CLOSING LOOPS, OPENING MINDS

THE ROLE OF SOCIAL CAPITAL FOR KNOWLEDGE SHARING RELATIONSHIPS IN CIRCULAR VALUE NETWORKS

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Abstract:

In the wake of the threats of climate change and natural resource depletion, an increasing number of companies are aligning their strategies and operations with the concept of the circular economy. The circular economy transition can be enabled by companies adopting novel circular business models, embracing collaboration and knowledge sharing between partners in broad circular value networks. Dimensions of social capital, like trust, shared language, and network ties, are important for knowledge sharing, and particularly for the developing and maintaining of the knowledge sharing relationships between firms that enable it. While social capital and knowledge sharing in traditional value networks has been amply researched, the same does not apply to circular business settings. To further investigate this, this study utilises a qualitative, single case study approach, specifically delimited to a circular value network for the recycling of flat glass. The study finds that the dimensions of social capital plays four roles, catalysing, aligning, incentivising and hindering, in knowledge sharing relationships in circular business settings. These conclusions add to novel research on the circular economy, social capital and knowledge sharing, in order to provide insights to be used as a base for future research as well as for business practitioners and policymakers undertaking the circular economy transition.

Keywords:

Social capital, knowledge sharing, circular economy, value networks, glass recycling

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Jacopo: To my parents, who always supported me in my darkest hours and raised me to be the man that I am. To Benedetta, my hero and constant source of inspiration, if I end up being half the person you are, I will be content. To Ali, Dylan and Sara, who turned Sweden into my new home and made these years wonderful. To Gaia, my dear sister from another mother.

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Definitions

Knowledge sharing	“Activities of transferring or disseminating knowledge from one person, group or organisation to another" (Marchiori & Franco, 2020)
Knowledge sharing relationship	Partnership enabling and facilitating knowledge sharing among partners in a network (Cheng & Fu, 2013)
Social capital	“The sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit” (Nahapiet & Ghoshal, 1998)
Circular economy	An industrial economy characterised by “design and business model strategies [that are] slowing, closing, and narrowing resource loops” (Bocken et al., 2016)
Circular business model	A business model “in which a focal company, together with partners, uses innovation to create, capture, and deliver value to improve resource efficiency by extending the lifespan of products and parts, thereby realizing environmental, social, and economic benefits” (Frishammar & Parida, 2018)
Value network	“Multi-relational networks consisting of a focal organisation, the focal organisation’s stakeholders, and the value exchanges between the focal organisation and its stakeholders, as well as between the stakeholders themselves” (Feng, 2013)
Circular value network	A value network in the context of the CE (Aminoff et al., 2016)
Circular business ecosystem	A term synonymous with CVN (Kanda et al., 2021)
Flat glass	Glass which, among other things, is used in the production of windows (Cable, 2004),

Abbreviations

Circular economy	CE
Circular business model	CBM
Circular value network	CVN

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1. Introduction

1.1 Background

It is widely accepted that knowledge sharing is important for organisations' success (e.g., Dyer & Nobeoka, 2000; Azeem et al., 2021). Particularly, research suggests that knowledge sharing with partner companies in the firm's value network is necessary for business activities such as innovation management and business sustainability (Wulf & Butel, 2017). Knowledge sharing is thus important for businesses' ability to tackle today's increasingly challenging and complex business environment (Blome et al., 2014).

The circular economy (CE) is an example of such a complex environment, in which knowledge sharing is particularly important. In the face of the challenges posed by climate change and natural resource depletion, companies transforming to circular operations and business models often find themselves in need of sharing diverse and complex knowledge with partner companies in a wider circular value network (CVN) (Markard et al., 2012; Geissdoerfer et al., 2017; Lieder & Rashid, 2016). The importance of knowledge sharing in the CE and, accordingly, for the creation of circular business models (CBMs) has been recognised in academia (Dangelico & Pujari, 2010; Stubbs & Cocklin, 2008). Some researchers have even argued that knowledge sharing holds a central role in circular business activities and innovation, more so than in traditional, non-circular business settings (Brown et al., 2019).

Social capital has been found to be vital to knowledge sharing relationships between companies, and especially so in complex settings (Chua et al., 2012). However, this has not been extensively researched in the context of CVNs, and for the purpose of the CE transition (Dias & Silva, 2021). Hence, this study uses the case of an environmental and recycling company working with a building materials manufacturer who have developed a new business around recycling flat glass in order to study social capital's role in knowledge sharing in a CVN context.

1.2 Knowledge Gap

Knowledge sharing has been deemed important for CE initiatives (Aloini et al., 2020). More widely it has been found that collaboration between companies in the CVN is a strategic driver for sustainable business model innovation (Bocken & Geradts, 2020), and that knowledge sharing is a priority for firms when managing uncertainty in CVNs (Leder et al., 2023). Social capital is important to knowledge sharing between organisations, and especially so when uncertainty is high (e.g., Inkpen & Tsang, 2005), sparking calls to research it further in sustainability and CE contexts (Dias et al., 2023), and specifically in value networks which go beyond traditional, linear buyer-seller relationships (Dias & Silva, 2021). While social capital has been used to study collaboration in circular business ecosystems in general (Leder, 2021; Leder et al., 2023), and knowledge sharing in related settings like green supply chains (e.g., Cheng et al., 2008), social capital theory has not, to the authors' knowledge, been used to study knowledge sharing between companies in the CVN context particularly.

1.3 Research Purpose and Research Question

As previously stated, further research is needed to deepen the understanding of the role of social capital for knowledge sharing between companies in the CVN context. Flat glass as this study's empirical setting is particularly interesting, as the virgin materials necessary for glass production are the world's second most exploited natural resources and are rapidly running out (Meredith, 2021). In fact, it is seen as one of the "greatest sustainability challenges of the 21st century" (Peduzzi et al., 2019) Arguably, this means there is a need to establish large-scale, financially viable CBMs for flat glass, likely as part of larger CVNs. In this innovation effort, knowledge sharing and thereby social capital will be central as CBM projects are characterised by "financial uncertainty and complex business operations" (Bocken et al., 2018).

Through research on the identified topic, business practitioners could gain a thorough, more nuanced understanding of what role social capital plays in knowledge-intensive CE-focused business partnerships. Further, academic discourse around CE could gain from deepened insights on knowledge sharing and social capital specifically in the CVN context. Hence, this study aims to explore the role of social capital in knowledge sharing relationships, specifically between partner companies in a CVN.

Consequently, the research question is:
What is the role of social capital in knowledge sharing relationships between companies in circular value networks?

1.4 Delimitations and Focus

This study is delimited to primarily explore the knowledge sharing relationship between a focal company and its main partner company in a wider CVN. This means the unit of analysis is the relationship between two companies that forms the basis for knowledge sharing, not the companies themselves nor their individual employees. Hence, this study does not primarily seek to look at how knowledge is actually shared with regards to for example knowledge sharing mechanisms, incentives etc. (e.g., Tsai, 2002). Furthermore, the study neither seeks to untangle what kind of knowledge is shared, nor attempts to establish a causal relationship between social capital and successful knowledge sharing. Rather, the study looks at what kind of effect social capital has on the formation and perpetuation of knowledge sharing relationships in CVNs. This also means the study makes a conscious distinction between knowledge sharing and organisational learning, in the sense that the terms are closely connected but that organisational learning is a result of knowledge sharing (Yang, 2007).

Additionally, the study will focus on one circular business project conducted by the identified focal company together with a defined set of partners in a CVN. The case chosen is aligned with the research purpose in the sense that it is operationally complex, involves managing financial uncertainty, and has a clear CE focus and purpose. Given these circumstances, there is a clear need for companies in the CVN to share knowledge to develop the new CBM.

Thereby, it is relevant for them to address social capital as a prerequisite for collaboration and knowledge sharing.

2. Literature Review

2.1 Inter-Organisational Knowledge Sharing

It has been argued that knowledge sharing is one of the most important topics in management research (Serenko & Bontis, 2016), although the term has frequently been confused with knowledge transfer in academia (Jonsson, 2008). Authors have divergent views on these terms, largely stemming from the ambiguous nature of their definitions (Paulin & Suneson, 2012). While some scholars use these concepts interchangeably, others contend that they are distinctly separate or correlated but not synonymous. For example, Tangaraja et al. (2016) consider knowledge transfer as an umbrella term with knowledge sharing being one subset of it.

Knowledge sharing as a stream of academic research can be traced back to early studies of organisational learning (e.g., Argyris & Schön, 1978). The explicit focus on knowledge sharing was popularised by authors like Argote and Ingram (2000). Since, research on knowledge sharing has evolved to study a breadth of focus areas, such as the role of organisational context, interpersonal characteristics, cultural norms and motivational factors (Wang & Noe, 2010), as well as the CE (Nujen et al., 2023). There exists many different definitions of knowledge sharing, but it has, in a wide sense, been defined as “activities of transferring or disseminating knowledge from one person, group or organisation to another" (Marchiori & Franco, 2020).

Scholars argue that knowledge sharing works differently based on what kind of knowledge is shared. Generally, researchers distinguish between tacit and explicit knowledge. Tacit knowledge is not readily documented but is instead disseminated through personal experience, whereas explicit knowledge can be articulated through written language and more easily shared through various means (Hu & Randel, 2014), and as for circular businesses, sharing both kinds of knowledge is important (Nujen et al., 2023).

2.1.1 Social Capital, Trust and Contracts in Knowledge Sharing Relationships

As the process of interorganisational knowledge sharing is integrated into cooperative relationships, it will be influenced by relational and social factors (Lyu et al., 2020). Knowledge sharing and the organisational relationships through which it takes place can therefore be understood through the perspective of social capital, popularised by Nahapiet and Ghohsal (1998) who identified the role of social capital in the formation of intellectual capital in organisations. The link between social factors, like trust, social networks, shared language, and knowledge sharing has gained popularity in literature, and has been conceptualised in several ways (e.g., Lefebvre, et al., 2016). Some authors have, for example, particularly focused on the role of trust in knowledge sharing, viewing it either as mediator or important antecedent (e.g., Inkpen & Tsang, 2005; Cheng et al., 2008; Asrar-ul-Haq & Anwar, 2016), while others have studied knowledge sharing in ecosystems (Vahlne & Bhatti, 2019).

Similarly, the role of contracts in relation to trust and knowledge sharing, as well as knowledge sharing relationships has also been widely debated by scholars. Early studies (e.g., Macaulay, 1963) indicated that contracts might be inconsequential or even harmful to trust and interorganisational relationships. Other research suggests that contracts are complements to trust, serving a reassuring function in business interactions (Arrighetti et al., 1997; Poppo & Zenger, 2002). With regards to knowledge sharing, it has been argued that formal contracts support the acquisition of explicit knowledge (Li et al., 2009). Somewhat contrarily, Guo et al. (2020) find that formal contracts hamper firms' ability to strike a balance between sharing and protecting their knowledge.

2.2 Circular Economy

Ever since its conception by Pearce and Turner (1990), the CE has gained significant traction in academia, business practice and politics (Kraaijenhagen et al., 2018; European Commission, 2020).

The term CE has evolved over time, and it carries various meanings depending on the temporal and geographical context (Bocken et al., 2016). Many widely used CE definitions are problematic for multiple reasons. For example, Figge et al. (2017) focus on closing resource loops, disregarding other approaches like lifecycle extension, which is reductive as only certain approaches to circularity are included. Furthermore, the lack of coherence in the definition of circularity, CBMs and CE leads to problems for researchers and policymakers. For this reason, contemporary scholars have pushed to create a consensus on these definitions (Bocken et al., 2016).

CE as conceptualised by Bocken et al. (2016), who built on prior work by Stahel (1994, 2010) in an effort to bridge the academic divide on the topic, fits the purpose of this study. This definition sees CE as an economic model in which materials flow "cradle-to-cradle", differing from the traditional "cradle-to-grave", linear perspective. Therefore, CBMs in the CE try to maximise value from extracted materials by narrowing resource loops (e.g., improving resource efficiency), slowing resource loops (e.g., increasing resource longevity) and closing resource loops (e.g., eliminating waste through recycling) (Kennedy & Linnenluecke, 2022) (Appendix 6.1).

2.2.1 Circular Value Networks

In order for a company to make its business "greener" by extending, closing and slowing resource loops, cooperation with stakeholders in its value network is critical (Vermeulen, 2013; Zhu et al., 2011). Value networks in general can be defined as "multi-relational networks consisting of a focal organisation, the focal organisation's stakeholders, and the value exchanges between the focal organisation and its stakeholders, as well as between the stakeholders themselves" (Feng, 2013). The resources exchanged can be tangible (e.g., materials, resources, transactions) or intangible (e.g., knowledge) and "essentially anything an actor perceives as valuable" (Frooman, 1999).

Many authors use the term business ecosystems to denote value networks in which a focal company collaborates with multiple stakeholders to work toward the CE (e.g., Parida et al., 2019). CVNs, defined as value networks in the context of the CE (Aminoff et al., 2016), can hence be said to be equivalent (Kanda et al., 2021). However, the term CVN is arguably more in line with this study's research purpose due to its explicit emphasis on circularity. In specific cases of CVNs, firms from separate industries holding common ideals on sustainability and circularity (Thornton et al., 2020) engage in a collective approach to competitive advantage, involving exchanges of materials, knowledge and services (Fraccascia et al., 2021). This exchange is complex (Velte & Steinhilper, 2016) and occurs at the interorganisational level, leading to the co-creation of monetary and ecological value (Appendix 6.2).

2.3 Knowledge Sharing and Social Capital in CVNs

Effectively managing and collaborating within their value networks is paramount for companies generating value through circular innovation and activities, more so than for traditional business models (Stubbs & Cocklin, 2008; Brown et al., 2019). Brown et al. (2019) emphasise that the primary motivation for CE collaboration lies in augmenting knowledge flows, while also gaining access to resources, exploring new markets, and enhancing skills. Even at the practical level, Sumter et al. (2018) find that facilitating collaborative sustainability problem solving is a key "sustainability competence".

Additionally, networks are important for understanding how experimentation is done in the context of CBM development (Konietzko et al., 2020), and novel research has shed light on different kinds of network relationships relevant to the CE transition, highlighting knowledge sharing as one type of collaborative relationship (Blomberg et al., 2023).

However, increased collaboration and knowledge sharing between companies in CVNs comes with common challenges. Among these, a lack of trust stands out (Boons et al., 2009), underscoring the importance for companies to be discerning when selecting their partners (Pouwels & Koster, 2017). According to Cheng et al. (2008), the social dimensions impacting knowledge sharing the most in green supply chains are trust, participation and communication in relationships, which can be challenging to achieve. Furthermore, Brown et al. (2020) highlight the difficulties of contracting in circular oriented innovation projects. Specifically, they argue that partner companies in this context often find themselves limited by traditional contracts, e.g., due to high uncertainty and complexity, and instead choose to rely on "rolling agreements" and collaboration.

3. Theoretical Framework

3.1 Theory Usage

This study utilises one primary theoretical framework to investigate interorganisational knowledge sharing in the context of CBM development – namely, an adaptation and updated version of the three dimensions of social capital as conceived by Nahapiet and Ghoshal (1998) and expanded upon by many scholars.

Using the three dimensional model of social capital will allow for a structured approach to identifying and analysing the role of social capital in the knowledge sharing relationship in CVNs.

3.2 Three Dimensional Model of Social Capital

Nahapiet and Ghoshal's (1998) three dimensional model of social capital is highly influential and has been adapted and used by many management scholars (Manning, 2017), including to specifically study knowledge sharing and transfer (Yue Wah et al., 2007; Inkpen & Tsang, 2005).

Contemporary scholars have developed and expanded on the model, for example by showcasing how social capital functions as an antecedent to knowledge sharing for innovation (Lazzarotti et al., 2015). Social capital has also been used to study cases of CE transition in several countries, finding that trust and commitment to a common goal are important for successful CE transition (Pitkänen, et al., 2016). In fact, social capital has been deemed important to CE implementation by academia, government and business practitioners (Padilla-Rivera et al., 2020). Additionally, social capital has also been studied specifically in relation to CBMs (Leder et al., 2020).

There exists several theories of social capital, but Nahapiet and Ghoshal's model has several strengths – it incorporates many aspects of social capital, includes a cognitive dimension, takes into consideration social interactions over time, studies social capital at the organisational level, and focuses on knowledge (Bolino et al., 2002). These strengths contribute to the model's appropriateness given our study's focus.

The original inception of the model analyses social capital and knowledge formation, specifying three dimensions of social capital in an organisation: the structural dimension, cognitive dimension, and relational dimension. These dimensions then feed into the combination and exchange of intellectual capital, which in turn results in new intellectual capital being created (Nahapiet & Ghoshal, 1998). For Inkpen and Tsang (2005), social capital can exist on either the individual or the organisational level, and for knowledge sharing to take place in a network it must be present on one or both levels.

Furthermore, it is important to keep in mind the possible interrelatedness of the social capital dimensions. Nahapiet and Ghohsal's (1998) version of the model viewed the dimensions of social capital as independent, but their interdependence has been studied and conceptualised by others (e.g., Tsai & Ghoshal, 1998; Castro & Roldán, 2013).

The version of the model utilised in this study has been synthesised following the footsteps of Inkpen and Tsang (2005) who applied it to analyse knowledge sharing and transfer between organisations, as well as Saffer (2019) who employed it to research the effect of social capital on networks with multiple stakeholders. On the basis of these articles, the model is therefore pivoted to analyse the effect of social capital on knowledge sharing relationships in CVNs.

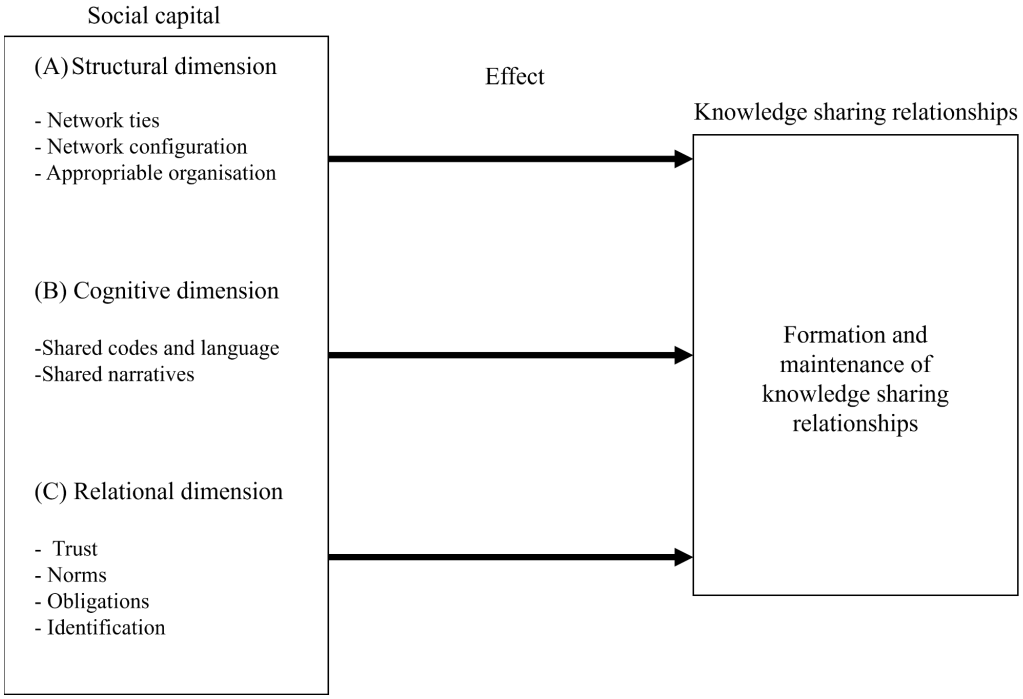

Figure 3.1 The role of social capital for knowledge sharing relationships (synthesised from Nahapiet & Ghoshal, 1998; Inkpen & Tsang, 2005; Saffer, 2019) (Edited by Angeloni & Axelson, 2023)

3.2.1 The Structural Dimension

For Nahapiet and Ghohsal (1998), the structural dimension of social capital denotes the arrangement of relationships among people in organisations – specifically, whom one can access and the means available to establish such connections. Crucial aspects of this dimension concern the existence and nature of network ties and the diversity, network position and boundary-spanning roles of stakeholders, as well as the importance of pre-existing relationships, or "appropriable organisation". Configuration of network ties is crucial when companies have very different knowledge bases, but scholars have historically disagreed on the appropriate density of ties and level of redundancy required for successful

knowledge sharing (Cohen & Levinthal, 1990; Coleman, 1988; Burt 1992). The specific context and environment of the network also plays a vital role (Gilsing & Duysters, 2008).

3.2.2 The Cognitive Dimension

The cognitive dimension refers to those resources providing shared context, representations, interpretations, and systems of meaning among parties. In the model, these context-shaping resources are divided into shared languages and shared narratives (Nahapiet & Ghoshal, 1998). A shared language influences knowledge sharing primarily by providing a "common conceptual apparatus for [...] exchange and combination [of knowledge]" (Nahapiet & Ghoshal, 1998). By having a base level of overlapping knowledge and a common vocabulary, organisations can share knowledge more effectively (Boland & Tenkasi, 1995). In regards to shared narratives, two main "modes of cognition" affect knowledge sharing (Bruner, 1990) – the information or paradigmatic mode, which implies a process rooted in rational analysis, and the narrative mode, which is concerned with synthetic narratives like good stories and metaphors. Also, digital cognitive models, such as ontologies, can enable knowledge sharing by creating a shared language and reinforcing narratives (Randolph et al., 2020).

3.2.3 The Relational Dimension

The relational dimension focuses on aspects of peoples' relationships that affect their behaviour. This concept is distinct from the structural dimension in the sense that people that possess the comparable positions in a network may act very differently based on their relationships with other network members. Hence, the relational dimension focuses particularly on assets created and leveraged through relationships, such as trust, norms, obligations and expectations, and identity and identification (Nahapiet & Ghoshal, 1998; Levin et al., 2015). In studies of interorganisational knowledge sharing, the trust aspect of the relational dimension has been deemed especially relevant, as willingness to share knowledge is higher when there is no perception of opportunistic behaviour (Inkpen & Tsang, 2005; Rivera et al., 2020).

3.3. Theory Discussion

Though Nahapiet and Ghoshal (1998) analyse one organisation in isolation, Inkpen and Tsang's (2005) widely cited adaptation of the model uses the same three dimensions of social capital to study the conditions for interorganisational knowledge transfer in networks. We deliberately decided to utilise these studies as a theoretical foundation, acknowledging that both refer to knowledge transfer and knowledge sharing interchangeably. As previously mentioned, the issue of inconsistency regarding these terms is common in management research (Paulin & Suneson, 2012). Given this, it was concluded that knowledge sharing and transfer, as used by Nahapiet and Ghoshal (1998) and Inkpen and Tsang (2005) are compatible with Marchiori and Franco's (2020) definition of knowledge sharing as "activities of transferring or disseminating knowledge from one person, group or organisation to another," which is used for this study. Thus, it is deemed that the two concepts are compatible to serve as an analytical groundwork.

Furthermore, there could be other relevant dimensions of social capital that are not covered by this theoretical framework, especially when considering the interorganisational context with, for example, geographic distance, and differences in organisational size and structure. Another inherent issue with social capital theory is that it is hard to measure. This relates to the risks of circular reasoning that come with the concept, particularly as an organisation's success is ascribed to its social capital, yet social capital itself is gauged by the organisation's success (Knorringa & Van Staveren, 2007). On a related note, popular conceptions of social capital have been criticised for not taking into consideration the negatives of social capital, like the cost of building and maintaining interorganisational relationships (Adler & Kwon, 2002).

The authors of this study have sought to engage with these shortcomings, addressing and mitigating them in various ways. First, recognising that not all potentially relevant dimensions may be captured by the theoretical framework, aspects of the empirics that do not fit the framework's categorisation will be acknowledged and used in the discussion to drive theory development. Second, this study focuses mainly on social capital as an antecedent of knowledge sharing relationships and does not delve into assessing social capital's causal role, meaning a lessened risk of circular reasoning.

4. Method

4.1 Research Philosophy

This study adopts an objectivist ontological position, thereby assuming one true reality that is external to social actors. Therefore, this study seeks to investigate the social world through observable facts with the aim of discovering aspects of how organisations function that can be generalised (Saunders et al., 2019). Furthermore, and in line with the ontological position, a positivist research philosophy is used. Epistemologically, this study thus focuses only on observable facts and phenomena and is not concerned with hidden meanings or constructs. In terms of axiology, the authors of the study have made efforts to stay detached, value-free and independent of the data and the research as a whole (Saunders et al., 2019).

4.2 Method Choices

This study uses a qualitative method, as it allows for in-depth analysis and the collection of detail- and context-rich data (Saunders et al., 2019). In line with this, in terms of research strategy, a single case study was chosen, allowing for a deep understanding of how a management phenomenon interacts with its context (Saunders et al., 2019). This fits well with the research aim, since knowledge sharing and especially the social dimensions involved in it are influenced by the organisational context. Also, case studies have been used in many instances to study various business issues in a CE context (Hina et al., 2022). Further, a single case as opposed to a multiple case study was chosen. Single case studies are often used to study critical, extreme or unique cases (Saunders et al., 2019). The case investigated in this study arguably has several unique qualities, like the clear focus on knowledge and material flows, an international partnership, and the development of novel circular solutions. Additionally, the authors gained far-reaching access to stakeholders in the relevant CVN companies, which increased the attractiveness of a single case study.

The study is cross-sectional as opposed to longitudinal, as it is based on data collected during a limited time period both due the study's time constraints and the nature of the research aim (Saunders et al., 2019). However, with this being a qualitative case study, participants may add temporal dimensions to their answers.

With regards to theory development, as suggested by Saunders et al. (2019), an abductive approach is used, since social dimensions of knowledge sharing have been studied extensively in some contexts but not in the CVN context specifically. The abductive approach is flexible and allows for the modification of existing theory in light of new themes and patterns found in the data, which is fitting as this study aims to investigate an empirical context, CVN, that is quite new and rapidly evolving.

4.3 Data Collection

4.3.1 Choosing and Delimiting the Case

The single case was not chosen opportunistically, but carefully and based on theoretical sampling. This means the authors began searching for a suitable case, not with a pre-selected theory in mind, but with some key concepts they sought to investigate, in this instance the knowledge sharing relationship between companies in a CVN. Ultimately, this particular case was chosen as it was believed to be a source of a significant amount of value on the concepts of interest (Goffin et al., 2019; Yin, 2014).

The case was delimited both in dialogue with the participants and through the authors' assessment of the case's relevant stakeholders. An organisation was deemed to be part of the case CVN if it was directly involved in the glass material flow. Hence, a prospective end-customer currently in talks with the focal company, and a university and a research institute that were involved in knowledge development that enabled the project, were excluded from the case study. Furthermore, it was important to delimit the case to only address a single circular business project, and not other projects conducted by the CVN partner companies in other constellations.

4.3.2 Sample

Selecting interview participants was, in line with the positivist paradigm, done with the goal of gaining a complete picture of the case, hence the authors sought to interview all people who fulfilled two inclusion criteria: 1) are employed at the CVN partner companies, and 2) had worked or are working on the case as delimited in a meaningful way. This resulted in nine participants being interviewed, five at EnviroCycle, three at Crystalio, and one at Brickwork (Appendix 1).

Participants were contacted through email (see Appendix 3). Following the first interview, participants were identified through snowballing, as interviewees gave suggestions regarding who to interview next. After nine interviews, there were no more people who fulfilled the two inclusion criteria, and it was deemed that the study had reached empirical saturation meaning that additional data collected is believed to add little new information (Saunders et al., 2019).

4.3.3 Interview Process

Interviews were semi-structured, with questions on the central themes of interest being pre-formulated in the interview guide (Appendix 4) to ensure consistency and structure, while allowing for follow-up questions and exemplifications (Saunders et al., 2019). After two initial pilot interviews, the interview guide was revised slightly to better capture key aspects of the theoretical model. Interviews were conducted in English, as it was the common language of all participants and the two authors. All interviews were internet-mediated using Microsoft Teams, and all participants consented to the interviews being recorded and transcribed. The authors took turns leading interviews and acting as principal notetaker, which enabled one person to consider follow-up questions and note down key insights.

4.4 Data Analysis

First, a draft English language transcription was generated by Microsoft Teams. This transcription was then reviewed, tested against the recordings and edited by the authors to ensure accuracy. After this, in instances where there was uncertainty, transcriptions were sent to the participants who were able to provide corrections. Then, all interviews were coded independently by both authors to mitigate bias and then compared and discussed by the authors (see Appendix 5). The coding was guided by the study's research purpose and objectives as well as the research philosophy, as advised by Saunders et al. (2019). After the first round of coding, 22 codes in total were identified. The interviews were then re-coded utilising the latest set of codes to ensure consistency as suggested by Saunders et al. (2019), after which the codes were grouped into eight categories presented in the empirics chapter.

4.5 Ethical and Other Considerations

The authors of this study have addressed ethical concerns primarily by adopting a deontological ethical position, meaning a defined set of rules determines what is considered ethical (Saunders et al., 2019). In the case of this study, these rules have comprised the SSE Student Handbook, national laws, and applicable European Union regulations, particularly the General Data Protection Regulation (GDPR).

When conducting internet-mediated research, issues of data management, confidentiality and anonymity of participants are especially important (Saunders et al., 2019). To address these concerns, several steps were taken. Prior to the interview, participants signed a consent form agreeing to be part of the study. At the beginning of all interviews, participants were informed about their rights under GDPR, and that nothing they said would be traceable back to them. Participants were also told they could withdraw their participation at any moment. Also, to ensure anonymity, names of participating companies and people, and work titles were pseudonymised.

Regarding the increased usage of generative AI tools in academia (e.g, Dwivedi et al., 2023), the authors employed AI tools very carefully and selectively when conducting the study. The tools were used for refining writing in a limited number of instances. The authors made sure not to provide the AI tools with any personal or sensitive data collected from the participants.

4.6 Method Discussion

According to Goffin et al. (2019), reflecting on validity and reliability is important for high quality case studies. However, Saunders et al. (2019) argue that these criteria may need to be adapted when assessing qualitative research and also present four alternative quality criteria – dependability, credibility, transferability and authenticity. To ensure validity and thus reliability and credibility, both authors, as suggested by Saunders et al. (2019) were present during interviews, coded transcripts independently and then compared results, and when needed used participant validation to ensure transcripts matched what the participants sought to communicate. Additionally, the research method was carefully considered and

transparently communicated. Validity and credibility could have been affected by the participants' varying levels of English proficiency. To address this, the authors tried to create a comfortable and convenient interview setting (see Saunders et al., 2019) and encouraged participants to not worry about language correctness.

As this is a cross-sectional case study taking place in a particular organisational and social context, reliability and transferability could arguably be negatively impacted. Hence, as suggested by Saunders et al. (2019), the authors sought to increase reliability by being transparent with the research question, research design, the empirics and our analysis, allowing readers to assess whether this study could be useful for research in another context. Similarly, generalisability is a common concern about case studies. However, according to Yin (2014), case studies are suitable for looking into or expanding on theory in ways that are of interest beyond the specific case study. In that sense, a case study is not equivalent to a sample that would be used to make statistical generalisations about a larger population, but rather a means of analytic generalisation using theory.

Lastly, the study's credibility could be criticised on the basis of the seemingly limited number of interviews, nine, and also the fact that participants were not sampled stochastically but were identified primarily through snowballing. Yet, it is essential to note that empirical saturation was reached since all people who were involved in the case as delimited were interviewed, and snowballing was used out of necessity since there was no written record of who had worked on the project.

5. Empirics

5.1 Case Overview

The business case that forms the empirical foundation of this study revolves around a CVN in the building materials industry in Europe. Specifically, our focal company EnviroCycle (pseudonym), a European environmental and recycling company with a longstanding legacy, has made a strategic shift to focus on CE solutions, launching several projects to transform its business. Among these is the RecyClear project (pseudonym) which is carried out together with leading European building material manufacturer Crystalio (pseudonym), as well as the construction entrepreneur firm Brickwork (pseudonym).

RecyClear is a project which fits with the definition of CE by Bocken et al. (2016) and can be defined as part of a larger CVN (Appendix 6.3).

5.2 The Findings

In this section, the empirical data of the study is presented and divided into eight ontological categories, based on the coding (Appendix 5). The findings presented paint an overarching picture of how social capital affects knowledge sharing relationships in CVNs.

5.2.1 Pre-Existing Ties

It was found that pre-existing social ties between stakeholders were crucial at the project's earliest stages, as (P) from Crystalio personally knew (D) of EnviroCycle from before. This pre-existing relationship laid the groundwork for the entire business partnership between the two companies.

P: "*She used to work with a family member of mine[...] We needed a partner and I wanted to work with her, it made business sense of course [...] If people you know and trust come into these kinds of positions, it's a good thing."*

D: *"(P), I know him very well. […] So it's easier to get this deeper contact with him.*

5.2.2 Key Sponsors and Project Champions

The interviews further reveal how (D) in EnviroCycle and (P) in Crystalio, acted as key sponsors of the project by enabling and supporting initial knowledge sharing efforts between the two companies.

In fact, the project owner at EnviroCycle (T), pointed out how (P) was vital to the project, and how he had started communication efforts to build a business partnership.

T: *"(P) from Crystalio had started a small project to find out if it was possible to collect and transport glass to Central Europe and recycle it. But […] they lacked a partner, they needed*

somebody like us who could actually collect it and do the necessary things. So they contacted us, or more specifically me."

(P) from Crystalio explained why EnviroCycle was chosen as a partner, as well as their role in the circular value network to ensure proper flow of materials:

P: *"We visited some construction companies and they all pointed out that they would love to give up their glass, but they wouldn't be able to ship it directly to us. [...] EnviroCycle is a major stakeholder that ensures proper transportation, and they even started to set up a treatment plant for the material."*

(P) possesses extensive expertise in glass recycling operations, making him an authority in the field. His knowledge was shared with EnviroCycle, allowing the company to access knowledge quicker and more precisely than what would have been otherwise possible.

D: "*(P)'s experience and his knowledge has helped us a lot to set up our own operations, and has also been useful when deciding for example what kind of equipment we need. So it's a lot of technical experience, and knowledge as well."*

5.2.3 Configuration of Flows

In addition to key sponsors, the configuration of the network and *how* knowledge is shared was raised in several interviews. Being the CVN focal company, EnviroCycle acts as a link between Crystalio and Brickwork, collecting the end-of-life windows before shipping it to Central Europe where it is turned into the finished product (Appendix 6.4).

D: *"No single company can make a circular material flow on their own [...] The ones that use the material have to interact with us and we have to ensure that the material stream keeps the quality that's needed for recycling into new raw material."*

These material flows are closely intertwined with knowledge flows between the different CVN companies. These flows of knowledge are multi-directional, especially between EnviroCycle and Crystalio. In this exchange, the former shares information on sustainability and control of material flows, while the latter shares technical information and operational know-how (Appendix 6.5).

D: "*So they (Crystalio) have a long experience with glass which we don't have. So it's very beneficial for us to have a deeper collaboration between the companies. But we also need collaboration with the companies that are demolishing houses because that's where our material comes from."*

M: *"Communication is a two-way street, we need feedback on our operations and to share objectives (with our partners). It can't be one sided."*

(L) at EnviroCycle further recognized the importance of these knowledge-sharing flows, viewing the initiatives as an indispensable element of the CVN.

L: *”We need information from every actor. So maybe it's not like the normal way to communicate. But what's cool here is that companies come together for a common need. So it's really a collaborative way of working.”*

Regarding EnviroCycle and Crystalio’s relations with Brickwork, (A) said the following:

A: *“After the initial in-person meeting, where two people from EnviroCycle came and presented the project, I have only been in touch via email with (D) and pretty intensely at times. […] I haven’t been in contact with anyone from Crystalio.”*

5.2.4 Digital Ontology

In order to manage and facilitate knowledge sharing, a common language is created between different stakeholders. The interviews showcase how this common language takes the form of a digital ontology developed by EnviroCycle.

L: *“We have mapped this circular value network to build something that we call an ontology, which is basically an information model that defines what we are talking about. So if we say, for example, thickness of glass, it's defined what thickness of glass is, so it's a common language.*

[...]

We have defined that looking into ontologies is something that can enable the circular economy on a bigger scale. […] It's a prerequisite to share knowledge in a structured way in this circular value network.”

5.2.5 Shared Ambition

In addition to the digital ontology, communal stories played a major role in developing the knowledge sharing relationship. Stories take the form of shared strategic objectives and circularity ambitions.

L: *”We really need to find solutions together, and I would say that the driver here is not on profit margins, it's more about how we can create something that's better for the environment.*

[...]

We have a bold position here. We say that we want to be climate neutral by 2030, and that we want to lead the change to a circular economy. So that's why we also need to participate in these kinds of projects and collaborate with other partners.”

Another participant from EnviroCycle (M) echoed this sentiment:

M: *”Collaboration? That's crucial, that's the future. We have to build partnerships, in order to help each other to accomplish this and not down-cycle. We have to be at the top of the circular economy.”*

On the topic of alignment of strategic objectives, (U) from EnviroCycle said that the intentions of Crystalio were known from the beginning of the project, but that not everything was explicit due to a general unwillingness to share sensitive information.

Q: *”Do you know what their [Crystalio’s] strategic intent or goals are?*”

U: *“Yes. That's been clear for a long time, but then we have layers upon layers of ways down in the business, so it’s complex. Also, there are things that you wouldn't share with the partner companies.”*

An in-depth analysis on this reluctance to share will be conducted in the next sections, that is the dimensions of trust and contracts.

5.2.6 Trust

From the interviews, trust between companies in the CVN was brought up by many participants as important to the knowledge sharing relationship.

Several participants expressed how building trust was a necessary precursor for open communication. Furthermore, they expressed that they felt assurance in the knowledge sharing process thanks to trust.

I: *”Knowing that we have partners that we trust and that we are almost confident that they will not go to someone else with our ideas it's the most important thing. So for me it's really key to build the trust between the different partners.”*

M: *”No, I don't think that anything should be off-limits in communication. It's best to be open about everything and make them aware of everything you can share.”*

(T) from EnviroCycle highlighted the role of (P) at Crystalio as important for trust to develop in the CVN.

T: *“(P) has been one good reason [for trust having been established] because he's been talking with both companies.”*

On the other hand, some participants held a less idealistic view, mentioning how not everything was shared due to the co-opetitive nature of the partnership.

L: *”I would say that an obstacle is the willingness of people to share data. it is something that we face a lot, people feel afraid to share knowledge because they feel it's too close to their core business.”*

D: *”There is some information that they [Crystalio] won't share until we have signed an agreement, especially some of their technical knowledge.”*

As we can see here, this reluctance to share stems from a lack of formal agreements in place, such as contracts, a facet which will be analysed next.

5.2.7 Contracts

The interviews revealed how, except for a letter of intent, no formal contract has, to date, been signed to formalise the network ties and obligations, but that contract negotiations are currently underway.

When asked why no contract was yet in place, one interview revealed the following:

I: *”Contracts are the definitive form of trust, when you sign it you are sure that the other party will be the right one to help you. We need to spend some years getting to know each other, see how well it works. And in the end, I won’t say it’s like a wedding, but almost something like that.”*

During that same interview, further insights on trust and contracts were shared:

I: *”We usually don't share everything, but once we have a contract with them we would probably be a little bit more keen to share, for example on the industrial level.”*

(T) from EnviroCycle discussed the on-going contract negotiations that builds on the current letter of intent:

T: *“When renegotiating this, trust has been extremely important. [...] The contract will be only about glass, we have no intention to add clauses about knowledge sharing, the LOI had a more holistic perspective.”*

5.2.8 Organisational Culture and Conventions

Lastly, organisational conventions and culture were identified from the interviews.

A notable convention was the value of openness found between the network companies:

I: *”Your partners will come to you first when they have an idea or a question, and for me that's the sign of a strong, open network.”*

Furthermore, differing opinions on the impact of culture in the CVN were identified:

D: *”Well I think there are cultural differences that have prolonged the work because we are in different countries and we do business in different ways.”*

L: *”I haven't really experienced any cultural difficulties. I would say that maybe it’s hard for some people to speak English. But most people are kind of comfortable where we are today.”*

6. Analysis

In this section the empirics above will be analysed through the theoretical framework as outlined in section 3.2 in order to answer the research question: "What is the role of social capital in knowledge sharing relationships between companies in circular value networks?¨
The data is then discussed alongside relevant literature, in order to complement the analysis and reach subconclusions which are backed by both empirical evidence and research.

6.1 The Structural Dimension: A Catalyst for Knowledge Sharing Relationships

The first section of the findings reveals how the nature and structure of ties between key stakeholders in the CVN proved to be an essential catalyst to initiate and maintain the knowledge sharing relationship and efforts in the project.

The pre-existing ties between the two key stakeholders, (P) of Crystalio and (D) of EnviroCycle, laid the foundation for RecyClear. This transfer of social capital from one context (personal) to another (business) fits with the idea of *appropriable organisation* (Nahapiet & Ghoshal, 1998). This points to the notion that pre-existing ties hold an important role at the early stages of a relationship between companies in a CVN, serving as antecedents to trust, strong relationships and knowledge sharing. Previous studies conducted on traditional value networks have reached similar conclusions (McNeish & Mann, 2010).

After the initial phase of interaction, the relationship and wider CVN began to take shape as EnviroCycle initiated contact with Brickworks, supporting the establishment of knowledge sharing flows between the companies alongside flows of materials. Two dimensions, namely *network ties* and *network configuration*, created knowledge pathways between the companies.

Flows of knowledge were opened between EnviroCycle and Crystalio thanks to (P) sharing his knowledge, while receiving in exchange cooperation and expertise with handling and shipping the glass.

The ties in the RecyClear network are dense in structure with a high level of redundancy, manifested by monthly meetings and regular email exchanges between people at various levels in EnviroCycle and Crystalio. Some scholars see this configuration as ideal to maintain the knowledge sharing relationship between companies with very different knowledge bases (Cohen & Levinthal, 1990; Coleman, 1988). On the other hand, Burt (1992) makes the argument that redundancy increases costs associated with maintaining contacts, and therefore should be avoided. High density and redundancy was beneficial to EnviroCycle and Crystalio, as they had many complex challenges that needed resolving together, even if frequent interactions sometimes might have meant additional communication costs. This suggests that the proper level of density in a CVN is context dependent (Gilsing & Duysters, 2008).

Furthermore, stakeholders stress how RecyClear is complex, as the companies involved are moving from linear material flows and towards circular ones. Velte & Steinhilper (2016) recognize this complexity in CVNs, and suggest that a way to reduce it is through careful design and management of the CVN. In the case of RecyClear, pre-existing network ties contributed to the creation of knowledge sharing relationships, which in turn enabled better management of complexity.

These findings lead to the first subconclusion, which is that the structural dimension of social capital, including the pre-existing network ties in the CVN function as a catalyst to initiate the knowledge sharing relationship. Subsequently, the structure and nature of ties lays the groundwork for the continuation of knowledge sharing relationships. Knowledge sharing is maintained by the high density connections and redundancy between the companies, all-in-all allowing for the managing of complexity and a seemingly stronger knowledge sharing relationship.

6.2 The Cognitive Dimension: Establishing a Shared Interorganisational Framework

The second part of our findings delves into the concepts of *shared language* and *shared narratives*, two dimensions which proved essential to establish a common framework for the knowledge sharing relationship in the case, and to provide a common vision based on shared goals and beliefs.

As established in section 5.2.4, the development of a shared language through a digital ontology is seen by stakeholders in RecyClear as a necessary tool for interorganisational knowledge sharing. This notion finds further validity in theory, as the effect of a shared language on knowledge sharing has been recognised in a variety of contexts. For example, it is established that common language increases knowledge sharing quality significantly in digital communities (Chiu et al., 2006).

Digital ontologies specifically, as a subset of shared language, have also been extensively researched as a critical antecedent to knowledge sharing relationships, as they promote communication through the establishment of a common vocabulary (Uschold & Gruninger, 1996). The common vocabulary creates an “ontological base”, a framework which has been recognised to be useful in various complex external environments (e.g., Ghrab et al., 2016). This was evident in the case, as the digital ontology allowed companies in the CVN to resolve complex operational challenges while simultaneously strengthening the knowledge sharing relationship. Consequently, shared language can play parallel roles in a CVN.

In fact, as previously mentioned the companies in the CVN have very different knowledge bases. The theoretical framework (Nahapiet & Ghoshal, 1998) suggests that this is not ideal for sharing knowledge, as more efficient knowledge sharing occurs between companies with overlaps in knowledge. Contrary to this theory, respondents did not see knowledge gaps as a limitation. A possible explanation is that the digital ontology created a common framework

that “filled the gaps” of knowledge, thereby allowing stakeholders with very different knowledge bases to communicate and effectively maintain relationships.

In addition to a shared language, shared narratives represent a second cognitive aspect of social capital that has bearing on knowledge sharing relationships as they provide a motivation for companies to share knowledge in the CVN.

The narratives in the RecyClear case take the form of “good stories” or shared beliefs in CE and sustainability. Stakeholders feel encouraged to share knowledge as they see the CE as a goal to collectively achieve. Research agrees with this empirical finding, as shared narratives have been recognised to create a bond of solidarity, which in turn facilitates collective action and increases trust (Chamlee-Wright & Storr, 2011). Even in the specific case of the CE, researchers emphasise how shared beliefs are central for transitioning towards sustainability (Thornton et al., 2020).

These findings allow the formulation of a second subconclusion, which is that the cognitive dimension of social capital serves an important enabling role in the knowledge sharing relationship in CVNs. More specifically, shared language constitutes a framework for interorganisational knowledge sharing in complex environments such as CVNs, where alignment of meaning between stakeholders is necessary. On the other hand, shared narratives incentivise knowledge sharing relationships directly *and* as a precursor to trust, through the use of good stories on sustainability which different stakeholders can relate to.

6.3 The Relational Dimension: Implications of Trust and Contracts for Knowledge Sharing Relationships

The third section of our analysis is concerned with the relational dimension of social capital. Particular attention will be devoted to *trust* and *obligations*, as the participants identified them as essential to the knowledge sharing relationship.

Trust has been recognised by every stakeholder in the CVN as pivotal for knowledge sharing relationships. This outcome is in line with research on CVNs (Boons et al., 2009), as well as with Nahapiet and Ghoshal’s (1998) theoretical framework, since they demonstrate that “where relationships are high in trust, people are more willing to engage in social exchange in general, and cooperative interaction in particular.” Moreover, trust is seen as a way to manage and cope with complexity, a key factor for the success of CVNs (Velte & Steinhilper, 2016). Furthermore, as previously introduced, trust, in the case, is also seemingly affected by various social dimensions (such as *appropriable organisation* and *shared narratives*), which in turn affects the knowledge sharing relationship. This gives further validity to the notion that trust is an important, mediating antecedent to knowledge sharing relationships in CVNs.

A dimension of social capital which is closely linked to trust is “obligations”, like contracts and formal agreements (Nahapiet & Ghoshal, 1998). In RecyClear, no formal contract had yet been signed, only a letter of intent. Stakeholders mentioned how the lack of binding

agreements hampered trust between the companies, which consequently hindered knowledge sharing. Contemporaneously, participants blamed the lack of formal agreements on an insufficient level of trust, mentioning how contracts are "the definitive form of trust", thus requiring high levels of trust in order to facilitate.

Simply put, the lack of contracts hindered the formation of trust, and in turn prevented the process of signing contracts, ultimately challenging the knowledge sharing relationship. This finding goes against social capital theory in the sense that two sub-dimensions of social capital appear to have at times a paradoxical relationship, resulting in a negative effect on the social capital between two organisations.

Given the aforementioned points, the third subconclusion can be formulated: Trust is key to strong knowledge sharing relationships in CVNs, and it has a mediating role with other dimensions of social capital. When considering the effect of trust and obligations, their paradoxical relationship can hinder knowledge sharing relationships.

6.4 Minor Factors Affecting Knowledge Sharing

In this final section the dimensions of *norms* and *identification* will be briefly analysed, as well as factors like geographical distance and company size differences, in order to tackle the limitations of the theoretical framework outlined in section 3.3.

As for norms and identification, empirics suggest that, contrary to social capital theory, their role in knowledge sharing relationships is rather minor, and occasionally ambiguous. Some participants recognise norms of openness in EnviroCycle and Crystalio, while others did not mention them. Regarding identification, some participants recognised cultural differences between the companies while others saw them as a non-issue. The low number of responses on these topics, as well as their ambiguity lead us to the conclusion that they play a minor role in the knowledge sharing relationship, compared to other social capital dimensions. The same reasoning applies to the questions of geographical distance and company size, two factors which did not seem to majorly affect knowledge sharing relationships.

7. Discussion

7.1 Answer to Research Question

The data above has been analysed through the lenses of the theoretical framework and literature in order to answer the research question: "What is the role of social capital in knowledge sharing relationships between companies in circular value networks?"

In essence, social capital directly and indirectly shapes knowledge sharing relationships between companies in CVNs, and, particularly, dimensions of social capital were found to play catalysing, aligning, incentivising and hindering roles.

Given these conclusions, an updated version of the theoretical framework (Figure 7.1), incorporating the more complex role of trust and obligations, has been created.

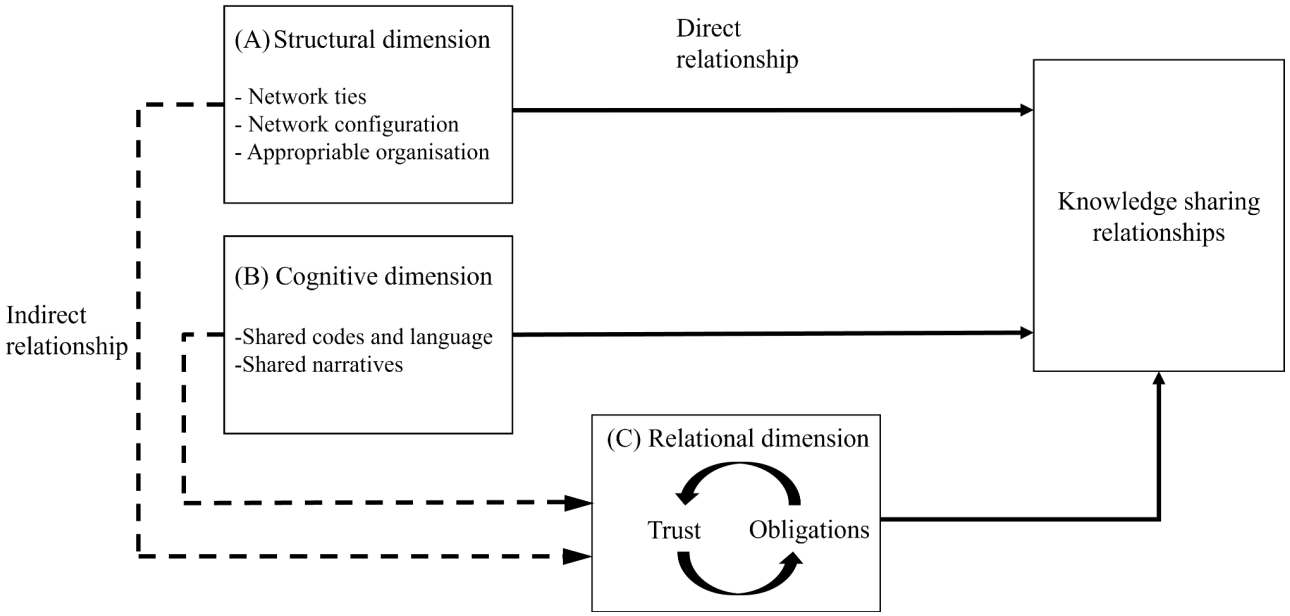

Figure 7.1 Updated role of social capital for knowledge sharing relationships in CVNs (Edited by Angeloni & Axelson, 2023)

7.2 Contributions to Literature

This study contributes to contemporary scholarship on CVNs, CE, and social capital by answering the call for research on the intersection of these fields (Dias & Silva, 2021; Dias & Silva, 2023). By shedding light on social capital's role in knowledge sharing relationships in CVNs, insights can be gauged into the antecedents of collaboration in the CE, which is argued to be crucial by e.g., Sumter et al. (2018) and Bocken and Geradts (2020). Additionally, this study adds specifically to the nascent literature that applies social capital theory to CVNs (e.g., Leder, 2021; Leder et al., 2023), showing it is applicable particularly to

knowledge sharing-related questions. In that sense, this study attempts to bridge well-established literature on knowledge sharing and social capital with the rapidly developing field of CVN research.

Furthermore, certain dimensions of social capital, mainly trust, have previously been recognised as important to knowledge sharing and collaboration in some sustainable business settings (e.g., Cheng et al., 2008). However, our study, unlike Cheng et al. (2008), finds that other dimensions of social capital, like shared narratives and values, are important for knowledge sharing too as they serve as a source of motivation in the knowledge sharing relationship. Perhaps this is due to many earlier studies focusing on sustainable business contexts that are less complex from the perspective of knowledge sharing than CVNs (Velte & Steinhilper, 2016). Fundamentally, partner companies in a CVN need to align incentives and motives, as individual companies lack the resources and capabilities to succeed alone (Frishammar & Parida, 2021). Hence, given the complexity faced by EnviroCycle and Crystalio, shared narratives and values appeared to be needed along with trust, to create the necessary alignment that enabled knowledge sharing and collaboration.

The topic of contracting in circular business projects is discussed in contemporary research, and firms' initial reliance on informal agreements over contracts to speed up collaboration is documented (e.g., Brown et al., 2020). This study adds the trust perspective to the discussion of contracting in CVNs. In line with Woolthuis et al. (2005), who show that in some cases a baseline level of trust is required as a hygiene factor for signing contracts, we find that trust and contracts act as complements rather than substitutes in the context of developing the knowledge sharing relationship. This finds validity in modern contract theory as Shen et al. (2020) recognise this phenomenon specifically in the expansion phase of projects. Similarly, Brown et al. (2020) find that greater importance is placed on formal agreements as innovation progresses towards commercialization in circular business projects. In the RecyClear case, it was also clear that the lack of a contract became a hindrance to trust and a deeper knowledge sharing relationship as the project matured. This finding adds to Frishammar and Parida's (2021) point that creating alignment between partners is a key challenge for CVN companies to overcome when collaborating and sharing knowledge.

7.3 Practical Implications

Finding potential partners is a challenging aspect of initiating CBM collaboration in networks (Leder et al., 2023) Our study implies that, from the perspective of knowledge sharing relationships, managers seeking to develop CBMs should seek to collaborate with firms where key people a) are very knowledgeable and experienced in the field, and b) ideally already have ties with key people in the manager's own organisation. Through this, pre-existing social capital (like in the case of trust and obligations in the previous section) can be leveraged and new social capital more easily developed, which arguably strengthens the knowledge sharing relationship.

Additionally, firms collaborating in a CVN should pay careful attention to the interplay between trust and contracts and its implications for knowledge sharing relationships. As this study finds, when companies work together over time trust develops, ultimately to a stage where parties feel ready to sign a binding contract. However, the study also finds that the lack of a contract hampers trust and makes companies hesitant to share certain kinds of knowledge. This, in turn, may slow down the progress of the CBM developed by the two companies in the CVN. Hence, practitioners should consider what trust-building measures can be taken, in lieu of contracts, to expedite knowledge sharing. Selectiveness when choosing partners could potentially serve this purpose (Pouwels & Koster, 2017).

7.4 Limitations

First, as stated in the research purpose (1.3) and delimitations (1.4) this study is mainly concerned with studying social capital as to how it persists in knowledge sharing relationships. Hence, the study has no ambition of establishing causal links between social capital and knowledge sharing itself. Studying this would likely require a more extensive, maybe quantitative or mixed methods study, where proxies for successful knowledge sharing are developed.

Second, this study neither assumes nor claims social capital is substantially different in CVNs compared to non-CVN business contexts, but rather that there are noteworthy nuance differences. Given this, the theoretical contributions made and the practical implications formulated in relation to what pre-existing literature claims characterises social capital in relation to knowledge sharing relationships in general. Consequently, a comparative case study could have yielded deeper and more extensive insights on how social capital's role is different in knowledge sharing in circular compared to linear business settings.

Third, as this study sits in the positivist paradigm, it is limited in how much light it can shed on how individuals working in CVN partner companies experience the role of social capital in shaping the knowledge sharing relationship. The study's subsequent interorganisational emphasis also means individuals' part in knowledge sharing relationships may have been downplayed in the study.

7.5 Suggestions for Future Research

In a sense, this study mainly examines how social capital contributes to knowledge sharing relationships in CVNs. However, future research could investigate more thoroughly the impeding effects, like the trust-contract paradox, of social capital on knowledge sharing, which has been studied (Asrar-ul-Haq & Anwar, 2016) but to our knowledge not in a CVN context. Additionally, future research could look further into how social capital relates to the different kinds of knowledge shared between companies in the CVN, as this study does not comprehensively distinguish for example between whether tacit or explicit knowledge is shared. Lastly, the role and perceptions of individuals in shaping interorganisational knowledge sharing relationships could be further examined.

7.6 Conclusion

Developing new circular solutions requires innovation, collaboration and knowledge sharing between companies. Hence, this study has explored and discussed what role dimensions of social capital like trust, shared language and networks play in knowledge sharing relationships in CVNs. The findings and take-aways can be of interest to both practitioners and academics engaged in business' transition to the CE.

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Appendices

Appendix 1. Overview of Participants

Interview number	Code name	Position (stylised)	Company (pseudonymised)
1	P	Technical manager	Crystalio
2	D	Business developer	EnviroCycle
3	U	Business developer	EnviroCycle
4	M	Key account manager	EnviroCycle
5	A	Sustainability manager	Brickworks
6	I	Technical manager	Crystalio
7	G	Sustainability manager	Crystalio
8	L	Digital manager	EnviroCycle
9	T	Project owner	EnviroCycle

Appendix 2. Information About Interviews

Interview number	Participant	Duration	Date	Setting
1	P	39 min	20/9 2023	Microsoft Teams
2	D	37 min	21/9 2023	Microsoft Teams
3	U	35 min	21/9 2023	Microsoft Teams
4	M	17 min	27/9 2023	Microsoft Teams
5	A	37 min	29/9 2023	Microsoft Teams
6	I	42 min	2/10 2023	Microsoft Teams
7	G	54 min	6/10 2023	Microsoft Teams
8	L	34 min	5/10 2023	Microsoft Teams
9	T	38 min	13/10 2023	Microsoft Teams

Average interview duration	37 min
Min. interview duration	17 min
Max. interview duration	54 min

Appendix 3. Initial Email to Potential Interview Participants

Dear [first name],

We hope this email finds you well. Our names are Isak and Jacopo and this semester we are writing our bachelor thesis in management at the Stockholm School of Economics, looking specifically at circularity and knowledge sharing. We heard from [name of contact person] at EnviroCycle [N.B. pseudonymised] that you might be a good person for us to talk to as we want to specifically look into the RecyClear project [N.B. pseudonymised].

Would it be possible for us to schedule an interview with you? It would take place over Microsoft Teams and take about 45 minutes. Please suggest a time that fits you.

Thank you in advance!

Best regards,
Isak Axelson and Jacopo Angeloni

Appendix 4. Interview Guide (revised version after two initial interviews)

Initial introduction

- Presenting ourselves
- Presenting the aim of the study and our research interests
- Presenting the structure of the interview, i.e. length, types of questions, etc.
- Explaining rights under GDPR, that anonymity will be ensured, and that participation is entirely voluntary
- Confirming with interviews that they agree to the interview being recorded and transcribed
- Asking whether participant has any questions before the interview begins

Biographical questions

- What is your role in the company? How long have you been there?
- How are you involved in the RecyClear project?

Collaboration in the circular value network

- How long has this project been ongoing? How did it all start?

- What is your company hoping to get out of the flat glass project? Why did the company get involved in it?
- How is the collaboration structured? Is there, for example, a dedicated project team?

Communication and sharing in the knowledge sharing relationship

- How do you communicate with the people in the other companies involved in the project? How often do you interact?
- For what purpose do you communicate and share knowledge? For example, is it to resolve operational issues or to discuss visions and strategy for the project?
- How detailed are the things you share? Are there things you are hesitant to share?

Social capital in the knowledge sharing relationship

- How well would you say that you know the people involved at the other companies? Do you trust them?
- Have you had challenges understanding each other or aligning expectations? In that case, how have you resolved that?
- What social factors are important for knowledge sharing and the partnership to work?

Potential follow-up/detailed questions

- How are things working with the letter of intent? What is the process of signing a contract looking like?
- How do your company's sustainability goals align with the RecyClear project?
- The digital ontology seems to be an important component of this project, have you been involved with it?

Wrapping up

- Do you have anything more you would like to add that could be of interest to us?
- Do you know other people who have been involved that we should interview?

Appendix 5. Example of Coded Interview

I haven't really experienced the any cultural like difficulties. I would say maybe for some people, when you're used to speaking your mother tongue and then have to change to English, that might be optimal for some. But I would say, like most people are kind of comfortable which is important when. think that discussing everything that needs to be in place to be able to create the ontology. That's maybe the hard part because people have a bit of different like perspectives and you really need to question what do you mean when you say this. So you're really really need to map the structure in detail because otherwise you can't build an ontology that actually works. […] [Developing the ontology], it's really hard because it needs to be super simple and then you really, really need to understand the problem that you code. […] I would say like the benefit in this case in this flat glass case is that it's kind of like straight down points. It's not that difficult. We take flat glass from used windows. We crush it, we control it. We can classify it [using the ontology]. Of course there are different steps, and it requires a lot of advanced techniques, but it's not that hard to map. […] I think maybe that's

also where it's hard, like for other circular value networks or ecosystems, that is, it's really hard to define this basic flow for all the different actors and stakeholders, and to agree that this is what we see.

Codes:
Differences in perspectives/culture
Role of language
Digital ontology
Strengths of the RecyClear project
Material flows
Other CVNs

Appendix 6. Figures

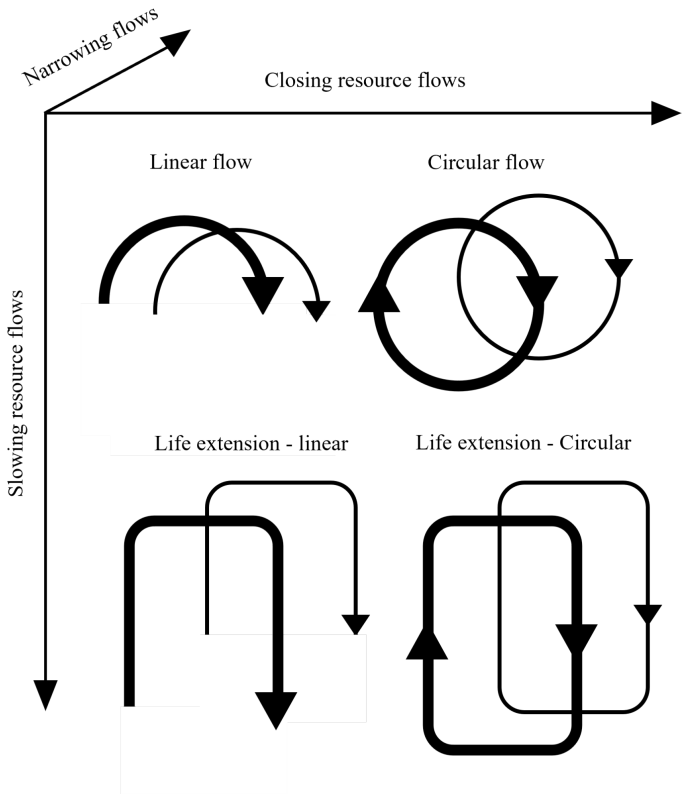

Figure 6.1 Categorization of linear and circular approaches for reducing resource use. (Bocken et al., 2016) (Edited by Angeloni & Axelson, 2023)

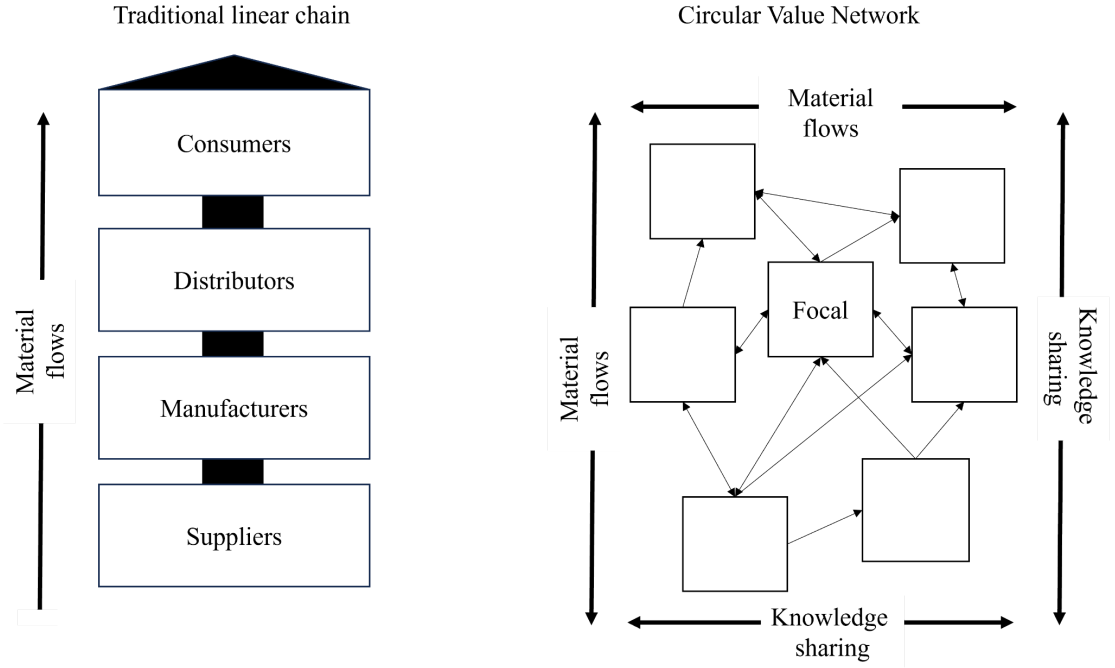

Figure 6.2 Traditional linear chain based on material flows and the circular value network based on knowledge exchange and material flows (synthesised from Feng 2013; Boons et al., 2009; Frooman 1999; Hein et al., 2017) (Edited by Angeloni & Axelson, 2023)

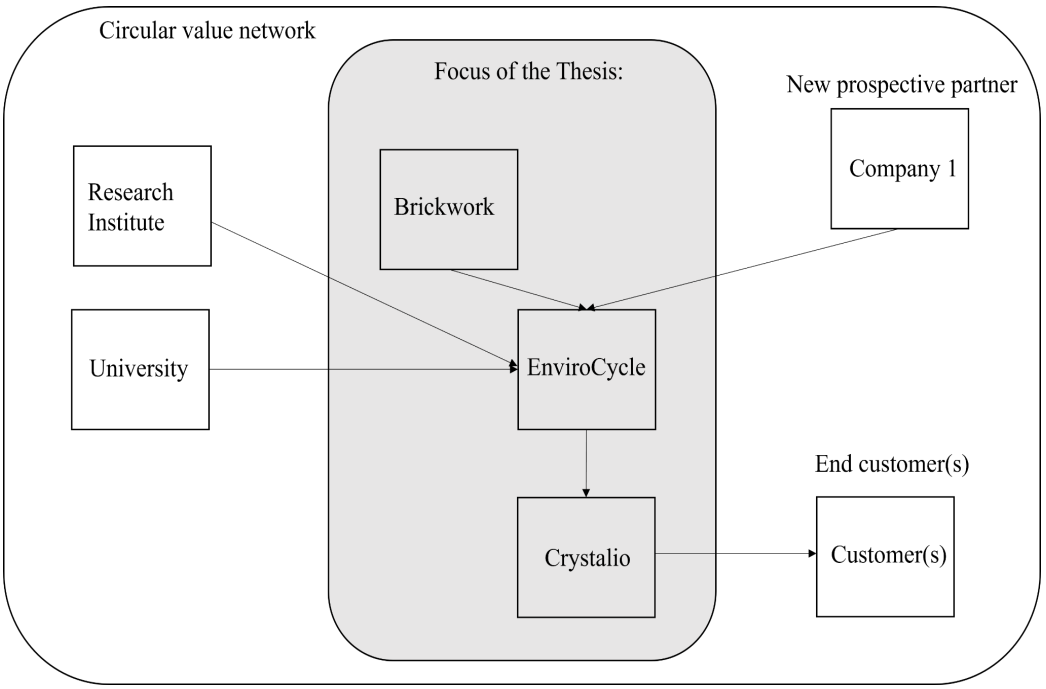

Figure 6.3 Overview of the circular value network of RecyClear, including knowledge and material flows (Edited by Angeloni & Axelson, 2023)

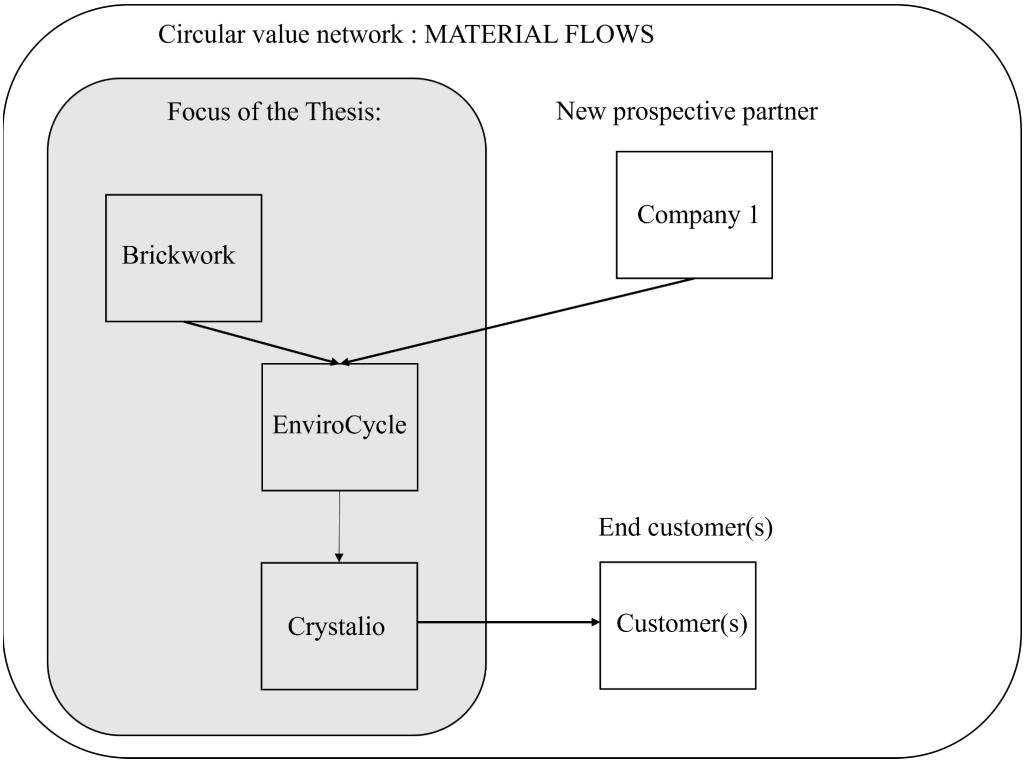

Figure 6.4 Overview of the circular value network of RecyClear, material flows (Edited by Angeloni & Axelson, 2023)

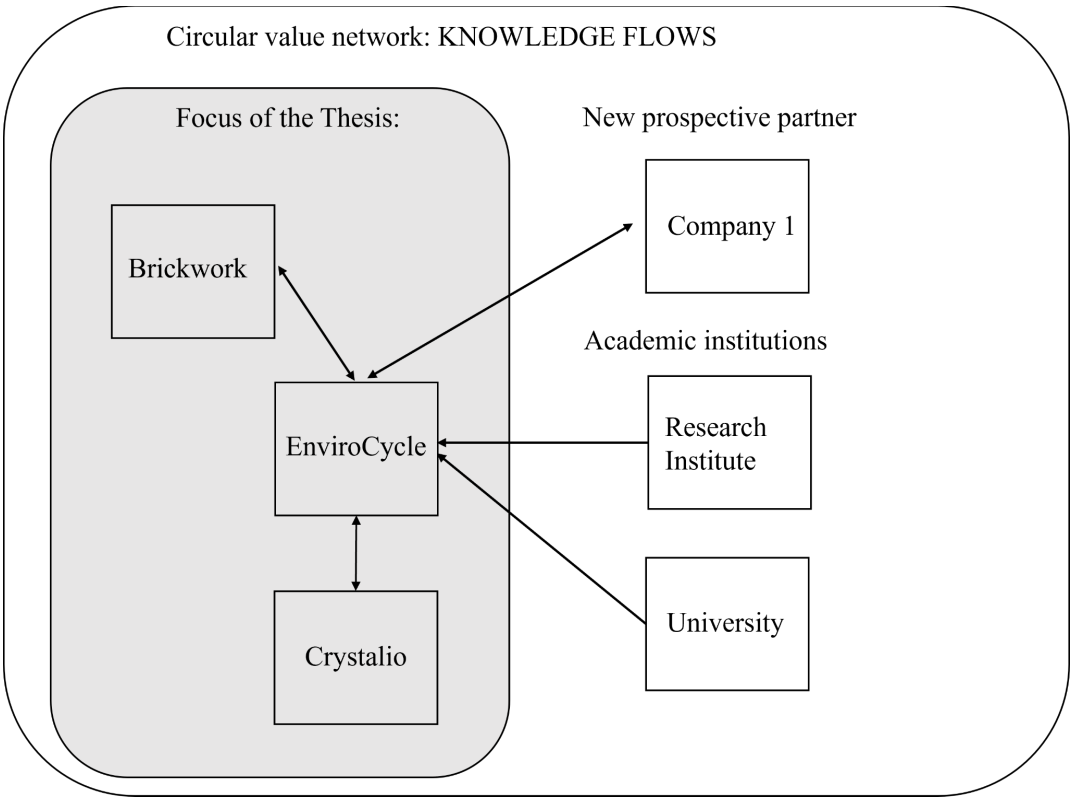

Figure 6.5 Overview of the circular value network of RecyClear, knowledge flows (Edited by Angeloni & Axelson, 2023)