax.
50 They're quite happy to make, like £10 on a £200 item and as a business how
51 are you meant to compete with that? You can't... erm... So it was, like I say, we
52 identified what needed to be done. And sort of like I say, went into custom,
53 custom making, custom making reclaimed furniture?
54 INTERVIEWER: Bespoke?
55 CS1: But sticking to tables and shelving units, that's literally all we do really.
56 Tables, shelving units and pallet wood.
57 But yeah, time is the biggest challenge. Coz obviously it's quite a big place,
58 there was only two of us, now we've got a little helper who comes in every
59 now and then, that helps. But again, you don't really get any help from
60 anywhere.
61 INTERVIEWER: Is it you and A?

Appendix

268 developed relationships with the foremen, with the pallet truck drivers and
269 they basically stack them up and when we go on they point us to the pile and
270 say 'help yourselves'. So that's all well and good but I'm only dealing with the
271 foreman and the site managers, the individual site managers, so when we're
272 dealing with the bigger construction sites, say the big national housebuilders,
273 we go on to some sites and site one and two will say yup, help yourselves,
274 we'll stack them up, jobs a good'un, and then sites three four and five will say
275 'no chance, why would we do that?'. And it seems to depend what mood you
276 catch them in.
277 INTERVIEWER: Right so they don't say... there's not a reason that they give as
278 to why you can't have it?
279 CS1: No, no, no, it depends what mood you catch them in and how busy they
280 are and time of day and you... for example, one site I went on to and the site
281 manager at the time was like, yup, cool we'll stack them up, come every week
282 we should have about 15 a week for you. Happy days. So, I was going for a few
283 weeks getting pallets, went back again a following week the site manager had
284 moved, [there was] a new site manager. So, as I do every time, I go to the site
285 office speak them, say hello, you know, two-minute chin wag. And this new
286 site manager was just sort of baffled, he was like 'what, you come on here and
287 you take pallets for charity? No, something doesn't seem right about that, no
288 I'm not having that.' And one of his site workers was stood behind him
289 basically just making rude gestures behind his own manger because he was
290 obviously just an awkward person to deal with.... And it entirely depends on
291 the personality of who you meet. So to try and obviously get past that I've
292 tried reaching out to the head offices and the regional offices of these bigger
293 firms to try and get some sort of site process. I mean at the end of the day
294 they'd have to pay to get these pallets taken and I'm offering a free service, we
295 recycle them, we can give invoices monthly to show how tonnage we've
296 recycled. We're registered waste carriers, we do pretty much everything by
297 the book as far as I'm aware, so obviously reaching out to the head offices of
298 these big firms and no-one seems to be interested. The guys on receptions all
299 say 'ah yeah, good idea, I'll pass it on to the relevant person' but there doesn't
300 seem to be one point of contact or a person in charge of deciding what
301 happens with the construction waste. For example, I know by 2020 all

302 construction sites have got to recycle 70% of the construction waste so by me
303 essentially offering a free service, I collect it from site, it's free and I can give
304 them weightage of what they've recycled you'd think I'd be saving them
305 money, doing them a favour... and you'd think they'd be all up for it but there
306 doesn't seem to be anybody, any point of contact, there is only, there's
307 literally one firm out of say 7 or 8 of the big national housebuilders that I
308 contacted that said they had an environment person in charge of ecology and
309 the waste, and there was one firm that said that. And even then, after a few
310 emails she still hasn't got back to me. The whole thing is juts bizarre, it's like
311 they're not even interested.
312 INTERVIEWER: It does seem odd.
313 CS1: So, there's a firm locally, it a... can I name firms?
314 INTERVIEWER: Yeah, if you want
315 CS1: Firm X huge reclamation, reclaimed stone, aggregate, huge yard. I
316 thought they would be best positioned to be able to help me because they've
317 already got contracts to take way all the waste and all the aggregates from
318 these sites because they put skips on and all the rest of it, they've already got
319 the contract. So, I actually manged to get one of the directors to listen to me,
320 well not listen I used... I went fishing with him 20 years ago so sent him an
321 email [laughs]. And basically, again he was like, he told me that they get paid
322 to take £20 per tonne of soft wood timber. So, if you do the maths of this: £20
23 a tonne, so in pallets that essentially a euro pallet weighs 21 kg, so for the sake
324 of argument call it 50 pallets to a tonne. So he is getting paid £20 to take 50
325 soft wood euro pallets, I would offer to pay £2 a pallet off him, so he's got his
326 £20 income from the 50 pallets which he then takes aback to site and it goes
327 through and it... I don't even know what they do... I think they've got
328 something that turns it into chippings or somethings which I know you need
329 thousands and thousands of pallets to even make it profitable. So I was like,
330 well if I pay £2 a pallet then you're getting paid £20 to take them... so you get
331 paid £20 to take 50 pallets i'd then give you £2 a pallet so you're then getting
332 another £100 for doing the same job, so you're essentially five times-ing your
333 income from the same one. And it wouldn't be any different processes all
334 they'd have to do take it to his yard in X put it on the weigh bridge so they can

Green for Good interview

14th Feb 2020

Conducted over the phone

I: Can you tell me a bit about why you started Greens for Good

IP: So the place to start is that the way we consume food is one of the most destructive things humans do on the planet, so you can put most of the environmental destruction on the planet at the feet of humans feeding themselves, so all of the habitat loss, damage to the rivers and oceans is caused by the way that we currently grow food, it's really unsustainable but on the same token the food that's produced is that system really isn't very good for us so it's designed for industrial logistic and supply networks to make people money so that food is often – it's grown in the cheapest place and then it's transported hundreds, maybe thousands of miles before it gets to us so it's lost all it's nutritional value and then it goes into products that aren't particularly healthy for us, so we've got a system that's destroying the planet but producing food that's killing us as well. If you want to do something meaningful and really change the world then food is the probably the best place to start, so that is probably where myself and my business partner got interested in food. We both come from a background that's interested in things like permaculture and soil based growing and sustainable ways of working with the planet, and then we discovered aquaponics, which is a way of growing fish and plants together in a closed loop system and that made us realise- that's when our journey started, when we realised you can actually grow food – because we're using aquaponics and hydroponics, where you grow plants in water rather than soil, that means we can use very high density systems and grow vertically, so produce a lot of food in a very small area and the advent of cheap and efficient LED lights means that it doesn't take that much energy to do that. So we're now at a point where it's economically viable to grow a significant proportion of food in cities so by doing that you get rid of all the waste because you don't have to transport the food because you're growing it right where it's need, because the food hasn't travelled it's much more nutritious and healthy, it's reconnecting people with food, because it's grown in cities it's making people think about where their food is coming from, it's creating new employment in cities because it's creating a whole new industry, so that's the core behind why we're doing what we're doing.

I: How are you using your networks and connection to keep your business going? Noticed on your website that you work with schools and based at Baltic Creative so how have you created these connections?

IP: The education bit is key to what we do and we're effectively – we're quite a small start-up, but we're effectively three companies in one, we have a food growing arm of what we do, then, because my partner and myself come from an academic background we have a research element to what we do, we still collaborate quite closely with the universities, which are big employers in the city and have huge networks themselves, but then we've primarily been an education company over the past few years and it's because, particularly aquaponics but urban food growing reconnects people with food, it brings in so many issues that you can talk about to kids, teach them about sustainability, global food security, the environment, health, wellbeing, science, chemistry, ecology, physics, so these, its such a wholistic thing that you can teach so much from it. So, we started developing education programmes around that and that's been our main business up to date and we have systems in more than 50 schools, we've taught many thousands of pupils. That's provided income but it's also ready to keep us going, but it's also got the word out about what we're doing and it's also actually found us employees, we've had people who we've taught once they graduate come and intern with us, or work with us, and through that we've also got into many schools that allow our products to get out there but also as you start to produce food the kids tell their parents about it and so it gets the word out about urban farming is and what it can do, so that's mainly been the community side from that side. We also, as much as possible, try and interact with local communities and businesses so we've – there's a local enterprise called Squash who we work with who do great work with the community so we partner with them on a number of activities, and there are other things we do such as we try to deliver all our produce by bicycle so we partner with a local social enterprise who do bicycle delivery, so we try to link into the community that way by working with other social enterprises that also have their roots in the community.

I: When you said 50+ schools, is that just in the Liverpool City Region or do you go further afield?

IP: Most of those are in the Merseyside area but we've working in schools in Manchester, we've done quite a lot of work with schools in North Wales which is kinda local it's just over border, and we're currently developing an online platform which would allow us to scale and extend what we're doing much further afield. We love working with local schools and having the personal interaction but to really scale and grow what we're doing we need to get more digital and more online so we're developing platforms to do that which will allow us to move at least a portion of our educational offering online to have a much wider impact.

I: Are there any other sort of businesses you've worked with? Any surprising connections?

IP: We've done a number of activities with a groups called Homebaked in Anfield, they do really cool stuff, they're a community based bakery that's also interested in doing some hydroponic growing so we've helped them, we've worked with the Baltic Farm Project so that's just over the road from us and there's an area where development is going to happen but that's going to be over a five year development plan so that means that a chunk of that land is going to be unused for several years before it gets built on but it's a beautiful green field so what we're doing is- it's going to get built on anyway, there's nothing we can do about that but we've started a project to activate that land, to engage the community around it, so we've done soil based growing on there, we've done community outreach activities on there, we've had the local communities come in and have them give us ideas about what we can do on that land, so we're activating that space, getting it used, and the agreement we have with the developers is that anything that really works and that inspires the community and is engaging will then go into the final project and they will potentially put an urban farm on the development to support that community that's then got that interest in growing and local food.

I: So, whereabouts is the field? Is it in the city?

IP: Yes, it's – I can see it from where I am stood at the moment, so 100 metres from the school where we're based.

I: How long have you been doing this for?

IP: So as a company we've been going 5 years, so that's primarily been education and most of that time I was part time and my business partner was part time but as the company's grown so now we have somewhere between 8 and 10 employees, so now I'm full time on it. We've grown very gently and organically but quite deliberately by doing sustainable growing and forcing these connections with local people, so it's the connection with the school that's given us the space where we're growing and now we're selling our produce into local businesses so that's businesses that we work with or have connections with and that we now sell our produce to some of those.

I: I noticed you have been selling salad walls as well

IP: Yes, so that's a new product that's we're developing which is really exciting so the idea is that that can go into businesses or restaurants and provide fresh living produce to them and it's something that we will then come and look after and restock them but it means that they can actually have quite a reasonable quantity of produce in their café or restaurant or in their office for their staff

I: I guess that would have to be aimed at local people?

IP: Exactly and we're really trying to do everything so we can do it by bicycle, that really is the ultimate aim that we can service all of our systems with bike or potentially electric vehicles so there really are no, or as little as possible, emissions from what we're doing

I: Can people come to visit?

IP: Yes, we're starting to run tours, we haven't booked the dates in yet but over the next couple of months we'll actually be booking dates when people can come and visit so just keep an eye on the website and I can email you when it's all up and running and you can come and have a look round.

*** Interview ends ***

Appendix

CE survey developed with Qualtrics

Circular Economy Network survey

Survey Flow

Standard: Introduction (1 Question)
Block: Section 1 - About your organisation (3 Questions)
Standard: Section 2 - Your organisation and the Circular Economy (3 Questions)
Standard: Section 3 - Challenges (2 Questions)
Standard: Section 4 - Membership pf a Circular Economy group (1 Question)
Standard: Section 4 - Member of Circular Economy group (2 Questions)
Standard: Block 5 (2 Questions)

Page Break

Start of Block: Introduction

0.1 This research is being conducted by Jess Robins (the researcher), a PhD student from Lancaster University. This survey should take no more than 15 minutes to complete. By completing this survey you agree to your data being used in future work by the researcher, if at any point before you complete the survey you wish to withdraw please just close your browser window and none of your data will be submitted. Once you have completed the survey, you will be taken to a page where you can submit details if you would like to be contacted about a future project collaboration with the researcher. This is totally optional, and any details provided will not be connected to your survey answers to ensure total anonymity.   *Thank you.*   If you have any questions about the survey please get in touch j.robins@lancaster.ac.uk

⭘ I understand that my data is anonymous and I can withdraw at any time (1)

End of Block: Introduction

Start of Block: Section 1 - About your organisation

1.1 What is the size of your organisation?

⭘ Small (1)

⭘ Medium (2)

⭘ Large (3)

Appendix

1.2 In what industry is your organisation based?

○ Low-Medium Tech Manufacturing (i.e.Food, Beverages & Tobacco/ Metal, plastic and non-metal mineral products/ Other Manufacturing/ Shipbuilding/ Chemicals) (1)

○ Medium-High Tech Manufacturing. (i.e. ICT & Precision Instruments/ Automotive/ Aerospace/ Machinery, Electrical & Transport Equipment /Pharmaceuticals) (2)

○ Other Production (i.e. Agriculture, Forestry & Fishing/ Mining & Quarrying/ Utilities/ Construction/ Communications) (3)

○ Knowledge Services (i.e. Digital, Creative & Information Services/ Financial Services/ Business Services/ Research & Development/ Education/ Hotels & Restaurants (4)

○ Other Services (i.e Retail/ Transport, Storage & Distribution/ Real Estate/ Administrative & Support Services/ Public Admin & Defence/ Health & Social Care/ Community, Social and Personal services) (5)

1.3 Where in the UK are you based?

○ Greater London (1)

○ Midlands (2)

○ North West (3)

○ North East (4)

○ Scotland (5)

○ South East (6)

○ South West (7)

○ Wales (8)

○ Not based in the UK (please provide country) (9) _____

Page Break

End of Block: Section 1 - About your organisation

Start of Block: Section 2 - Your organisation and the Circular Economy

Appendix

2.1 How long has your organisation been working within the circular economy?

○ under 1 year (1)

○ 1 - 2 years (2)

○ 2 - 5 years (3)

○ 5 - 10 years (4)

○ 10 - 15 years (5)

○ 15 years + (6)

2.2 Was your organisation started with the Circular Economy embedded in its mission or did you adopt Circular Economy principles at a later date?

○ My organisation was founded with Circular Economy principles embedded in its mission (1)

○ My organisation adopted Circular Economy principles after its foundation (2)

2.3 What factors made you decide to adopt Circular Economy principles? Please select all that apply

☐ Economic (1)

☐ Environmental (2)

☐ Resource efficiency (3)

☐ Consumer pressure (4)

☐ Right thing to do (5)

☐ Other - please elaborate (6) _____

Page Break

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Appendix

3.1 What challenges have you faced while adopting Circular Economy principles? Please select all that apply

☐ Internal - employees resisted move (1)

☐ Internal - board members resisted move (2)

☐ External -issues with suppliers (3)

☐ External -issues with clients/customers/users (4)

☐ Financial (5)

☐ Other - please elaborate (6) _____

3.2 How have you overcome these challenges?

_____
_____
_____
_____
_____

4.1 Are you a member (paid or unpaid) of any Circular Economy or sustainability groups or networks? (i.e. Circular Economy Club, CE100, etc.)

◯ Yes (1)

◯ No (2)

Display This Question:
If Are you a member (paid or unpaid) of any Circular Economy or sustainability groups or networks? (... = Yes

Appendix

4.2 How do you communicate with this group?

☐   Online forum (1)

☐   In-person group meetings (2)

☐   Email (3)

☐   Conferences (4)

☐   Other - please state (5) _____

Display This Question:
    If Are you a member (paid or unpaid) of any Circular Economy or sustainability groups or networks? (... = Yes

4.3 How has being a member of a Circular Economy group benefited your organisation?

_____

Skip To: End of Survey If How has being a member of a Circular Economy group benefited your organisation? Is Not Empty

End of Block: Section 4 - Member of Circular Economy group

Start of Block: Block 5

Display This Question:
    If Are you a member (paid or unpaid) of any Circular Economy or sustainability groups or networks? (... = No

4.4 Do you feel that being part of a group would be beneficial to your organisation?

○ Definitely yes (1)

○ Probably yes (2)

○ Might or might not (3)

○ Probably not (4)

○ Definitely not (5)

4.5 Why do you think that?

_____

Page Break

You have now completed the question part of the survey, if you agree to your answers being submitted please click agree to be taken to the final page. If you are not happy, please close your browser window and your answers will be deleted.

End of Block: Block 5

Start of Block: Block 6

Appendix

This survey is part of PhD research looking at the importance of professional networks to organisations when developing or changing to working practices to fit within Circular Economy models. The researcher is looking primarily at organisations in North West England and is keen to develop projects with organisations who are working in or moving towards the Circular Economy.

If you would like to be contacted by the researcher regarding future project collaborations, please include a contact name:
[text box answer]

And an email address:
[text box answer]

These details will be stored separately from your previous survey answers.

End of Block: Block 6

Appendix

Survey results

1.1 - What is the size of your organisation?

(Bar chart: Small, Medium, Large — Choice Count)

1.2 - In what industry is your organisation based?

(Bar chart: Low-Medium Tech Manufacturing ..., Medium-High Tech Manufacturing. ..., Other Production (i.e. Agriculture, ...), Knowledge Services (i.e. ..., Other Services (i.e Retail/ ... — Choice Count)

1.3 - Where in the UK are you based? - Selected Choice

(Bar chart: Greater London, Midlands, North West, North East, Scotland, South East, South West, Wales, Not based ... — Choice Count)

1.3_9_TEXT - Not based in the UK (please provide country) - Text

Not based in the UK (please provide country) - Text

| Global |
| Germany |
| Germany |

| USA |
| Slovenia |
| Portugal |

2.1 - How long has your organisation been working within the circular economy?

(Bar chart: under 1 year, 1 - 2 years, 2 - 5 years, 5 - 10 years, 10 - 15 years, 15 years + — Choice Count)

2.2 - Was your organisation started with the Circular Economy embedded in its mission or did you adopt Circular Economy principles at a later date?

(Bar chart: My organisation was founded ..., My organisation adopted ... — Choice Count)

2.3 - What factors made you decide to adopt Circular Economy principles? Please select all that apply - Selected Choice

(Bar chart: Economic, Environmental, Resource ..., Consumer ..., Right thing to ..., Other - ... — Choice Count)

4.3_5_TEXT - Other - please state - Text

Other - please state - Text

| Skype |

4.4 - How has being a member of a Circular Economy group benefited your organisation?

How has being a member of a Circular Economy group benefited your organisation?

| Increased and deepened knowledge creation and sharing. |
| Yes. Sharing ideas and professional support |

4.5 - Do you feel that being part of a group would be beneficial to your organisation?

(Bar chart: Definitely yes, Probably yes, Might or might not, Probably not, Definitely not — Choice Count)

4.6 - Why do you think that?

Why do you think that?

| - |

3.3 - Since joining the Circular Economy, has your organisation seen an improveme...

Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum

	Min	Max	Mean			Responses	Sum
resource productivity?	7.00	7.00	7.00	0.00	0.00	2	14.00
employee motivation?	3.00	8.00	6.25	1.92	3.69	4	25.00
supply chain?	7.00	7.00	7.00	0.00	0.00	2	14.00
annual turnover?	1.00	8.00	5.67	3.30	10.89	3	17.00

4.1 - Are you a member (paid or unpaid) of any Circular Economy or sustainability groups or networks? (i.e. Circular Economy Club, CE100, etc.)

(Bar chart: Yes, No — Choice Count)

4.2 - How many CE groups or networks are you a part of?

(Bar chart: 1, 2, 3, 4, 5, 5+ — Choice Count)

4.3 - How do you communicate with these groups? - Selected Choice

(Bar chart: Online forum, In-person group meetings, Email, Conferences, Other - please state — Choice Count)

Appendix 3 — Interviews

Interviews

Interview protocol

- Tell me about your background and how [organisation] came about.
- What made you start working in the circular economy?
- Can you tell me about any challenges you've faced.
- Map drawing exercise.
- Can you talk me through the different communities and/or networks you are part of?
  - Professional and non-professional?
- Which are related to the CE?
- How are you involved in these networks?
  - What do you offer them?
  - What do they offer you?

Questions that were adjusted or added for the interviewee:

Ricoh UK

- What about your approach has changed over the last 25 years? What challenges have you faced/do you face now?
- Tell me more about how you engage with your local networks and communities. What does being a member of BESST involve, for example?
- Tell me more about your policy towards employee awareness of environmentalism and sustainability?

Arup

- What research was conducted with Ellen Macarthur Foundation?

Interview transcript examples

Sample Ecospheric interview

9th January 2020

Face-to-face, conducted in Passive House + Victorian retrofit property.

IP: our main project at the moment that is really dying to get hold of some circular economy concepts in an applicable manner, in something we can actually do, actually apply, is a project over in Levenshulme, which is a food hall. So, there's going to be five pod restaurants in a food hall setting with a big tap bar, and that's also got a brewery in there and there is – it's quite a large brewery, a 10-barrel brewery, so that's 1800 litres of beer a day. Also, we've got another restaurant type of set up, which is a development kitchen which is focused on pop-up food and food development and it's a got a yeast lab going in there and other cool things. We've got a big cellar which we might be looking at kombucha, you can bring the alcohol levels up on a kombucha so you can bring it up from a soft drink to an alcoholic beverage and do so with a lot less calories, so it's healthier. And then, we've got some offices and then a shop, a grocers, deli type of shop, and all of these we're trying to bring it so that the whole site can be considered zero energy as well as zero-waste. We've got to give ourselves some time to achieve that especially the zero-waste, so 24 months-ish after opening we hope to be there. So, the zero-waste thing particularly, could benefit from a circular economy approach and it's really understanding the inputs to the site and the outputs from the site and – actually the best description I've ever seen is a tree where you start drawing

links between the leaves in the branches above to the roots below, otherwise it's normally a one way system and it's bringing it back down again. It works best- that whole metaphor works best in the sense of food because there are only 110 trading desks in the world that all food goes through so from your farmers, of which there are something like, I might get my statistics wrong here but it's something like 300 and something thousand farmers across the world, 350,000 [fact check: 570 million farms worldwide], and then there's obviously 6 odd billion of us and 110 trading desks, and the idea was to do farm to fork links, hence that tree metaphor working very well. So that platform is what we're trying to bring to bear at the moment and the big issue with circular economy, is the only one that actually works on the ground right now is the idea of disassembly [sic] and reuse of buildings at the end of their lives. So the concept is, if you build a building out of materials that can be reused then you can essentially after its use- usable life which could be 20, 50, 100 years, whatever it might be you can then essentially dissemble [sic] the building and rebuild another building with the materials. Whilst all of that logic is sound and works the problem is that this is a carbon saving in the future, a future that we need to save now. So it's not something that's fabulously useful for us and, I'd also like to point out, a project like your sat in right now, the Zetland Road project, which was the first passive house to be built as a retrofit which has no petrochemicals used in its fabric or construction and that was done without any thought to circular economy whatsoever, but it also translates to the ability for me to give clear instructions on how to dissemble [sic] the building at end of life no problem at all. The point being that just by focusing on getting rid of petrochem you're already in a situation where you've done the tick for the circular economy from its perspective. So, what I was looking for were concepts that would actually be applicable right now, that we could install right now that would join the circular element on whatever it might be and I went out freely, I to one of the biggest conferences on this in the built environment is FutureBuild down in London, and the last FutureBuild I attended they had an entire section given over to the circular economy, it was probably 100 stands or more in that section, loads of universities, huge amounts of research, everybody attending, and I just dotted around and I just asked the same question: "what could you give me now, here's my brief for the project, essentially unlimited money, unlimited space, unlimited everything, just out there, what could you tell me that I could do now?" And there was almost nothing that came out of it. I had one example that I had developed that I suggested to them, the sort of thing I'm looking for, which was TACs, Thermally Accelerating Composting Units, so we take green waste from our kitchens and we put that into a device that is capable of removing the water from the green waste very, very quickly so it reduces it by volume around about 80% in 3 days, so you get what's known as leachate coming out of the bottom, and it's like a black liquid highly concentrated fertiliser, and then we send that back or we'd be using hydroponics onsite, these kind of vertical farming type situation, and then that leachate can be a nutrient source to then grow more food which can then come back to be served take the waste from it and create more fertiliser, so this was a circular idea that could be applied, and essentially, nobody could add anything to it. So I was a little apprehensive about this interview on the basis that whilst I've tried for years, and talked in depth with places like CAT, Centre for Alternative Technology, and the like, there is very little of true value coming out of circular economy, when all I'm wanting to do is actually do something in real terms, real life, build it, test it, check it out, scale it up, show everybody how to do it, that kind of – it's all about impact, and that starts with an inspiration and the ability to show people what they don't know that they really want. That's where we're coming from so I don't know – that's literally a summary of all we do circular economy there is an energy link which we're developing at the moment which will be a world first, whereby we're taking our green waste and we're putting it into a small silo where we add a little bit of waste water and we stir it, slowly, it just keeps everything a little bit buoyant so you don't get a sludge at the bottom and then what happens is that you've got a high and a low switch and when it gets to the high switch a pump switches on and you get a slug of this green slurry and dumps it into a system known as EMR, Electro Methanogenic Reactor and this system essentially, converts that green waste into methane, you might say, that's anaerobic digestion, and it is a form of anaerobic digestion but it is much higher purity and it uses electrodes to do some clever things and essentially the methane purity we get off it is good enough, with a very small amount of processing to put straight into, believe it or not, a fuel cell. So you've heard of fuel cells in the context of hydrogen presumably, but this is a methane processing fuel cell where we literally dissect the molecule on a catalytic surface, on the atomic scale, and therefore not

having to run an engine, so engines or turbines have massive losses associated with them and the engines particularly are limited by a thermo dynamic cycle known as the Carnot cycle, which essentially means that you have 30% in real terms, I think 38% is the theoretical maximum recoverable energy if you're going from a chemical source to an electrical source via a mechanical source, you have to go through an engine cycle and thermodynamic says that's your max, so in real terms it's about 30%, in fuel cell terms we can process from chemical to electrical directly on a catalytic surface, not via mechanical, and it gives us an 85% output, so it's a complete game changer, and it also gives us some high grade heat which we can use so if you had some methane you might burn it in a boiler to produce hot water, you might use that hot water as domestic hot water or you might use it for space heating, if you're a bit more advanced you might use a CHP, Combined Heat and Power Plant, and get some electricity out of it, that's the one that's limited by 30% and then what we're doing is taking it to the next level, and we're taking it to the next level again because then we're taking this electricity and putting it into some vans where the vans are electric vans, the benefit of this is that vans actually are a huge battery, you know 40 kilowatt hours per van and that energy goes into those, and those vans can actually then power my foodhall and brewery, so that's known as vehicle to grid or vehicle to building technology, V2B, and so this kind of draws around this energy link so – it's not circular though, in the sense that truly circular goes back to producing the same thing that was consumed, whereas what we're doing is taking the green waste and we're producing energy from it and then we're using that energy to cook more green so it's nearly there, but it's not quite.

I: What's happening to- is there any other waste?

IP: Any other waste product from that?

I: Yeah

IP: So, the – there's two options with the other waste products, so what you get out of the back of it is a kind of fibrous slurry, so a slug of green come in here, that extracts all the energy it can do using –

I: Like a person?

IP: Yes, exactly, it's a stomach, and then what comes out of the end of that is reduced in mass reduced in volume, hugely reduced in energy, there'll be almost nothing left, but it needs to go somewhere. So there's now different ways that can be consumed, one is that you can dilute it with water and send it down the drain, and what that does is it then puts the biological oxygen demand up at the local treatment plant which means that essentially they will- I mean you pay for that, it's a very common practice, this is the normal ways it's done. And you regularly test your biological oxygen demand level, and so if you've got more organic matter per litre that you're sending back, you measure the volume, you measure that and you get a charge to say "well, we're going to have to treat that where we are", and all they're doing at the treatment plant is using again, biologicals to consume and then settlement tanks to take anything else out, the heavier product. That's one way of dealing with it, the other way is that we essentially do that process on site and then send a clean water back, there will still be, even if we put that in, there will still be that final settlement product which is essentially landfilled but we are talking very tiny amounts, we're talking once every 6 years we'd probably extract 2 cubic metres of- and it would essentially be mud at that point, so it's a fairly benign process going all the way through.

I: I was just wondering if that could then be used on an allotment or something but if it's just mud then it's not particularly fertile.

IP: It would mix in with the land no problem. Are you finding any different answers coming out- have you had any other experience with talking to people from the built environment?

I: Not really, I think everything is still in its very embryonic form at the moment which is a shame really because it would be- what's needed is actual action rather than talking but I think- I've spoken to somebody who's doing- reclaiming, upcycling reclaimed bits of timber from old demolitions sites and trying to use old timber to turn it into furniture and that sort of thing.

IP: So, reduce, reuse, recycle is specifically cut out of circular economy

I: I think it's still part of it because it's reuse, it's not sending it to landfill. I'm looking at the Ellen MacArthur Foundation's butterfly diagram as the standard of what [CE] is, those circles.

IP: Have you got any applications for them?

I: The circles? Well, I guess, reuse, reusing stuff is quite obvious. Although I'm not sure about the built environment, I'm not an expert in any way of that, it just happens that-

IP: I'm not trying to reverse the interview or anything, I'm just keen to see if there is anything, if you're going round talking to people that know about this stuff. It's just too embryonic, it's too theoretical and it's too much overlapping with just common sense in the sense that it's not a new idea, reduce-reuse-recycle, I think I learnt that at primary school, it's not complicated when you're talking about reusing product, and in the built environment there's a high degree of reuse, well not on proportion but certainly in terms of the number of people in the industry that have reused products would be almost 100%, do they do it regularly? Probably not, because it's almost always cheaper not to reuse. Again, a product like this, like Zetland Road, you're looking at a system where 100 tonnes of brick per building were reclaimed, there were no extensions so the original footprint and format and layout and everything of the building – not layout, but everything else is essentially exactly as it was so the only walls that were removed is where these "A's" and "V's" are.

I: It's just the back isn't it?

IP: Well, the back is all existing, so there's brick in this wall, there's brick above here, it's only this one section here, and this one section here that was removed, everything else is original. So, all the rafters, all the floor joist, stairwells were reclaimed, and all of the systems I developed to get up to this level of performance, Passive Haus + certified, which again is pretty much - it's the second in the world to have achieved that, that level with the refurbishment. To achieve that whilst reclaiming and reusing all those elements was very very complicated, we had to do a lot to overcompensate, because existing materials are not developed for passive house, so I'm literally dealing with 1895 solid brick wall and saying how can I get that up to passive house level, how can I make that perform, how can I manage moisture through that structures etc etc. So, what I'm saying here is that we used no petrochemicals, we didn't expand anything we didn't adjust anything, we reused almost everything that was reclaimable in the building and all of that's done without a single mention circular economy, because that's just using principles of sustainability. So, I guess the way I'm drawing a line to it, for me, what I'm boxing in is stuff that I didn't do before I started looking into circular economy and looking at it more from a strategic perspective, because again, one of the roles I play is at the GMCA [Greater Manchester Combined Authority] from a strategy board perspective, I'm the technical lead on the retrofit side of things and we're looking at economic models for the circular economy to be built in a much larger scale for, let's say, the whole of GM [Greater Manchester], how could a region use circular economy to create this kind of loops, and it's remarkably complicated. So, no applicable elements, I've found to date, recycling is not done in the way in which we think it's done…

I: No, recycling is probably the worst point, people talk about: "oh we're doing the circular economy", "are you?", "yes, we're recycling".

IP: Exactly, and that's the level of conversation you have as soon as you break out of this smaller niche set of people that term things circular economy, it's very difficult to explain it, that you're a link in a chain, they get, that you're a link in a circle, they don't.

I: That's a good point, people don't seem to-

IP: They don't grasp it.

Appendix

Sample Arup interview

11th September 2019

Conducted over Skype.

I: So what do you do for ARUP?

IP: So I, well my educational background is in chemical engineering and obviously didn't go into that, for some reason, and I built- [aside] I kind of do- I became interested in the environmental impact of the chemical processes that we were designing rather than designing the chemical processes themselves which got me into thinking about just environmental impact of the things that we create and so an opportunity came up to join the environmental consulting team in ARUP, specifically the resources and waste team. I really like that team because its work not just in consulting, but we worked in developing infrastructure as well as building related to resource and waste management and there was a mix of the more narrative building but also the more modelling aspects, which coming from engineering I quite like the balance. So, I was in the resources and waste team for about 5 years, and then- I've now moved to focus on circular economy, although I have been working on circular economy I would say probably since 2014, now the focus is on circular economy and trying to tie that in to climate change as much as possible and seeing how they can work together. Maybe if I give you a bit of background about circular economy at ARUP it can kind of- maybe it can lead into some questions. So, the Ellen MacArthur Foundation, which I'm sure you're very familiar with, approached ARUP in 2014 ? to become part of the C100 network and when it first came to ARUP they were like – "Oh, this is to do with waste management so they got in touch with the resources and waste team which I was in at the time. And so the team leader at that time forged a relationship and started to become – well educate themselves about the circular economy more and because I was in that team I got offered a chance to do part- to be part of the Bradford University, I think it's called the executive education programme, it was like a six week programme and then just slowly started to become more aware of the concept hear about other companies getting involved, and then there was a strategic decision to move it away from the resource and waste management group at ARUP, just because it had a bit of a stigma around it, it wanted to be seen as more than just the resources and waste management so it was moved to our advisory services team. Not to say that no one else can get involved it was just a strategic move. And then in 2016 we became the built environment knowledge partner for the EMF and what that involves is we put in a value in kind amount that will fund some research that we collaborate on with the Ellen MacArthur Foundation and other people who we see as good contributors to the project and so over the last 3 years, which is the first term of our partnership, we did 3 projects, well three main projects, and at the moment we're going through the partnership renewal process so we will be then renewing that for the next 3 years, so hopefully some exciting stuff to come and I think there's been a bit of a move, so we did three years research with people and now it's time to actually work on developing real projects, actually working with construction clients and investors to see how we can put our money where our mouth is and really get on to getting buildings up there which are circular.

I: That would be cool.

IP: It would be, that would be really cool. The three projects we worked on are- there was one around circular economy opportunity in Chinese cities and we did that with MacKinsey and that looked at five [inaudible] sectors to see the opportunity, and there was a focus on the economic opportunity in that one. We have done one on circular economy in cities that's available- well all of this is available on the EMF website, but that was mainly about pooling together some resources that city leaders can use in developing policy and frameworks and strategies on circular economy for their cities and then there's one which I'm co-project managing called 'From Principles to Practices' and – it's been going for about two and a half years now but it's near the end which is scary but also exciting. The first phase, which was published at the end of last year- no, summer last year, it was, we did a case study review so we look at about a hundred and, I guess, twenty case studies across the globe looking at different scales of application from components within buildings, buildings themselves, districts, and even national- countries, to see

what are the trends in circular economy implementation, where are there gaps, where are there opportunities to implement more and we did a big stakeholder engagement exercise so we spoke to stakeholders across the value chain from policy makers, investors, clients, to contractors users and suppliers to identify the barriers opportunities and enablers of circular economy in the built environment, we did that in five cities across Europe so that was London, Berlin, Milan, Aarhus in Denmark and Amsterdam. And then from both the case study analysis and the stakeholder engagement we identified who the leaders of the circular economy transition need to be and what their first steps might be. Now one of the first steps was that people didn't understand the business benefit, as in they qualitatively did but they didn't quantitatively and if you want to money put into these sorts of projects you need to show a good financial performance so what were doing- what we've done in this phase is develop new real estate investment models that can help- we've developed the models and we've used real project data to undertake discounted cash flows, we're using to highlight the financial performance and if it's- we're kind of flexing the kind of revenue and cost to understand what's the tipping point, what changes do we need to create the financial performance that we want if we're not going to be able to get it using the inputs, the costs and revenues that we receive now. So, that's that…

I can talk about our networks within ARUP and other things that we're involved with but you probably have some questions?

I: I do, yes. The main question from what you said was "what was the research" but you answered that. I'm trying to use similar questions for each of my interviews so I've got some general questions and then I go a bit more into the networks. Because you appear to have quite a few internal and external networks so it might be good to explore those, and I might draw them in a rough pattern and then we'll do it properly in some software that I've been using to map network connections of different groups.

IP: Yes, that sounds great.

I: So my first question is why the circular economy, do you have an answer for that, it's quite a broad one.

IP: Yeah- from an academic perspective, it's amazing to think that there could be a new- a paradigm shift to where you actually operate in an economy that we haven't really operated in. And the transition itself is immense, the way it questions economics as we know it is fascinating so from that perspective there's that but there's also the whole sustainable development agenda and how future generations won't be able to … live, if I'm gonna be completely honest, if we don't do something a bit drastically different.

I: So ARUP have been working in this area for a while, do you know what are biggest challenges when you started working in the circular economy, did you find?

IP: Many. The main ones are that circular economy is one of many agendas, we are 14,000 people and everyone has an exciting new idea, so to get it heard is a big thing. Now, I think we got extremely lucky in 2014 that we developed a partnership with EMF and I think that Ellen MacArthur herself was invited to speak at the ARUP Annual General Meeting, I think it was 2014 or 2015, and that's when she inspired leadership in ARUP to take this on more seriously, and then that was taken up a level and that's when we became the built environment knowledge partner. Which is a huge commitment from ARUP but the fact that it got top level support is big. And then it's been given to enthusiasts within ARUP to take and lead, and, I guess that's moving on to a different part of the question. But that was one of the barriers. The other barrier is … it is a very broad and you get these enthusiasts who coming from a specific direction, or a specific background and whether that's design or whether it's more advisory and economic, but you need everyone to make it happen and so it's been quite challenging to bring everyone together to the table so that whatever you're proposing to a client or within your research has all elements covered, and that has also involved not just bringing together people within, inside of ARUP, but speaking to people outside, like, we don't have property tax specialists, so it's about engaging people like that, or understanding the insurance implications, again ARUP don't have that so it's about talking to insurers and reinsurers to figure that out so I think that's been really

challenging. It's also challenging specifically in the built environment as well because it's a notoriously fragmented industry, more so than any other industry, and so ARUP are one part of the value chain overall, and so how do we get our construction clients, how to we talk to our suppliers to ensure that, in terms of project delivery, we are delivering circular economy, and one, I guess another, one of the biggest barriers is that we still largely operate in a linear economy so to make the business case is super difficult, because when we're doing say the discounted cash flows we're using discounted rates, we're using depreciation rate which people have to use in order to get sign off from their commercial team and so challenging that is super- a real key barrier.

I: Thank you, that's a lot of things to overcome. So, if I can just move into more of the networks now, and you've talked about being part of the EMF network, but are there any- well I'm sure ARUP are part of many professional networks but if we stick to the sustainability side of it, not necessarily circular economy but the sustainability networks that ARUP are part of.

IP: So there are internal and external ones, so first I will focus on the external ones. We have the EMF but across the globe, there's circle economy as well but their focus I guess is the Netherlands, so our Amsterdam office is very connected to them and their work and their initiatives. There's also business in the community BITC that ARUP are a member of-

I: Is that UK based?

IP: That is UK based, so you've got different companies ranging from Burger King to JLL who are property agents and that's just about- I think that's a Princes charity..?

I: Princes Trust?

IP: No, not Princes Trust, I think it's just one of the Prince's charities that he has, but it's about how we can get sustainability even more mainstream within these businesses, they have different working groups, they one on water, energy, and they also have one on built environment, and then another one on circular economy and I've been in the meeting before saying like, "oh there are all these" and there's someone from ARUP who attends different ones but then circular economy comes up in say the water one but then there's also its own circular economy subgroup so at some point there's circular economy being spoken about everywhere and there's an element of needing to tie that up a little bit, but I know that were definitely involved in the circular economy one and trying to drive and lead conversations and that- and then there's UKGBC [UK Green Building Council] that ARUP are- well they recently published some guidance around circular economy and ARUP were involved in putting together some sections on that and again that's another kind of reach in network that we've been following. There are so many different networks out here, but they all have different audiences so it's good that ARUP have the opportunity to be involved in all of them and take a kind of different light. So, I think the UKGBC guidance was around how to ask for circular economy on projects whereas Business in the Community is more around how to implement it within your own organisation, and then say EMF work thought leadership on different kind of levels, so the reach is quite different. And then on a slightly different level there's also the C40s partnership that we have, that's going on for quite a few years now around carbon and climate change and we work with cities to develop a climate action plan, but recently as circular economy has been spoken about a lot more, they wanted to look at the- how circular economy can effect climate change but on a more on a consumption based angle. So, they- we worked on a report with them around consumption-based emissions to see how if- to what level would we need to reduce consumption by to meet the Paris 1.5 degree target which is amazing. I went to a presentation around it, and it was talking around- for clothing specifically, we would need to by 8 new pieces of clothing only a year…

Sample Dsposal interview

28th November 2019

Appendix

Conducted face-to-face in Dsposal office.

I: Right, I'd like to explore your communities and networks, so I've got some pens. We could think about the networks and communities you're part of, any professional ones, any not unprofessional but less…

IP: Less formal

I: Yes, less formal ones, and how you're connected to them, even other companies, other organisations, you know. Where do you fit in the web of stuff that goes one?

IP Around circular economy stuff?

I: It doesn't have to be around circular economy but obviously if you could highlight those ones, but I'm also interested in ways other groups are feeding in to circular economy organisations like yourselves, they're not specifically circular economy.

IP: Gosh, I might need a bigger piece of paper…

I: I've got 2 pieces of paper, how big is your writing?

IP: Not neat!

I: it doesn't have to be neat I just need to be able to read it.

IP: So, you want me to put us in the middle.

I: If the middle is where you want to be.

IP: I don't really know… I'm trying to think how to even start, maybe I'll start sort of chronologically. So, the first two things that we got involved with were CIWM, do you need me to write that out?

I: No, just tell me what it is.

IP: Ok, so I think it's the chartered institutions of wastes management, it's the industry body and then the resource association.

I: So are these people that you …

IP: These are things that we're both members of, so the CIWM we're members of individually so you as a waste professional- so it's a professional waste management body where you can become a chartered waste manager. The Resource Association is a trade association for mostly UK re-processors so paper mills aluminium recyclers things like that. It has literally this week, announced that it will be closing or finishing, I don't know what the right word is but I think it's a huge loss, but it was the real, it still is, the real champion of better quality recycling, recycling at home, and using those materials as- well using that waste as a resource

I: Within your home?

IP: No no, as in in this country, rather than shipping it abroad because generally when we offshore it, we seem to take no account of what the quality of it is, and we seem to just go "it's fine, it's not our problem any more" until it gets repatriated. So, they were- yeah, we joined the Resource Association before we even launched actually and they've been really integral to us as an organisation developing and finding our feet in the industry and they're genuinely really good people who are really trying to do good stuff.

So, who else… what happened after that.

It's really hard to think about how to- as in – because those are organisations, as in group, if you know what I mean, but there's a lot of individual organisations that we've been involved in you know like specific companies or whatever as well, and I don't know how to- does it matter if it's not very well connected?

I: No, it doesn't matter.

IP: What I might do is- there's some of these that we've continued to have- ooh- DS Smith are a member… [v quiet] they've not really done…

I: Have you done work with these…?

IP: Yeah, as in, not necessarily paid work but we've done things with them, if that makes sense?

I: So that's DS Smith and

IP: Novelis

I: Thanks

IP: Resource futures is a consultancy that we have done stuff with as well and erm, and Resource Media is a trade press, trade paper, who have been very nice to us and who we've done stuff with we got voted 5th in their Resource Hot 100.

I: So, is anything going to be taking over from the Resource Association?

IP: So, there is talks at the moment about members, so re-processor members like DS Smith and Novelis but not like these (gestures) and us, moving to another trade organisation called InkPen which is the industry council for packaging and the environment, they're a much broader – so they have food manufactures and packaging producers and some very big names on their books and they're from a specifically packaging perspective so yeah, I don't know what's going to happen to that, we have some links to them – should I do a little – because they may have links to them but I don't know, it's hot off the press!

Where else have we done stuff? So, there's things like the business growth hub that we've been involved in and had support from… and like circular economy club Manchester…

I: Have you made any connection through the circular economy club?

IP: So, we have had- I'm trying to think- something happened really early on, but I think maybe it didn't end up going anywhere which is why I'm trying to remember what it was… what was it? … I don't think anything concrete has come out of it if I'm honest, albeit we are now working with MMU [Manchester Metropolitan Univeristy] which is kind of isn't through that, but they are part of the same thing.

I: Well Amanda (runs CEC Manchester) works for MMU.

IP: Yes, and I think they semi-fund her doing this stuff.

So yes, that's the training module that we developed, we did for MMU, and we are now selling to other people as well

I: So, what are the training modules?

IP: So, there are two at the moment that we've developed, and they are mostly around hazardous waste consignment notes and waste transfer note, just filling in the paperwork correctly and being able to figure out the difference between hazardous waste and non-hazardous waste.

Appendix

I: Is this for undergraduate courses or…?

IP: Oh no, this is for- as in people dealing with waste, so sorry, it's for the estates team, it's not for the university.

        And we've had some nice conversations with REPIC who often come to it, but we've not got any work or anything but…

I: What sort of stuff have you done through the business growth hub, do they give funding support or is it just networking?

IP: So mostly they- in the early days it was mostly about training and stuff like- so, social media training and sales training and stuff like that because we have no idea how to run a business because it's the first time we've done this so there was a lot of that kind of stuff and a few networking events and things like that… and so most of that came through the Low Carbon Hub which is like the bit that's part of this but specifically for environmental businesses but we did get some funding actually for a project which we called 'Tip of the Bin Burg' which is a- we got funding to do a research project on fly tipping and waste crime in Greater Manchester and Ray from the resource association (Ray Georgeson) is one of the researchers that did Tip of the Bin Burg, along with Jane Beesley… we're definitely linked with these guys and I think they're members of CIWM but it's all going to get very messy.

I: So, I guess through Tip of the Bin Burg, was that with GMC, through the council as well?

IP: Yes, its funding is GMCA and the Growth Hub… And yeah, and so GMCA we've had lots of conversations with and finally they're going to start pointing people towards Dsposal which is really exciting but it's taken a long time.

I: They've got some very ambitious targets haven't they so you'd think they'd want you.

IP: Yeah, but they also have some very weird things about working with businesses where they seem fine working with big established businesses, but they seem nervous about working with smaller businesses but don't say "Oh, we're not sure if you're good or not" it's like "we can't be seen to be pointing people in the direction of business". "What do you tell people to do at the moment?" "Oh, we tell people to Google it" You do realise Google is a business? So, it is– there's some weird things around that but…

        So, what else is there, I think there's also- there's other universities that we're talking to now, so we're talking to Manchester University about some stuff around hospital waste, and around plastics and stuff like that… They've got a project to look at recycling and resource efficiency of hospital waste because at the moment most of it gets incinerated so we're doing stuff hopefully with them, and Edinburgh University as well… that's another Circular Economy thing… so I might put 'customer' here and 'project'… maybe, it hasn't happened yet… no offence but academics seem to work an incredibly slow pace.

Appendix 4 – Maps & Journal Entries

Hand drawn maps

Drawn by interview participants or the interviewer during the interview, except Ecospheric which was drawn afterwards by the author.

Ricoh

Appendix

PPL
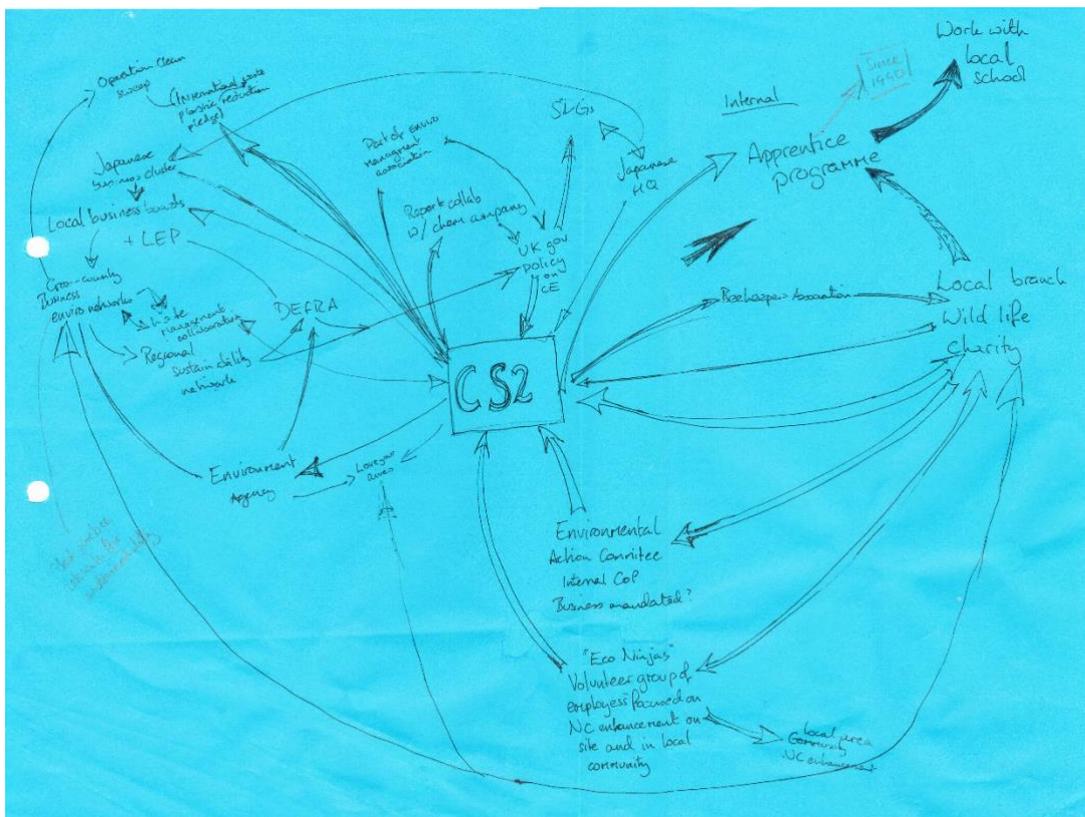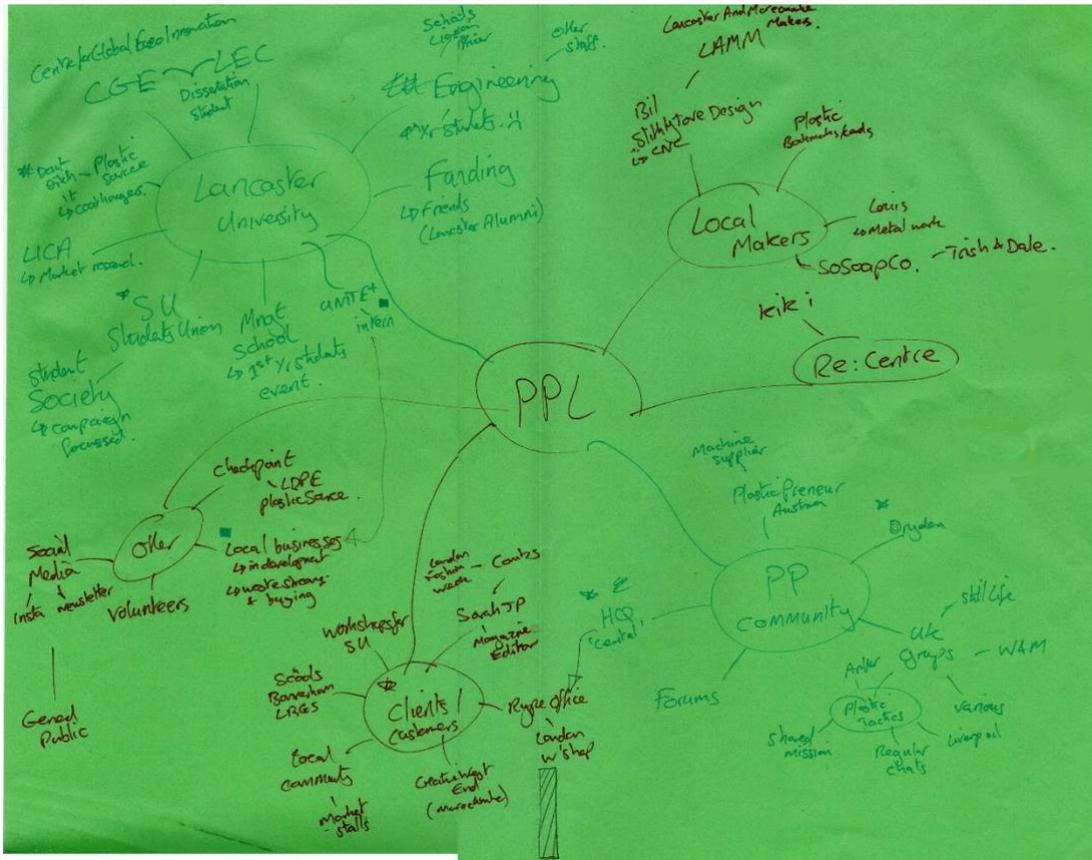
Dsposal
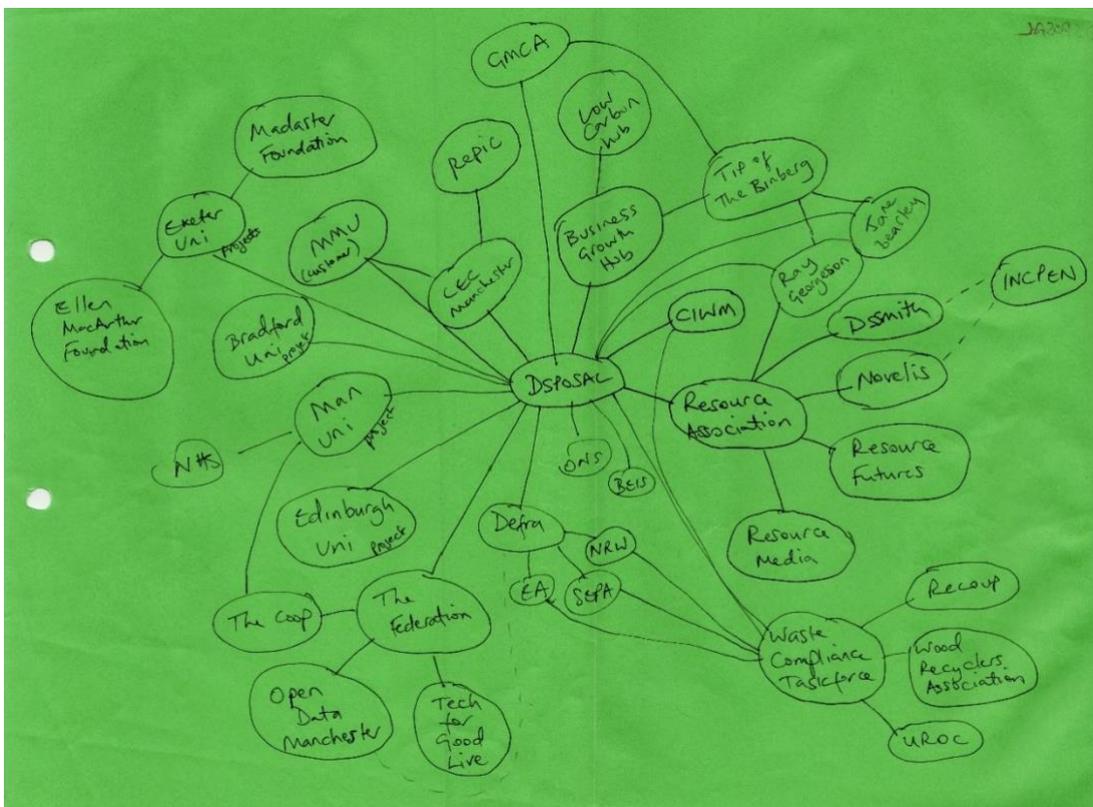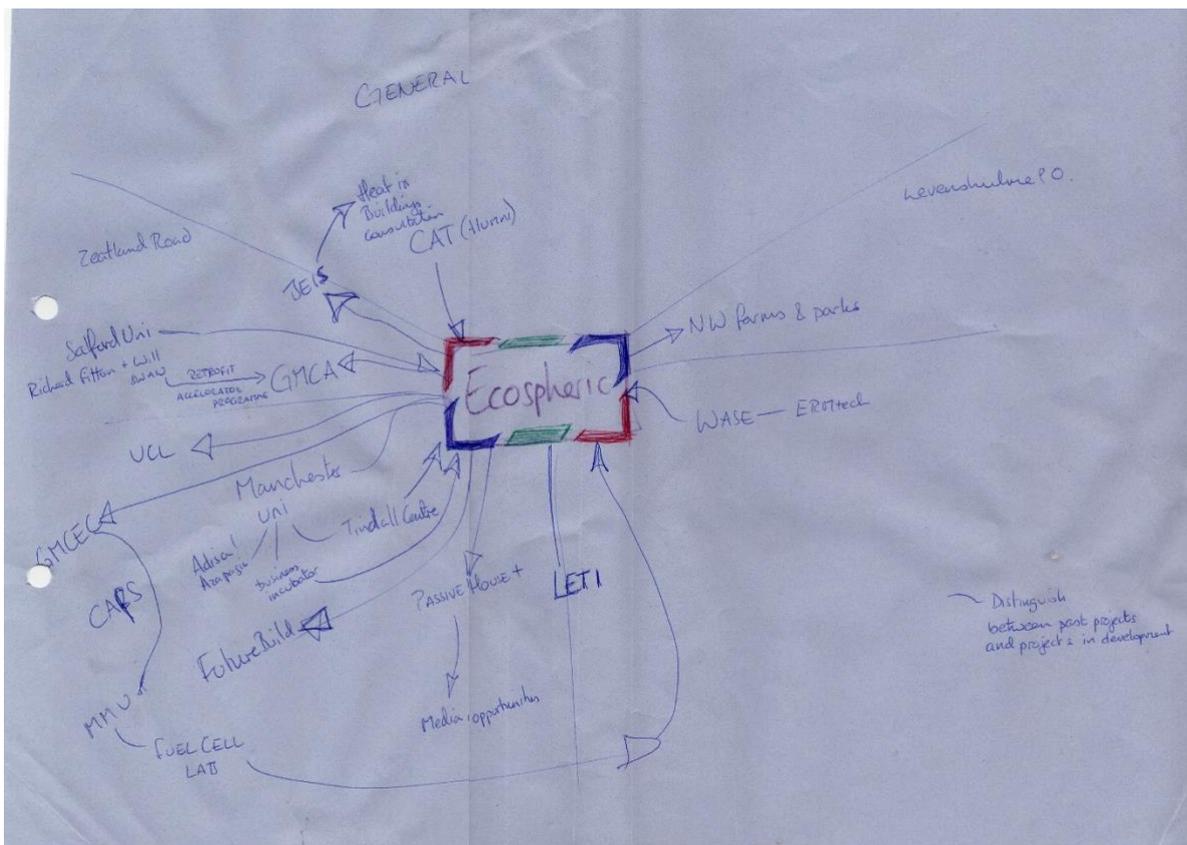
Appendix

Ecospheric
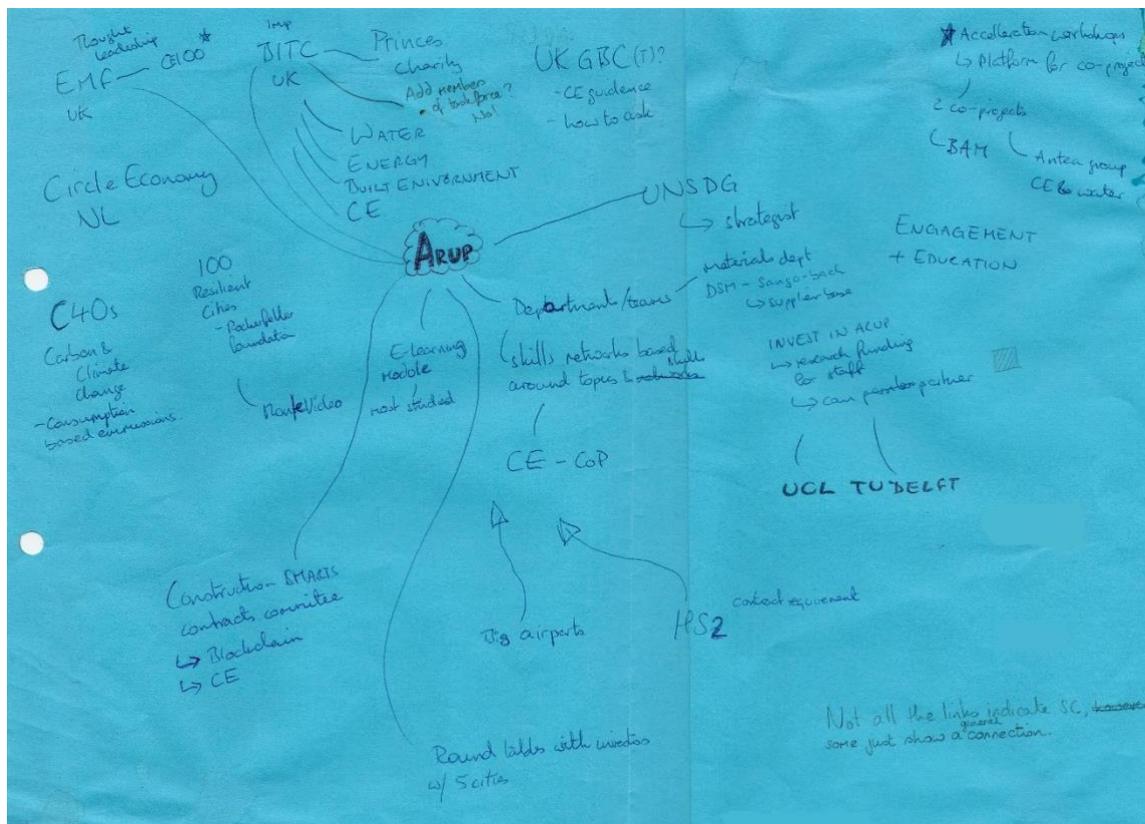
Arup

Appendix

Research journal entry examples

Appendix

Left page:

→ get find a 'good' journal, respected / with citations
↳ send list to L&E

Identify journal — where do I want to go next
↳ use this to
think of story to tell
↳ main message I want to say
1 sentence to start with
structure around that

"Design & sustainability journals

→ scope & aim for journal
→ author guidelines

→ write abstract & forward to editor
& ck if within remit

— different perspectives on thesis for different journals

Right page:

24/09/19 - transcribing Ricoh interview

Can the different CSs. be plotted onto a timeline of their CE journey?
Or ask them to rate themselves themselves?
10 - fully circular, all waste reused
0 - still linear, only virgin materials etc.

24/02/20 - Transcribing Ecosphere

Can the any categories be created around industry? Is this a deliberate phenomena?
*   *   *   *   *   *   *   *   *

10/03/20 - Transcribing PPL

Further along open source route, ie. PPL took ideas from original OS plans. Other companies spoken to are at the pioneering rather than implementation end — except Ricoh...

Appendix 5 — Coding

Analysis codebook

Codes used in NVivo to categorise sections of interview and document text.

NAME	DESCRIPTION
CCF	Community Capital Framework, taken from Flora *et al.* (2004), Nogueira *et al.* (2019)
Built Capital	Connections that provide physical infrastructure
Cultural Capital	Relationships with cultural orgs, grassroots community groups etc.
Digital Capital	Relationships that exist mostly online, digital infrastructure provision
Financial Capital	Connections that provide or receive funding
Human Capital	Connections that enhance the skills of knowledge of an individual
Natural Capital	Involvement in projects/groups to enhance or protect nature, greenspace, biodiversity
Political Capital	Links to structures that have the power to set policy at local regional or national level
Social Capital	Connections between individuals in a personal or professional capacity
CE Barriers	Developed through Kirchherr *et. al.* (2018), Rizos *et. al.* (2016), Tura *et. al.* (2019).
Economic	High costs of implementation Lack of capital Limited funding
Environmental	Lacking a company environmental culture beyond mandated policy
Institutional	Complex regulation Lack of gov. support Lack of CE know-how among policy makers
Organisational	Lack of compatibility with linear operations and targets Siloed thinking and fear of risk-taking Conflicts within existing culture and lack of cooperation Lack of management support and strong organisational hierarchy Lack of CE knowledge and skills
Social	Lack of social awareness Lack of information Lack of market mechanisms for recovery Lack of clear incentives
Supply Chain	Lack of network support and partners Strong industrial focus on linear models Lack collaboration and resources Low virgin material costs Lack of standardisation
Technological and informational	Lack of information and knowledge Lack of technologies and technical skills
CE Drivers	Developed through Kirchherr *et. al.*. (2018), Rizos *et. al.*. (2016), Tura *et. al.*. (2019).
Economic	Cost efficiency improvements new revenue streams Business development, innovation, and new synergies
Environmental	Resource constraints Preventing negative environmental impact Company environmental culture
Institutional	Regulation and standards requirements Support from the demand network Supportive funds, favourable taxation, and subsidy policies
Organisational	Potential to strengthen company brand and differentiate from rivals Increased understanding of sustainability demands Circularity ingrained in company strategy and goals Development of skills and capabilities for a circular future
Social	Increased internationalisation and global awareness of sustainability needs Potential to increase workplaces and vitality
Supply Chain	Potential for reducing supply dependence, avoiding high and volatile prices Open collaboration and communication Increased availability of resources and capabilities Management of reverse networks
Technological and informational	Potential for improving existing operations new technologies Increased knowledge sharing and networking
CE interpretation	Taken from Kirchherr *et. al.*. (2018)

Appendix

4 Rs		As opposed to 3 - 9 Rs
	Recover	Recover energy from waste through incineration
	Recycle	Breaking down a product into its raw parts, reuse of waste
	Reduce	Actively discouraging consumption through increased efficiency of product, prolonged lifespan
	Reuse	Reusing product as is, refurbishing and repairing.
Aims of CE		Within company, what are the aims for CE adoption
	Economic prosperity	Improved profitability
	Environmental quality	Improve the environment
	Social Equity	Bridge gap between rich and poor
Consumer focus		Are consumers thought about or mentioned in the interviews?
Systems Perspective		What level are the company looking at?
	Macro	Global, national and industry wide changes
	Meso	Regional level, and or eco-industrial parks
	Micro	Product level changes
Communities of Practice		Make up of CoPs taken from Wenger, McDermott, & Snyder (2002)
	Formation	spontaneous or intentional
	Level	micro (inside an office or business), meso (across a business or businesses), macro (national or industry level).
	Lifespan	months and years → generations (in terms of a specific artisan community).
	Location	Location collocated or distributed, "sharing a practice requires regular interaction" but that interaction doesn't need to be face-to-face.
	Make up	homogeneous (same discipline or expertise) or heterogeneous (across disciplines).
	Relationship to org.	Unrecognised – Invisible to organisation and sometimes even to members Bootlegged – Only visible to circle of people in the know Legitimised – Officially sanctioned as a valuable entity Supported – Provided with direct resources from the organisation Institutionalised – Given an official status in the organisation
	Size	small, a few expert individuals → very large, usually structured by geography or subtheme

Appendix 6 – KEPI Framework

KEPI framework feedback transcripts

Examples of the feedback phone conversations transcribed with Word 365

Sample feedback 1

00:00:57 AW

I think it's really useful, the colour coding is brilliant to be honest because it's all there, isn't it? I don't need to look at it and work out what's what. It's like, oh there, there's a knowledge transfer, there's the value in that relationship and I'm in two minds just to print it off and send it to Rica with an anonymous envelope to be honest. Show them what they're missing. I think I think it's brilliant. Well, I wish I'd have had it to be to be honest, because I was often asked, in the boardroom "What's the value?" And I know many people that...

00:01:38 AW

Leanne, there's one another one that you really need to meet at some point. I've helped Leanne in the past and mentored her, but she's like the sustainability manager for the Sentra group. And she has difficulty showing what the links and the values are.

00:02:00 AW

So it's quite a common thing, it's just people, like sustainability professionals will go out and they will do, do, do, do action, do action, do action, and when you come back to the boardroom and somebody says, well, that's several hours of your time, where's the value in that? And to be able to throw that [stakeholder map] up and say that's it. That would be brilliant. I wish it had been a tool that I could have used in the past.

00:02:24 Jess

Well, I'm afraid it's only just been developed, so you've you've got it hot off hot off the Press I suppose.

00:02:35 AW

No brilliant. Have you got it there? That's fine, have you got it? Have you got the actual document? The explanation document?

00:02:44 Jess

Yes, I've got. I've got a previous iteration. It's just in different colours.

00:02:52 AW

But that's essentially my feedback on it. How would you improve it? I'm not sure. I'd be looking at, for a group of stakeholders, So for the business board for example, how would you layer that? Almost like Prezi? You know what Prezi is.

I was thinking off the top of my head here, but I put mine in the Prezi, someone else in The Prezi and zoom around them and have them open up and then if you wanted to click on someone you could go out to somebody.

00:03:36 AW

I'm glad you thought of that. It's really good idea.

00:03:42 Jess

Well, it's it's been through a few iterations. To get to to get to my framework but. This framework is much more Concise, nice, and concise.

00:03:59 AW

It is and that's that's what I mean, it's not. I've seen some and they're they're like no, they're amazingly. Intricate content. And it scares people off. It scared me of it. We had one where we did one plus the local nature partnership and it was incredible Somebody must have took Years to put it together, it's like it's pretty incredible, It's not usable at all. It just the to drill down to that level of data and and and another thing that struck me was that would it's difficult to manage because they had the the stakeholder position whatever they were in the organization, what their contact details were and there was no way of... keeping it relevant, I just thought that in in 10 minutes time that's going to be obsolete. Somebody in that massive network is going to leave. So you really want something that's a singular level, easy to see and easy to amend and then it's not difficult for people to update it and send it in.

00:05:15 Jess

Yeah, I think that's that's my next challenge is to Develop it in a way that people can input their own Data into it, and it comes back.

Sample feedback 2

00:09:02 JR

No, it's just I just wanted a bit of light feedback, but we can definitely talk about maybe doing it in the future. Yeah, like a future sort of application. That's something that I would be able to write about, you know, next steps, actually apply the framework to people as they are now. Yeah, rather than retrospectively applying it.

So, I mean, so you, but you do think that you would be able to.... It would apply to some of your.... You would be able to. Actually, we would be able to do this with your new Connections, wouldn't we? To apply the framework.

00:09:51 Interview participant

Yeah, I would say, and I you know even even one, you know, very basic takeaway is like trying to have everything on one page is really interesting to look at, because a lot of the time, you know it's in your head, but it's not clear or when you're trying to explain to other people or you know other people you know have joined the team. For example, I might be talking to them about this person or this connection, or where we get plastic from or this is the person we worked with before, you know? You can start trying to build it in your head but on a very basic level, it's almost really nice just to have everything like on our page, because that's not something we have otherwise. And then of course you know the framework that you've done is you know another level to that.

Yeah, different connections and how they're important? And I will say looking at it, it's quite hard from a colour scheme point of view between the two greens.

00:10:55 JR

I know.

00:10:59 Interview participant

Like I can see it on the document you know, obviously your colour change kind of somewhat makes sense but when it comes to the lines, it's quite hard.

00:11:12 JR

Yeah, that's it. That's the second iteration as well. The first time round, it was really difficult. I couldn't tell. I couldn't tell them apart at all, so I will take that back. That is good feedback.

00:11:19 Interview participant

Right? Yeah, whether you put the yellow between and then it goes blue, yellow, green, or yellow, green, blue or something.

00:11:32 JR

Maybe I'll make it yellow so it's yeah.

00:11:43 Interview participant

I don't know, but then yellow on a white background is hard. Because that's the other thing the image that you sent doesn't have a background, I think.

00:11:52 JR

Oh, did I send you a png? Oh, interesting.

00:11:57 Interview participant

So, it was all grey, but I just opened it in Paint, so I have a white background.

00:12:03 JR

Sorry about that.

00:12:05 Interview participant

But I imagine it's a small thing.

00:12:09 JR

Yeah, I think because I've been just putting them straight into word documents. It's I've it. I've not really considered people opening them as as, PNG's Oh yeah, they are. It is sorry about that.

00:12:23 Interview participant

OK, I mean fine like you know, could work around it, but I don't know whether that's the same format that would be going out, or whether that is just like a one off because it's not the final thing.

00:12:35 JR

No, I mean because it would well, it would go into my work, which is a Word document. So, it would be on a white background.

00:12:41 Interview participant

OK. Well, that doesn't affect your work so it doesn't really matter.

00:12:42 JR

I mean, I've just opened it, and my computer is set to black, so I can't read any of it at all. I should have sent it to you as a PDF that would have been much better. It printed it as one.

00:13:03 Interview participant

But I hear colour, like the whole colour stuff is really hard because, I've got other friends who make, different graphs or maps like trying to find the right colours to help eyesight and there seems to be a lot of research on how you represent stuff with colours and which are friendly to everyone and what makes sense.

00:13:25 JR

Yes, I think I'm not. I've I've not really looked into that. Yeah, but it definitely makes sense to me that different colour. I mean I can't look at green writing on a red background, for me, that's really awful. Like it, just it just jars too much. I can't actually read it. I mean not that you find too many things that are green and red together, but they do happen. So, yeah, if a poster's got that on it, I can't read it, so I immediately walk away even if it's interesting, but so yeah, so we've got some colour feedback, but I think in principle, do you think there could be anymore added to the actual framework, the document, or anything else.

00:14:30 Interview participant

I mean from, I think I'd probably like find more detail if I started re mapping stuff but like on the face of it looking at it It's kind of, it's an instant like net gain for how I look at stuff anyway. Because, like, say, from the very basic level you see everything on page and then you know the next level of how specifically those connections are important. And even without the final purpose of improving circularity I can see how the different connections are important in different ways. So obviously you took circularity as the main, like how we can improve it. But even without that as a final purpose I'm getting benefits by seeing different connections and types of connections, anyway. So, I could apply those in other ways, I know this person, and that's like that sort of connection, and that means I can do this. Say you know you could almost have your different connections, whether it improves circularity or improves productivity or improves something else, I feel. So, everything here, like I say, is a net gain because it's more information than I've had before. It's a nice way of thinking about things that I haven't done so already.

Sample feedback 3

00:07:57 Jess

That that sort of builds up over time so that you can, so that Ecospheric is able to experiment with other people, sort of things because that seemed to come through with a lot of what Kit was saying, that that they that you guys Take sort of devices that people are creating and put them into real situations and test them and try and work with them And I think that That involves quite a bit of trust From the people that have made the device to sort of If it's not necessarily ready, or if it is ready but to be able to get that feedback and sort of work on the on the thing together So those are the those are the little yellow connections on the map. And then on the other side, I I sort of worked out that Everyone in my All of the case studies that I did. Everyone had some sort of connections to structures of power somehow, so for you guys it's it's very much the connections to GMCA So through so either through Salford or x being on the Environmental Strategy Board Which I just thought was Just a very interesting kind of element of people's networks was that Everyone that I spoke to and I spoke to some really small like tiny volunteer led organizations. Uh, everyone managed sort of managed to get on to some Get access to some sort of power structure which I thought was really quiet an interesting result So I've just put That on. Uhm, yeah, so I mean, that's sort of talked through the the map a bit and I just I just wondered if you had any feedback from what you sort of looked at. I don't know if I don't know if I necessarily got everything right in terms of the map and there's probably not right anymore, because obviously this is a snapshot of a conversation had two years ago nearly three years ago now.

00:10:36 TC

Yeah, I mean, I think I think it It generally all looks kind of quite reflective of the work That we've done, but I yeah, I would just Think that with some of those organizations like they've been swapped out for, kind of like the different organizations or bodies in terms of those relationships. Yeah, so in terms of That knowledge exchange. We've expanded that quite a bit, so we've got a PhD researcher whose kind of an industry-based pH D from University of Liverpool, so he's working with us so kind of building up those sorts of knowledge exchange connections and expanding on that a bit more. Yes, so we've got

kind of a few more connections just mentioned the university Also because we have now Kind of shifted or Office project site in Lymm We've got We've kind of got kind of Practices with us from local sort of trade college. So that kind of expanded there a bit. Yeah, and then we're we're less involved with sort of like business incubator like organized Yeah, I guess the other connections could still involve with the GMCA kind of, that's Advising on constant commercial buildings Retrofit group so that role has kind of expanded a bit more as well And then we also recently joined the board of the ACP So in terms of kind of Influence or access to power I suppose that's kind of an expansion in those areas. And then is his Connection with kind of Manchester Met of the WAZE project Previous fields after program that finished now so not really doing that anymore. Not yeah, we don't We don't have so much lately a kind of relationship with the Center for alternative technology, although obviously we That we still kind of Those folks there, but we're not necessarily actively doing So much there or with the Super hopes network and you know it's more the passive house. Yes, we're just kind of like swapping out different organizations but still, I would say the framework is still quite applicable. I mean, what What's your... what's like a takeout finding from your research Would you say in terms of like where this is providing value for A research perspective.

00:14:06 Jess

Well, I think I would, so I this is. This is sort of the final point of development with the PhD So I think for the next in terms of my next steps, I would be looking at maybe creating. Creating a sort of a stakeholder mapping tool that people the organisations could use. As part of a sort of stakeholder mapping exercise, and then they could input their stakeholders into a probably a web-based application and go through the the sort of questions. I mean I would. I would need to develop the sort of questions I think to. So that people could sort of reflect on who they are. Or you know who they're connected to and whether they're knowledge-based connections or power based connections. And then they could input this into this app and then populate a map for themselves because I think for for some people it's they they don't. They don't visually think about this, isn't how they sort of they don't visualize it in this way, so I think it would that. Would probably be My next steps and then and then using and then developing the tool further with More organisations to doing a wider study based on the framework and applying the tool to different organizations and sort of getting feedback and and seeing how it could be refined. That I think that would be the next that's sort of where the contribution is from my work but it's been. It's been a very interesting few year.

00:16:02 TC

I guess there is there a weight to certain types of stakeholder of connections like our Ziggy trying to determine if one type of connection. Is more influential or has more impact on your organization.

00:16:22 Jess

I don't know The issue I think maybe I think there's I think actually there's room for all the different connections and I think it it's maybe worth I think if I was to expect, you know to expand this to looking more organisations, it would be interesting if To find out if people if there was challenges around for organisations that maybe were very heavy on one Particular in one particular area and and very light in another area so You know, maybe people had a lot of knowledge transfer, but no experimentation, and whether that could be, whether identifying that would help. In any way If they were struggling to sort of implement more circular or more sustainable policies. I think that's that's sort of Yeah, that's sort of. Where I think that it Would be interesting to see, but I'd need more I'd yeah, I'd need to do more research for that.

00:17:30 TC

And I guess just to get some clarity. So when you're talking about circularity, it's more just because I think I think when I open this up I was Sort of like Surprised I guess because I think my idea of circular economy is like, you know, zero-waste or sort of the idea of As circularity in the life cycle of something rather than looking at it from like an influence and relationships point of view, which seems to map

more of That sort Of the connections that organizations have with other organizations. So is that. You were saying Kit also had quite a different view of circularity than you did, so I guess I'm Just trying to clarify if I also have sort of misconstrued this idea of circularity in the circular economy.

00:18:23 Jess

Yeah, that's fine. I think for for me, there's definitely obviously there's The Zero way side and the resource reuse and the sort of continuation of resource keeping resources in the In it going, you know, in in the system for as long as possible is sort of the main thrust I think of the circular economy, but I think that there also needs To be a a move away from The Consumer based economies that we have and I think because it's such a big challenge, you know you can look at resources, but we but we need to reconsider almost everything As part of a sort of move to a circular economy, and I think that actually I've been trying to work out what What the value of people's connections is in in doing this, and I think for A lot of organisations it is in making different connections and learning how to How to change Attitudes and how to create, because I think there's, you know, there's very large sort of sort of overarching circular economy kind of ideas And then there's also creating small, very small loops within your own organization or your own area, because I think it needs to... The circular economy needs to sort of be, uh, demonstrated on very local scales as well as very international scales, and I think so, for for me, sort of my approach to this has been whether there's a role for different communities within trying to sort of achieve these different levels of of circularity. And I found that there definitely is a role, particularly in Exchange of of ideas and exchange of and sort of learning and and also I think the in terms of the power side what's come out as being quite important is that Because it's such a new idea and even this covers sort of sustainability stuff as well. The organisations that I've looked at you know you guys included are the experts on this and the policymakers are not and really having access to being able to influence policy is incredibly important because you know, you guys are the experts and You should be the ones telling The people who Are making these decisions what you know directing their decision making as the people who are working in it, and as the people who are having to implement this stuff on the ground.

00:21:39 TC

Yes, yeah, I know that's all quite interesting because I guess it's kind of Made me think about like the quality of those connections as well and just Like in terms of our work with the GMCA, sometimes I think the feeling is like we're included in the room, but they're not necessarily always Taking in that feedback, you know. Or acting on it in any meaningful way. So, it's sort of like that Sometimes, sometimes you know as actors in the industry We're at the table, but We're not necessarily having that much of a meaningful influence, so just taking into account like The the level of those connections or quality of connections, whether they're truly Meaningful and result and I Guess yeah. I'm just sort of thinking out loud about about that and just.

00:22:47 Jess

That's that's really interesting and actually, I think that in itself could definitely warrant a whole A bit of research in terms of you know what What is are the, what are the barriers to to governments implementing this, which I haven't looked at at all, but obviously You know, that's something that I think needs to be addressed. And soon because there's almost in, in my view, there's you know there's so there's only so much that business can do to lead If there's not being the if the policy isn't being implemented, you know if it isn't being changed and updated to reflect what's going on in industry.

00:23:37 TC

Yeah, and I guess sometimes like the way these meetings or the interaction is structured, it's it's sometimes structured in a way that's not necessarily Productive or constructive in terms of like resulting in change or I think I think there's some Sometimes, like with the GMCA as an example, just there's this aspiration, but there's not the budget behind it, so at the moment, like GMCA, is using a lot of really big companies like Brentwood take the lead on on these projects and it's sort of kind of

falling under these very large private sector organizations to Take the lead and it's I guess it's like time will tell us whether how much feedback from the other people around the table they're going to take on in terms of shaping the way they they've rolled out their retrofit strategies. It's just that, just the quality of communication as well, because you know, there's these meetings and then suddenly I think sometimes hear ohh well now there's this initiative that's happened, but there hasn't That hasn't necessarily been talked through with all the kind of The different players around the retrospect strategy group so I don't know, or I think on the flip side as well, it's like we're now in this role where these get involved in the industry for quite a long time and we do get approached by various Organizations to you, you know where they're trying to connect with us, but we just Feel like we Literally don't have the time or capacity to engage meaningfully in further collaboration sort of down the chain in a certain way, like with Organizations that are starting up that sort of thing. Aspect of time the lack of it, yeah.

00:25:58 Jess

Yes, I, I completely appreciate that That's really interesting. Thank you.

Appendix 7 – Correspondence

Email exchange with CAT alumni co-ordinator and CAT Manchester food network co-ordinator, redacted to keep identities private.

Robins, Jess (Student)

From:	███████████████████
Sent:	10 November 2020 15:49
To:	Robins, Jess (Student)
Subject:	Re: [External] Re: Fwd: Re: CAT alumni network

Hi Jess,
There is another project I supported in Manchester, Plastic Shed www.plasticshed.org which you might be interested in.

They upcycle plastic in a community centred way, happy to make the connection to the gang if desired.

Take care,

███████

On 10/11/2020 11:42, Robins, Jess (Student) wrote:
> Dear ███████,
>
> Thank you so much for your reply, that is all very useful for now. I am
> trying to see if Communities of Practice play any sort of role in
> organisations working with the circular economy and even though your group
> doesn't meet much it fits my criteria and I will include it in my analysis
> of Ecospheric.
> I am really happy to keep the conversation going if you want to arrange a
> talk of some kind in the new year.
> Good luck with your research too.
>
> All the best,
> Jess
>
> -----Original Message-----
> From: ████████████████████████████
> Sent: 03 November 2020 10:22
> To: ████████████████████████████████
> Robins, Jess (Student) ██████████████████-
> Subject: [External] Re: Fwd: Re: CAT alumni network
>
> This email originated outside the University. Check before clicking links
> or attachments.
>
> Dear All,
> I hope you are all keeping well. Thus far we are ok here in the middle of
> the Univeristy of Manchester campus which is pretty deserted.
>
> Jess, we have 36 email addresses on an email list that I maintain, in the
> sense that people send me people to add or remove and then I try to group
> a few changes together and send out the updated list from time to time.
> I started studying at CAT about 3 years ago – trying to work on my MSc
> dissertation at the moment. CAT food Manchester was being revived by
> █████████████ and I joined in. At the time the idea was for a meet up for
> some food in Manchester every other month. That did not always happen so
> regularly, roughly about half a dozen people might come.
> Sometimes, we met at a particular place of interest that someone had
> organised (such as a house ███ was working on).
> If you are interested in history further back, I could try to put you in
> touch with ████████ she became very busy with other commitments and so
> took a step back.

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We had not be regular for several months but were about to meet when
lockdown hit in March. A while later 1111 put out a suggestion to meet
online. There was not much response to that (I think) - me partly because
I was just getting into dissertation mode.
As -   says, perhaps your work might be an interesting topic for an
online talk?

There are occasional emails from someone asking whether they know about
something or can suggest some resources about a topic, etc.

Those are some initial responses - hopefully of some help. Please let me
know if you would like more. I hope the research goes well.

Regards,

On 30/10/2020 16:12, ▬▬▬▬▬▬   wrote:

    H i _ ,
        How are you?

    I hope this finds you safe and well.

    Had an enquiry, copied below about CAT food Manchester. Would
    you be
    able to get in touch with her and perhaps let her know numbers
    of
    people etc if you have them? Perhaps an interesting speaker
    for an event?

    Copied 1111 is a I know she was interested in having a virtual
    event
    if possible.

    Take care,

        -------- Forwarded Message--------
        Subject: Re: CAT alumni network
        Date: Fri, 30 Oct 2020 12:56:59 +0000
        From: ▬▬▬▬▬▬▬▬▬▬▬▬▬▬

        Dear Jess,
          Thanks for your note. Hope this finds you well. It sounds
        like a
        really interesting area. Do you have any provisional findings,
        exciting case studies or suggested actions that can support
        community
        circular economy work?

        The CAT food group in Manchester has been going for many
        years. While
        I was doing maternity cover in Manchester for a year I helped
        coordinate it and while I'm not based in Manchester, do have
        lots of
        links there still. Geoff is a good contact there now, I'll
        forward
        this on to him as requested.

        My work includes elements on the Circular Economy and Bio-
        mimicry. The
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Welsh Government Circular Economy Strategy
<https://eur02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgov.wales%2Fcircular-economy-strategy&data=04%7C01%7Cj.robins%40lancaster.ac.uk%7C56c8ab36001b4ddc991a08d87fe24947%7C9c9bcd11977a4e9ca9a0bc734090164a%7C0%7C0%7C637399957146968760%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMziiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7ClOOO&sdata=7mgua8eMsLTiz27DepjQyS41Q4v9MVIGfFsrPQzJo5g%3D&reserved=0>, seemed to get lots of clever minds working together on solutions which was nice.

Look forward to hear more about your work and hope the CAT food group
is valuable for you.

Kind Regards,

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Dear _,

I am a PhD student looking at the role of
community in circular
economy businesses in NW England. I recently
interviewed ▮▮▮▮▮▮▮▮▮
from Ecospheric who mentioned you in relation to
the CAT alumni
network. I wondered if you could give me a bit
more information on
this network for my research?
I am interested to know:
- How big the network is?
- When it was established?
- How active it is, do members share best practice
with one another
or are connections made on a needs basis?
- Do its member meet up or do they all have access
to each others
contacts etc?
If you don't have any of this information please
could you pass this
message on to someone who does?
Please feel free to email me a reply if you'd
rather
j.robins@lancaster.ac.uk Kind regards Jess

--

Explore and Build a Sustainable Future
Ymchwilio i ac Adeiladu Dyfodol Cynaliadwy

Meeting local needs for PPE
Diwallu anghenion o ran OPA yn lleol

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